Introduction

Individuals with autism are typically slow to learn. Impairments of attention (ranging from lack of effortless attention to overly focused attention) are also prominent in individuals with autism, and may be one of the major factors contributing to their learning difficulties. As a consequence, many teaching methods have attempted to attract and focus attention. In this pilot study, we explored movement as a method of improving attention and, hence, learning in individuals with autism.

Movement has been shown to attract attention in a number of situations and across a number of species. Even young infants will orient toward a moving object (Vollman & Dobson, 1976; Dannenmüller & Fredrick, 1989; Ainslie & Shea, 1990; Nagata & Dannenmüller, 1996). Although motion in general is a powerful attractor of attention, motion toward an individual is particularly effective. Animals as diverse as pigeons and locusts have nerves that are tuned to detecting and reacting to “looming stimuli” or rapidly approaching objects (Lee, 1976; Schleitter, 1977; Rind & Simmons, 1999). Infant rats have a high level of startle reactions in many species (Schiff, 1965). Both human and primate infants exhibit startle reactions, agitation, and fear in response to the rapid visual approach of a stimulus (Schiff, Caviness, & Gibson, 1962; Ball & Touwen, 1971; Riekhoek & Eckerman, 1973). Loomingness captures attention independently of the fear or threat that it may invoke (Riek & Maddox, 1993). Stimulus movement has been shown to improve discrimination learning in monkeys (Naedas, Harlow, & Suomi, 1977; Washburn, Hopkins, & Rumbaugh, 1989). There are reasons, therefore, for believing that presenting materials with looming motion will (a) capture attention and (b) improve treatment. We explored these linked hypotheses in two sets of experiments: one using stimuli that moved mechanically, and the other using stimuli presented on a video screen with simulated movement.

General Methods

Basic Design: Both experiments used a within-subjects, repeated-measures design. The first experiment used a matching-identical-pictures task, the second a moving-still contrast. With this binocular, two-dimensional visual discrimination learning task, all possible response items in a given trial were either static or moving. Trials with static or moving response items were blocked in sets of up to 10 or 20 trials, depending upon the particular subject and session. Training involved manually prompting the subject toward the correct response, fading the prompts until the subject chose the correct target on his own. One target and two distractors were the response items. There were three measures of learning:

1) The number of training sessions to reach a mastery criterion of at least 80% correct for a given target.
2) The percent correct on a post-test at the end of each session, in which all targets trained that day in the moving and static conditions were displayed. The trials were interspersed rather than blocked (i.e. one trial of an item that was trained moving, followed by one trial of an item that was trained still, etc.).
3) Percent correct on a post-test after a 1-week interval from mastery.

Subjects: There were four low-functioning males with autism. AI-14 yr, HR-12 yr, FN-12 yrs. (falsified initials). All subjects scored at the preverbal level (approximately 20-22 months) on standard cognitive tests of expressive and receptive language. Informed consent was obtained in all cases, in accordance with procedures established by The Johns Hopkins Medical Institutions IRB.

Materials: For Experiment 1, visual response items were animal pictures from the Baby Dolly flash card set (Baby Einstein, LLC.). Pictures from the Internet were used with AI, since he ceilinged on the Baby Dolly set. For Experiment 2, visual response items were selected from a set of 67 animal photographs from Flashcards to the Animals (Gallop, 1999). Included in this set were 10 animal groups, each containing a specific species of animals, such as tigers or beetles or eagles, and (b) to be as clear photographic examples as possible. The animals were selected to appeal to infants known to the particular subject. From this set, pairs of items were pseudorandomly selected for testing in either the motion or static condition, subject to the requirement that the two items had to be from the same type of animal (e.g., Felinae). Items selected included 6 animal groups, each containing a specific species of animals, such as tigers or beetles or eagles, and (b) to be as clear photographic examples as possible.

General Procedures: Training and testing was done in one-on-one sessions. All training and testing was semi-self-paced, with breaks when the subject wanted them. All training sessions were videotaped, in double-checking.

Experiment 1

Apparatus: The Flashcards to the Animals were photocopied onto Ilford 80 photographic paper and mounted onto a piece of black cardstock. The cards were then pasted onto two wooden boards. Each board contained 14 black and white photostats of the animal stimulus set. The back was left blank. The cards were loaded into a plastic box and the child was seated directly in front of the board. The box was removed, and the subject was allowed to move freely through the box.

Procedure: The Matching Task was a matching familiar animals photo in the moving and static condition. The child was shown a picture on a black card and was asked to choose the moving or the static picture. The same procedure was repeated for the next picture. The subject was allowed to choose the correct answer and was then asked to choose the correct answer. Two additional trials were performed, and the child was allowed to choose the correct answer. The subject was allowed to choose the correct answer. Two additional trials were performed, and the child was allowed to choose the correct answer.

Results: The subject was able to recognize the same animal in the moving and static condition. The subject was able to recognize the same animal in the moving and static condition. The subject was able to recognize the same animal in the moving and static condition. The subject was able to recognize the same animal in the moving and static condition.

Discussion: The results of this experiment suggest that moving stimuli may help improve both attention and learning. AI also seemed to pay more attention to the moving materials, though this was often negative attention (i.e. swiping at the moving picture). AI, however, did not seem better learning for the moving items.

Experiment 2

Apparatus: The Flashcards to the Animals were photocopied onto Ilford 80 photographic paper and mounted onto a piece of black cardstock. The cards were then pasted onto two wooden boards. Each board contained 14 black and white photostats of the animal stimulus set. The back was left blank. The cards were loaded into a plastic box and the child was seated directly in front of the board. The box was removed, and the subject was allowed to move freely through the box.

Procedure: The Matching Task was a matching familiar animals photo in the moving and static condition. The child was shown a picture on a black card and was asked to choose the moving or the static picture. The same procedure was repeated for the next picture. The subject was allowed to choose the correct answer and was then asked to choose the correct answer. Two additional trials were performed, and the child was allowed to choose the correct answer. The subject was allowed to choose the correct answer. Two additional trials were performed, and the child was allowed to choose the correct answer.

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Effect of Looming Motion on Learning in Children with Autism

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