

# NONSENSE FIGURE

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## 1. Introduction: Definition and Conceptual Context

The concept of the **nonsense figure** occupies a crucial, albeit specialized, niche within the history of experimental psychology, primarily serving as a standardized stimulus designed to isolate the purest forms of human perception, learning, and memory processes. Fundamentally, a nonsense figure is a visual stimulus constructed specifically to lack inherent, recognizable meaning or association for the observer, thereby preventing the intrusion of prior knowledge, semantic encoding, or emotional biases during experimental tasks. This intentional lack of meaning distinguishes them sharply from meaningful stimuli, such as photographs of common objects or recognizable geometric shapes, making them invaluable tools for researchers seeking to study the fundamental mechanisms by which the brain organizes, retains, and retrieves novel information. The theoretical underpinning for utilizing such stimuli rests on the assumption that if the material presented holds no pre-existing cognitive hooks--no name, no function, no cultural context--then any observed learning or recall must necessarily reflect the efficiency of the core cognitive systems being investigated, rather than relying on semantic elaboration or mnemonic strategies developed through life experience. Therefore, the nonsense figure acts as a cognitive blank slate, offering a controlled environment for dissecting the complexities of human cognition.

The utility of the nonsense figure is inextricably linked to the early movement in psychology aimed at establishing rigorous, quantitative methods for studying mental phenomena, moving away from purely introspective analysis. By employing standardized, meaningless visual arrays, researchers could ensure that all participants started from a comparable baseline of knowledge regarding the stimulus, significantly reducing inter-subject variability attributable to differing life histories or subjective interpretations. This methodological rigor allowed for the formulation and testing of precise hypotheses concerning the parameters influencing perception and recall, such as exposure duration, complexity, repetition, and interference effects. While often conceptually paired with **nonsense syllables**, the visual nature of the figures introduces unique variables related to spatial organization, feature extraction, and holistic perception, demanding specific analytical approaches distinct from those applied to verbal learning. The study of how individuals attempt to impose meaning upon these inherently meaningless configurations further illuminates the brain's innate tendency towards organization and pattern recognition, even in the absence of objective structure.

Furthermore, understanding the definition of the nonsense figure requires appreciating the distinction between figures that are simply unfamiliar and those that are genuinely non-representational. An unfamiliar object from a distant culture might still possess inherent meaning and context within that culture, which could potentially be inferred or learned quickly; conversely, a true nonsense figure is designed specifically to defy immediate categorization as an object, symbol, or letter. This strict criterion ensures that the cognitive effort required for processing is focused entirely on the novel visual characteristics--lines, angles, symmetry, closure--rather than on retrieving existing semantic networks. This focus on the purely visual elements has made

nonsense figures particularly important in studies examining the development of perceptual skills in children, cross-cultural differences in visual processing, and the impact of neurological damage on the ability to integrate fragmented visual input. Consequently, the nonsense figure is not merely a random drawing, but a carefully engineered scientific instrument designed to probe the limits of human perceptual capacity.

## 2. Historical Origins and Experimental Utility

The historical trajectory of the nonsense figure mirrors the professionalization of experimental psychology in the late 19th and early 20th centuries. While Hermann Ebbinghaus famously pioneered the use of the nonsense syllable (CVC trigrams) for measuring verbal memory in the 1880s, establishing a paradigm for studying learning curves independent of semantic content, the application of truly meaningless visual stimuli followed closely, driven by parallel interests in visual perception. Early researchers recognized that visual stimuli, like verbal stimuli, needed standardization to isolate core perceptual processes. Figures that were irregular, fragmented, or deliberately non-Euclidean were introduced to challenge the observer's natural tendency to categorize and simplify, forcing a reliance on rote visual memory rather than conceptual coding. This early period saw researchers grappling with the ideal level of complexity and meaninglessness required to achieve experimental control, leading to various attempts to systematically generate such figures, often drawing inspiration from abstract art or complex geometric arrangements that lacked common names.

