An apparatus for the study of motivation and learning in children

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An apparatus is described for use in learning and motivation research with children. A dual track with cars permits singular or paired presentation of stimuli, presents different types of reinforcing events, counts the occurrence of these events, and automatically prints out latencies and correct or incorrect responses. Although designed primarily for studying the motivational properties of stimulus events, the apparatus is suitable for use in simple and complex learning studies.

A description is reported for an apparatus which can be used with children for the study of motivational and learning variables. The apparatus allows either E or S to choose between two reinforcing events (delivery of a marble or cars rolling down a track). Other response outcomes are: verbal reinforcement, nonreward, or onset of a light. The E is also able to vary the number of stimuli presented, the anticipation interval, the delay of reinforcement interval, the intertrial

interval, and the amount or duration of reinforcement.

The apparatus consists of three sections: a S's stimulus-response box (1½ x 2 ft), a detachable ramp which serves as the race track, and a control panel (located any distance away) which contains the main electronic controls. Figure 1 presents the electrical schematic for the apparatus in relation to the child and includes the more salient dimensions. The child is in a position to observe the backs of

the stimulus cars (which he only views and does not keep), to depress the appropriate response buttons (R_1 and R_2), and to observe the reinforcing stimulus events.

The cars are assembled Boy Scout Pinewood Derby cars, available at Boy Scout outlets and hobby stores, and they are 7 in. long. Grooved pieces of wood hold the rear-mounted stimulus cards. Cars are placed on the track and held in place by retractable rods which prevent them from rolling. Contingent on the correct response, reinforcement is delivered. This event may be the retraction of the rods which allows the cars to roll down the ramp, the onset of the appropriate reinforcement light (L_1 or L_2), or the activation of a Gerbrands marble dispenser. The marbles are received through a marble-dispenser hole (1-in. diam) by a cup (3½ x 3½ x 2 in.) located in front of the S. In addition, there are two buttons located to either side of the raised platform which permit S, when enabled by E, to choose the reinforcement, marbles or track (R_M or R_T). A ready signal (L_3) is situated in front of S on the back of the raised platform.

The ramp, inclined at approximately 20 deg, is removable. The ramp, which is 10½ in. wide, has two tracks of lath (1-3/4 x 3/16 in.)

Fig. 1. Circuit diagram.

Fig. 2. Diagram of S's stimulus-response box, track, and stimulus car. R_M allows S to choose marbles and R_T , the car track. L_1 and L_2 are the reinforcement lights for responses to Buttons R_1 and R_2 , respectively. The onset of L_3 serves as the "ready" signal.

which guide the car, preventing it from rolling off the track or into the other lane. By placement of wooden stop blocks on the track, the distance traversed by the cars can be varied, the maximum distance being 6 ft 3 in.

The control panel allows the E to determine: (1) whether or not S will be allowed to choose the reinforcing event; if not, (2) which reinforcing event (R_M or R_T) will occur; (3) which response is correct; and (4) the intertrial interval. Reset can be accomplished either automatically or manually. The frequencies of the two reinforcing events (R_M or R_T) are accumulated on two mechanical counters, and a printout counter records latencies and correct and incorrect responses. Lights on the panel notify the E: (1) that the ready

signal is activated, (2) that a response was made, (3) which response was made, and (4) which reinforcement was delivered.

Power to the apparatus is supplied by 115 V ac and a 28-V 4-A power supply. The apparatus was constructed mainly from surplus parts, many of which can be found in most psychology department shops, or inexpensive items from local distributors. The exceptions are the Gerbrands marble dispenser (cost \$180), the Grason-Stadler printout counter (cost \$250), and the power supply (many types are available and appropriate, but in this case the cost was \$30). Excluding these items, the cost, including marbles, cars, and plywood was approximately \$25 and

required 20 h to construct.

This apparatus incorporates a number of features which allow for the manipulation of variables investigated infrequently. The reinforcing event of cars rolling down a track integrates the discriminative stimulus cues with the reward stimulus complex. The S can be permitted to choose reinforcement prior to a trial, rather than merely having this option once, at the beginning of the experiment. By varying the length of the track, the duration of the reinforcing event can be manipulated. The apparatus has so far been used exclusively with preschool children where it has been clearly demonstrated that the marbles and track (M & T) function as rewards on various discrimination learning tasks.