

Discrimination Learning: Training Methods

The term *discrimination learning*—learning to respond differentially to different stimuli—encompasses a diverse range of different types of learning, such as perceptual learning, concept learning, and language learning. The practical goal of discrimination training often involves complex discriminations, such as when pilots learn to recognize potentially hazardous patterns on complicated instrument panels. The greatest challenge in discrimination training—aside from the initial problem of perceiving differences between categories—is to accomplish long-term learning that transfers across situations and stimuli. Training techniques that produce good performance can be misleading; difficult training is sometimes more effective than easier training in the long term.

Discrimination learning occurs at many levels, such as perceptual learning, higher level concept and category learning, and language learning. A baby experiences all three types of learning: She has to learn basic perceptual categories (e.g., discriminating between “ba” versus “ga”), higher-level concepts (e.g., friends and relatives versus strangers) and linguistic labels for these categories and concepts (e.g., “dog” refers to furry pets, but not cats).

Learning to discriminate often involves a process of differentiation and unitization. Differentiation involves learning to separate similar stimuli into different categories (e.g., ravens versus crows); unitization involves learning to group stimuli into larger units and to discriminate based on the unit (e.g., seeing a whole face instead of separate facial features). Unitization and differentiation may appear to be opposite processes, but both involve learning to perceive information at the appropriate level of representation.

To appear in Pashler, H. (Ed.), *Encyclopedia of the Mind*. Thousand Oaks: Sage Reference. Please do not quote without permission.

Real-world applications

In real-world applications, the usual goal of discrimination training is to teach people or animals complex discriminations. For example, drug-sniffing dogs learn to discriminate among complex odor compounds in order to respond appropriately.

Athletes, such as quarterbacks in American football, goalkeepers in hockey, and batters in baseball, need to be able to discriminate very complex and fast-moving patterns of stimuli and respond appropriately. In athletics and more generally, perceptual learning works in concert with motor learning, which requires discriminating among internal sensations, such as the proprioceptive feeling of an ace tennis serve versus a serve that goes into the net.

In school, learning occurs primarily via direct instruction—books and teachers provide information, and students try to understand and remember that information. Direct instruction alone is not sufficient to promote many types of discrimination learning, however, which often requires a combination of instruction and experience. Verbal descriptions of a genre of music, for example, may be of little help compared with actual experience listening to the music.

Factors affecting discrimination learning

In most cases, the goal of discrimination training is long-term transfer—that is, teaching learners in a way that will be relevant when they encounter novel stimuli and new situations. For example, a soldier taught to distinguish enemy soldiers from civilians during basic training needs to be able to transfer that learning to the battlefield. Training techniques that make training conditions difficult—and thereby decrease performance levels during training—often increase long-term learning and transfer. Such techniques

are referred to as *desirable difficulties*. In learning to recognize patterns, for example, increasing the variability between members of a category during training decreases training performance but positively affects transfer.

Trainers and trainees often mistake short-term performance during training as evidence of long-term learning, and therefore perceive difficulty during training as an impediment when it is actually an advantage. For example, people think they learn artists' styles best when the artists are presented for study one at a time, whereas in reality mixing various artists' paintings together enhances categorization of novel paintings. It is important not to be fooled by training techniques that enhance short-term training performance at the expense of long-term learning and transfer.

Although difficult training can be vital, especially if the goal is to train difficult discriminations, too much difficulty can prevent learners from identifying categories' essential features. For that reason, perceptual training often begins with easy discriminations that adaptively increase in difficulty during training. However, discrimination learning can also occur when discrimination is impossibly difficult; asking people to discriminate between physically identical tones, for example, enhances transfer to a discrimination task on which tones vary.

At relatively early stages of perceptual processing, such as learning to make fine distinctions between lines at various orientations, transfer is frequently difficult to accomplish. Learning does not necessarily even transfer when an old task is presented in a new spatial or retinal location. However, long-term training can increase basic sensitivity in a way that can be transferred; for example, violinists show more activity in

the sensory cortex when touched on their left hand (i.e., the violin neck hand) than when touched on their right hand (i.e., the bow hand).

Some forms of discrimination learning seem to benefit from a period of sleep following training, which appears to aid memory consolidation. In a simple visual discrimination task, for example, people who are allowed to sleep normally show improvement 3 days after initial training. People who are not allowed to sleep for 30 hours following training and are then tested after two nights of sleep show no improvement compared to baseline performance.

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See also Categorization: Psychological Perspectives; Concepts: Development of; Desirable Difficulties Perspective on Learning; Perceptual Learning; Transfer of Training.

Further Readings

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