One pivotal development involved the work of the Würzburg School, particularly that of Oswald Külpe and his associates, who were interested in thought processes and mental set. Although their primary focus was often on verbal tasks, the need for neutral visual stimuli to test the influence of instructional set on perception was evident. However, the most significant formalization of the nonsense figure as a standardized stimulus set is often attributed to the development of specific batteries designed for replicable research. These standardized sets aimed to ensure that researchers across different laboratories could compare results directly, knowing they were using stimuli of equivalent difficulty and associative value. The utility of these figures lay precisely in their negative definition--they were useful because of what they were not--they were not letters, not symbols, not faces, and not common household objects. This negative attribute allowed experimenters to precisely measure the rate at which meaning is imposed or learned onto arbitrary visual input, offering quantitative metrics for perceptual learning.

The enduring utility of the nonsense figure stems from its ability to serve as a baseline measure in complex experimental designs. When comparing the speed and accuracy of learning meaningful shapes (e.g., symbols associated with specific tasks) versus nonsense shapes, researchers gain powerful insights into the cognitive efficiency benefits conferred by existing semantic networks. For instance, in studies of transfer of learning, participants might initially learn a list of nonsense figures

and then transition to learning a list of meaningful figures. Differences in the learning curves provide evidence regarding how general perceptual skills acquired during the initial phase transfer to the subsequent, semantically rich phase. Moreover, the figures became indispensable in studies of recognition memory, where the difficulty of distinguishing a previously seen nonsense figure from a novel, but structurally similar, distractor highlights the precision and fragility of visual trace memories, particularly when semantic elaboration is unavailable as a compensatory strategy.

### 3. Characteristics and Design Principles

The construction of an effective **nonsense figure** is governed by specific design principles intended to maximize its meaninglessness while maintaining sufficient complexity to challenge the perceptual system. A poorly designed figure might inadvertently resemble a letter, an animal, or a tool, thereby compromising the experimental control; conversely, a figure that is too simple, such as a single line or a dot, would not engage the necessary higher-order organizational processes. Therefore, researchers often employ rigorous criteria for screening stimuli, frequently using pre-testing phases where participants are asked to name, describe, or associate the figures, ensuring that those eliciting strong, consistent semantic responses are discarded. The key characteristic is the balance between complexity and non-representational quality, ensuring the figure is novel and challenging without being utterly chaotic or impossible to perceive as a unified whole.

Several quantifiable dimensions are considered critical during the generation of these stimuli. One primary dimension is **complexity**, which can be measured by the number of line segments, angles, points of intersection, or the perimeter-to-area ratio. Figures of low complexity might be too easily encoded as simple geometric primitives, while figures of excessive complexity might overwhelm working memory capacity, leading to floor effects. A second crucial dimension is **closure** and internal organization. While some nonsense figures are composed of closed, cohesive forms, others are deliberately fragmented or open, forcing the observer's perceptual system to actively impose organization or structure where none objectively exists. The degree of symmetry, or lack thereof, is also a powerful variable; highly symmetrical figures tend to be perceived as more organized and are often easier to recall, even if they lack meaning, whereas asymmetrical figures challenge the brain's inherent preference for balance.

The methodology for creating standardized sets often involves combinatorial approaches or algorithmic generation. For example, some early researchers developed systems where a fixed number of lines (e.g., five to ten) were randomly connected, subject to constraints ensuring no immediate resemblance to common symbols. Later, more sophisticated methods utilized computer generation to systematically vary parameters such as jaggedness, curvature, and density, allowing for the precise calibration of figure difficulty across experimental conditions. The use of algorithmic generation helps ensure that the figures are truly novel and that the variance in recognition or recall performance across a set of figures is due to inherent differences in their visual structure,

rather than accidental semantic resemblance. Ultimately, the design goal is to produce a stimulus that requires maximum visual encoding and minimum semantic processing, forcing the observer to rely purely on the mechanisms of visual memory trace formation.

