

Abstract: A Free Operant Analog of Automaticity Research

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Background During the 1970's we began to systematically observe the effects of varying practice durations on frequency and celeration. We saw that individuals whose performance levels fell below normal levels of competent performance were often unable to maintain their performance rates for more than brief periods, while fluent performers could. We also noticed that much of what had been reported as "attention span" problems, or problems of distractibility in classrooms, might actually be the same phenomenon: decreasing ability to remain on-task, often switching to other behaviors, when students were asked to perform for more than brief intervals while not yet fluent.

When we encountered a now-classic article by LaBerge and Samuels (Toward a theory of automatic information processing in reading. *Cognitive Psychology*, 1974, 6, 293-323), we attempted to develop a free operant analog of their latency-based trials procedure, in conjunction with our ongoing research on fluency in mediated transfer (or stimulus equivalence) paradigms.

Reference Although the specific studies reported here were never published, a related publication was:

Binder, C., Houghton, E. and Van Eyk, D. Precision Teaching attention span. *Teaching Exceptional Children*, 1990, 22(3), 24-27.

A mediated transfer task We used a mediated transfer paradigm that involved the following tasks:

Given:

- SEE addition problems (sums to 18), SAY sums
- SEE names of Hebrew characters, SAY them (reading)

Teach and build fluency:

- SEE the names of Hebrew characters, SAY a number (trained)

Test:

- SEE "addition problems" of Hebrew characters (sums to 18), SAY sums
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Apparatus and materials Although the entire series of experiments involved a number of different types of materials and procedures, the apparatus used for testing distractibility was the most unique, and has not been used since that time to our knowledge.

- **Practice sheets:** See/Say numbers, See/Say names of Hebrew letters, See/Say sums to 18, See/Say sums to 18 from "addition problems" constructed of the names of Hebrew letters.
 - **Voice-operated relay:** A piece of laboratory equipment which picks up speaker's vocal stresses (amplitude peaks) via a microphone and turns them into discrete electrical pulses that can be counted. This is a way of automatically transducing speaking rate.
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Abstract: A Free Operant Analog of Automaticity Research, Continued

Apparatus and materials (continued)

- **Tape player and headphones:** Tape recording of a voice reading random numbers was turned on to distract subjects during parts of intervals while they responded freely to practice sheets.
- **Cumulative recorder:** Connected to the voice-operated relay, it traced moment-by-moment rate of response and indicated onset and offset of distracting auditory input. (We also used electromechanical counters.)

Procedure

We followed this procedure

Step	Description
Probe	Confirm that subjects already can fluently: <ul style="list-style-type: none"> • read numbers (0-9) • read names of Hebrew characters • say answers to addition problems (sums to 18) Confirm that they can <i>not</i> : <ul style="list-style-type: none"> • say numbers, given names of Hebrew characters • “add” Hebrew characters
Teach	Use automated trials procedure to teach paired associate: See names of Hebrew character, say number.
Probe	Emergent: Subjects could now “add” names of Hebrew letters.
Fade	From trials procedure to self-paced performance on practice sheets with “addition problems” constructed of two names of Hebrew letters now associated with numbers. This shift allowed learners to perform these tasks more rapidly, and to build fluency.
Build fluency	On paired associate task - SEE Hebrew letters, SAY numbers Note: Different subjects achieved different levels of performance on this task prior to the next step.
Probe	Use apparatus to assess rate suppression when individuals hear random numbers being read into their ears while they perform each of the prerequisite tasks, the trained task, and the emergent task.

Measures

We used visual inspection of cumulative records, plus a suppression ratio, to assess degree of distraction. The suppression ratio is the rate of responding during the period of the distracting auditory input divided by the rate of responding before and after, when the auditory distraction was off.

Results

Although these were preliminary, and have not been replicated, the results showed that on both the trained paired associate task and on the transfer task (“adding” names of Hebrew letters), a lower level of performance is associated with greater distractibility. That is, low rates support lower “endurance.”