TECHNICAL NOTE

FOCUS DIFFERENCE IN CUE FADING: A NEW TECHNIQUE¹

Following the development of cue fading as an adjunct to discrimination training with lower animals (Terrace, 1963a, 1963b, 1963c, 1964, 1966) it seemed valuable to utilize cue-fading (prompting) techniques with children. Because educational institutions offer the major source of child subjects and because such institutions can provide only limited and temporary space, it seemed desirable to consider a relatively simple, portable, and flexibly programmed apparatus for presenting prompted stimulus materials. Such an apparatus should allow for: (1) presentation of visual stimuli which can be progressively varied along a prompting dimension; (2) adjustment, during training, of the number and size of prompt steps in a prompting progression; and, (3) repetition or interruption of any part of a prompting progression at any time during training. The latter two requirements can be met in one of two ways: (1) many series of stimuli must be prepared which progress through the prompting dimension in a wide variety of steps and step sizes (successful cue fading with children has been obtained under these conditions: Acker, 1966; Sidman and Stoddard, 1967; Touchette, 1968; Gollin and Savoy, 1968); or (2) the training apparatus must be capable of making these changes in the prompting progression independently of the stimuli (Moore and Goldiamond, 1964). The present system utilizes the latter method, thus providing a more immediate and economical means of adjusting the prompting progression to suit the immediate needs of the experiment.

The present system utilizes a focus difference between two stimuli (S+ and S-) to prompt a correct choice of S+ [Israel (1960), successfully used variable blurring to prompt recall of the second member in a paired-associate learning task]. Two Kodak Carousel, 35-mm projectors (model No. AV900) with remote control are used to present the stimulus. Using one projector for presenting S- and the other for S+, a focus difference (prompt) between the two stimuli can be created. For example, keeping S+ in focus it is possible to present a series of S-s which progresses from extremely out-of-focus to in-focus over trials. The number and size of steps in such a progression is immediately adjustable

by altering projector focus. This obviates making more than one set of the original slides.

A knurled focusing knob on the S- projector allows setting a sprung metal strip against it, giving a roulette wheel effect (Fig. 1). As the focusing knob is rotated, a standard number and size of focus changes is achieved. It was possible to obtain over 60 prompt steps of decreasing focus difference between S+ and S- while holding S+ in focus over all trials. If keeping equipment to a minimum for the sake of portability is not an over-riding factor, then it is possible to automate changes in focus in lieu of manual rotation of the focusing knob. For this purpose a pulse former (e.g., Davis Scientific Instruments model No. D-501) may be put in series with the standard focusing motor of the projector. By adjusting the pulse duration between 1 sec and 50 msec, a grosser or finer progression of focus changes can be provided.

Eighty slides can be accommodated in each tray. Since the trays are circular, an unlimited number of trials is obtained with one interruption between slides 80 and 1. The gravity feed of the projectors is reliable; more than 10,000 trials have been run without jamming.

Using focus difference as a prompt to any stimulus dimension requires, as noted above, that S- be projected through the same projector over all trials. Since positioning of the stimuli must be varied over trials, it is necessary to compose the images on film properly and to superimpose the projected areas from the two

Fig. 1. A small wooden block screwed to the top surface of the S- projector provides support for a thin strip of sheet metal layed against the knurled focusing knob. As the focusing knob is rotated the end of the metal strip springs over each knurl in turn. By placing the metal strip so that it just touches the knurls, the focusing knob may be turned easily in either direction.

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Fig. 2. The varying of the left/right positioning of the projected images of the stimuli over trials is accomplished by photographing S- on the left half of a slide film while S+ is photographed on the right half of a corresponding film, both films to be used on trial n. For trial n + 1, the photographic composition can be reversed, thus reversing the left/right positioning of the projected images of the stimuli. Care must be taken to aim the two projectors at the same point on the screen so that the projected images of the stimuli maintain a constant distance apart over trials.

projectors (Fig. 2). The processed films are mounted in 2- by 2-in. glass mounts to prevent the films buckling from projection heat with a resultant change in focus. An alternative to photographing stimuli is to use press-on letters or symbols which are available through stationery stores. These letters can be mounted directly on the glass mounts.

Because there is as yet no *a priori* way of determining which of several prompting dimensions would be most effective in cue fading, the consideration of other dimensions with the dual projector system described above is suggested. For example, the S- projector, when fitted with a zoom lens (Ektenar, F/3.5), could provide for size difference as a prompting dimension. Another possibility could involve a rheostat in series with the S- projector bulb, thus obtaining brightness difference as a prompting dimension. In both these cases, as with focus difference, changes in the prompting progression are independent of the stimuli.

The focus difference system, as described, has been used for the training and study of visual discriminations at a school for retarded children, St. Lawrence's Hospital, Caterham-on-the-Hill, Surrey, England. Portability to the school, flexibility of use, and functional reliability were excellent over an eight-month period.

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