#### 4. Application in Learning and Memory Research

The primary domain where nonsense figures have demonstrated their critical value is in the study of human learning and memory, particularly in differentiating between visual short-term memory (VSTM) and long-term memory (LTM) encoding processes. Because these figures resist verbal labeling--a common strategy used by participants to bolster VSTM capacity--they provide a unique window into the purely visual, non-semantic components of memory storage. Researchers can precisely manipulate factors such as presentation speed, concurrent verbal load (to suppress subvocalization), and interference tasks to isolate the parameters that govern the formation and decay of visual memories devoid of linguistic support. For example, if a participant is prevented from assigning a descriptive phrase to a complex nonsense figure, their subsequent recall performance is seen as a direct measure of the capacity and duration of the visual buffer itself, bypassing the often-dominant influence of the phonological loop.

Furthermore, nonsense figures are essential in investigating the effectiveness of different encoding strategies. When participants are explicitly instructed to invent meanings, narratives, or verbal labels for the figures, their recall often improves dramatically, demonstrating the power of semantic elaboration even when applied to arbitrary stimuli. Comparing performance under rote learning conditions versus elaborative encoding conditions allows researchers to quantify the cognitive gain provided by imposing subjective meaning. This paradigm is crucial for understanding metamemory--the knowledge individuals have concerning their own memory processes--as participants learn to adapt their encoding strategies to deal with material that is fundamentally difficult to verbalize. The results often confirm that the human memory system prefers meaningful content, but also reveal the capacity to utilize visual features (like symmetry or specific angles) as non-semantic retrieval cues.

In the context of long-term memory, nonsense figures have been used extensively to study pattern separation and generalization. Pattern separation is the process by which the brain distinguishes between two highly similar inputs, ensuring that a memory trace for one does not interfere with the trace for the other. When presented with a series of distinct but structurally related nonsense figures, the observer's ability to correctly identify only the previously seen items, while rejecting highly similar foils, serves as a sensitive measure of the fidelity of LTM encoding. Conversely, studies of generalization utilize figures that share underlying structural rules; if a participant learns a set of figures and then successfully classifies novel figures based on those hidden rules, it suggests that the learning process moved beyond mere rote memorization to the extraction of underlying visual principles. These applications provide crucial insights into how the hippocampus

and related structures manage similarity and difference in visual input.

## 5. Nonsense Figures and Perceptual Organization (Gestalt Theory Connection)

The employment of nonsense figures is deeply intertwined with the principles and investigations of **Gestalt psychology**, which focuses on how the human mind organizes discrete elements into unified, coherent wholes (Gestalten). Nonsense figures, by definition, lack conventional meaning, yet observers invariably attempt to perceive them as organized structures, demonstrating the powerful, inherent organizational biases of the perceptual system. When confronted with a chaotic arrangement of lines and angles, the observer's mind immediately applies principles such as proximity, similarity, closure, and continuity to try and structure the stimulus into recognizable sub-units or a single, unified shape. Thus, the nonsense figure serves as a perfect test bed for observing these Gestalt laws in operation, independent of semantic interference.

For example, a nonsense figure composed of several disconnected lines might still be perceived as a single, broken circle or an incomplete square (the Law of Closure), demonstrating the brain's tendency to fill in gaps and achieve the most stable, simplest interpretation of the visual field. Researchers studying perception often manipulate the parameters of the nonsense figures--adjusting the spacing between elements, the consistency of line weights, or the degree of asymmetry--to determine which Gestalt principles dominate the organizational process under varying conditions. This research has been vital in confirming that perception is not a passive reception of sensory data, but an active, constructive process where the mind imposes structure onto ambiguous input. The figures reveal the fundamental drive toward "Prägnanz," the tendency to perceive the "good form" or the most clear and memorable organization possible.

The study of perceptual learning also utilizes nonsense figures to track changes in organizational efficiency over time. When observers are repeatedly exposed to the same set of complex, arbitrary figures, they often become faster and more accurate at recognizing them, not necessarily because they have assigned names, but because their perceptual system has optimized its organizational strategy for those specific visual inputs. This shift demonstrates the plasticity of perception and the ability of the visual system to learn how to efficiently group and chunk complex information. In clinical settings, nonsense figures are sometimes employed to assess visual agnosia or other perceptual deficits, as difficulties in organizing or recognizing these arbitrary forms can pinpoint specific breakdowns in the visual processing hierarchy, distinct from failures in semantic knowledge or language comprehension.

## 6. Comparative Analysis: Figures vs. Syllables

Although both the nonsense figure and the nonsense syllable were historically introduced to

provide clean, standardized stimuli devoid of pre-existing meaning, their applications and the insights they provide differ significantly due to the distinct sensory modalities and cognitive processes they engage. The **nonsense syllable** (typically a consonant-vowel-consonant, or CVC, trigram like DAX or JAT) is fundamentally linguistic; it probes the mechanisms of verbal learning, rehearsal, and retrieval, heavily relying on the phonological loop and acoustic encoding. Its primary purpose is to measure rote, serial learning capacity and the factors governing interference in the verbal domain.

In contrast, the **nonsense figure** is purely visual and spatial. It bypasses the phonological loop and requires encoding based on visual features, spatial relationships, and holistic configuration. Learning a nonsense figure relies heavily on the visuospatial sketchpad component of working memory and the visual cortex's ability to form durable, non-semantic visual traces. The cognitive challenge posed by the figure is one of organization (how to chunk the lines and angles), whereas the challenge posed by the syllable is primarily one of order and sequence (how to maintain the correct serial position). Consequently, experiments using figures provide deeper insights into aspects of memory influenced by visual acuity, spatial attention, and pattern recognition, which are often obscured when verbal strategies are dominant.

The difference is most apparent when considering the nature of errors. Errors in nonsense syllable recall typically involve transposition, substitution of letters, or phonetic similarities (e.g., recalling 'TAV' instead of 'JAT'). Errors in nonsense figure recognition, however, often involve failures in pattern separation, where the recalled figure is a composite of features from two or more learned figures, or a failure to distinguish the target from a structurally similar foil. This contrast highlights the fundamental distinction between the verbal and visual memory systems. While the syllable aims to strip away meaning to study phonological memory, the figure aims to strip away meaning to study pure visual encoding and spatial memory. Modern cognitive models frequently utilize both types of stimuli in dual-task paradigms to explore how visual and verbal working memory resources interact and compete during complex cognitive operations.

## 7. Contemporary Relevance and Criticisms

Despite their origins in early experimental psychology, nonsense figures retain significant contemporary relevance, particularly in specialized fields such as neuropsychology, artificial intelligence research, and advanced studies of perceptual development. In neuropsychology, they continue to serve as diagnostic tools. For example, tests involving the reproduction or recognition of complex, non-representational figures (such as the Rey-Osterrieth Complex Figure Test, although semi-meaningful, it shares the principle of testing organizational skills) help clinicians assess deficits related to right hemisphere functions, visuospatial constructive abilities, and non-verbal memory impairment, providing objective metrics that are less contaminated by language skills or cultural background than verbal memory tests.

However, the use of the nonsense figure is not without its criticisms, which largely center on the difficulty of ensuring absolute meaninglessness. Critics argue that human beings possess an overwhelming tendency to impose meaning on any stimulus presented, a phenomenon known as **pareidolia**. Even the most carefully designed nonsense figure might instantly suggest a familiar object or symbol to a subset of participants, thereby reintroducing the semantic contamination the methodology sought to eliminate. While pre-testing helps mitigate this, the subjective nature of association means that true zero-associative value is likely unattainable. Furthermore, the inherent complexity required for a figure to be useful often means it is not perfectly equivalent to other figures in the set, leading to subtle, unintended variations in difficulty that can complicate statistical analysis.

Despite these challenges, the principle of using arbitrary visual input has been successfully adapted in modern computational neuroscience and machine learning. Researchers utilize similar non-representational stimuli to train and test artificial neural networks, assessing how efficiently these models learn to classify novel visual data and form internal representations of complex patterns without reliance on pre-labeled categories. This application underscores the enduring value of the nonsense figure concept: providing a controlled, non-semantic visual challenge that pushes the limits of both biological and artificial intelligence in organizing and recalling arbitrary visual information. The nonsense figure remains a powerful reminder that while meaning facilitates memory, the cognitive machinery for pure visual pattern recognition operates independently of semantic context.