Using Automatic Reinforcement to Develop Skills in Learners with Autism

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Automatic Reinforcement Defined

- Skinner’s usage of “automatic” is simply to counteract “any tendency to restrict the concept of reinforcement to those occasions upon which it has been deliberately arranged by another person or group” (Vaughan & Michael, 1982, p. 218)

Automatic Reinforcement Defined

- Skinner (1953, 1957, 1969, 1974) did not directly define it
- He uses the term “automatic” over 150 times in these books
- The most frequent usage of “automatic” occurs in Verbal Behavior (87 times)
- It does not appear in any of his indexes
- He did not use it as a separate principle of behavior
- He also occasionally uses “self-reinforcement,” and “self-stimulation” as synonymous with automatic reinforcement (Vaughan & Michael, 1982)

Automatic Reinforcement Defined

- “The idea (of automatic reinforcement) takes some getting use to, and Skinner for the most part leaves the reader to work it out by himself” (MacCorquodale, 1969, p. 835)
- “Automatic reinforcement is reinforcement that is not mediated by the deliberate action of another person” (Vaughan & Michael, 1982, p. 219)
- Automatic reinforcement is involved when the behavior itself is reinforcing (it’s fun to do)
- Automatic reinforcement can also be synonymous with “natural reinforcement” and “intrinsic reinforcement”
Automatic Reinforcement Defined

- Behaviors that might be automatically reinforcing because they are fun:
  - Infant babbling
  - Building towers
  - Humming a song
  - Playing guitar
  - Reading a novel
  - Bird watching
  - Playing golf
  - Self-stimulation, delayed echolalia

- Behaviors that might be automatically reinforcing because they produce positive/practical outcomes:
  - Grab toy—have toy in hand
  - Pull string—toy moves
  - Push door—it opens
  - Turn on faucet—water comes out
  - Pull blind string—blinds go up
  - Climb steps—get to the top
  - Place items in a form ball—they successfully go in
  - Turn and look—you see interesting things

Automatic reinforcement has the same defining properties as "reinforcement":

- Follows behavior
- Increases behavior
- Under the stimulus conditions it occurs

Automatic reinforcement can be:

- Unconditioned (e.g., sitting in the sun)
- Conditioned (e.g., a clean garage)
- Positive (see above) or Negative (e.g., hands over ears to reduce an aversive sound)
- Intermittent (e.g., shooting a basket)
- Increase verbal behavior (e.g., delayed echolalia) or nonverbal behavior (e.g., an artist’s painting behavior)

(Paul Whitley, 1980)
### Automatic Punishment
- Skinner also discusses “automatic punishment”
- “Verbal behavior may be automatically self-punishing. The names of disliked persons and responses appropriate to embarrassing, dangerous, or gruesome episodes generate punishing consequences in the process of being emitted” (p. 375)
- Automatic punishment has the same sub-types as automatic reinforcement (unconditioned, conditioned, etc.), but the behavior decreases (e.g., touching a hot stove, stepping in dog poop, “putting your foot in your mouth”)

### Automatic Extinction
- Skinner also suggests automatic extinction
- “When, as a listener, a man acquires discriminative responses to verbal forms, he may reinforce himself for standard forms and extinguish deviant behavior” (p. 164).
- For example, a vending machine does not deliver the item, a loud noise prevents a mand for information from reaching the listener, no response is given because a cell phone call is dropped

### Automatic Consequences
- Perhaps “automatic consequences” is a better term. Skinner does use this term (e.g., p. 66, 442)
- Main point so far...consequences affect behavior even though they are not deliberately programmed by a behavior modifier

### Automatic Antecedents
- How about automatic “stimulus control?”
- “Such contingencies may be successful in developing...stimulus control, presumably through...automatic reinforcement” (p. 416)
- “This (automatic) differentiation into chains of stimulus-response units could hardly fail to come under the control of discriminative stimuli (Bijou & Baer, 1965, p. 113)
- Automatic “motivational control?”
- “A neutral stimulus...is made aversive by being paired with aversive stimuli. Escape is then automatically reinforced” (1953, p. 174) (A new CEO-R)
Automatic Procedures

- Can behavioral procedures be “automatic” (e.g., shaping, prompting, fading, chaining)?
- “The young child alone in the nursery may automatically reinforce his own exploratory vocal behavior when he produces sounds which he has heard in the speech of others….The process is important in the automatic shaping up of standard forms of response” (p. 58)
- Behavior can be shaped and maintained by consequences that are not deliberately arranged, including coming under sources of stimulus and motivational control

Automatic Contingencies

- Perhaps “automatic contingencies” is a better term
- Automatic contingencies are related to the distinction between “intrinsic and extrinsic reinforcement”
- “intrinsically controlled behavior is simply behavior maintained by consequences that are the natural and automatic results of responding. Extrinsically controlled behavior is behavior controlled by stimuli external to the task” (Dickinson, 1989)
- It isn’t one or the other, both are essential to learning

Automatic Respondent Conditioning

- How about automatic respondent conditioning? Yes!
- For example, many people have phobias where they cannot identify the original pairing (e.g., a fear of closed spaces may develop for reasons unknown to the person, and clearly not deliberately arranged)
- Thus, all behavioral principles and procedures (operant and respondent) can affect a person without deliberate arrangement from other people
- This is basically what Skinner meant by “automatic.” Now, how do we apply this concept to children with language delays?

Types of Automatic Contingencies

Skinner presents two types of automatic operant contingencies (1957, pp. 164-166; 438-446)

- “Practical”: The reinforcement is provided by the physical environment (“the producing response operates on the surrounding world”)
- “Autistic and Artistic”: The reinforcement is provided by the response product emanating from the behavior. (“The producing response operates on the behaver directly”).
- The behavior acquired can be verbal or nonverbal
Nonverbal Practical

- **Nonverbal practical**: The producing nonverbal response operates on the surrounding world, and behavior is automatically shaped and comes under the relevant stimulus control
- An infant learning to pick up a pea vs. a hard-boiled egg (Bijou & Bear, 1965)
- “The environment normally and somewhat automatically instructs the infant... Attempts to pick up the pea by sweeping it into the palm with all five fingers succeed only occasionally... but attempts to pick up the pea with a scissor movement of the thumb and forefinger are likely to succeed more frequently and easily... this... exemplifies (automatic) response differentiation... By contrast a hard-boiled egg (shelled)... constitutes an environment in which simultaneous flexion of all or most of the fingers... allows the child to manipulate the egg” (pp. 112-113)
- A toddler learning to manipulate a form ball and to climb steps (Video 1)

Verbal Practical

- **Verbal Practical**: The producing verbal response operates on the speaker as listener, and behavior is shaped and automatically comes under the relevant antecedent control
  - Self-mand (e.g., “What do I do now?”)
  - Self-tact (e.g., “Greg! That’s his name”)
  - Self-echoic (e.g., “454-8798, 454-8798”)
  - Self-intra-verbal (e.g., Problem solving, thinking)
  - Self-textual (e.g., reading Harry Potter)
  (Skinner, 1957, pp. 440-446)

Nonverbal Autistic and Artistic

- **Nonverbal Autistic and Artistic**: The producing nonverbal response operates on the behavior directly, and behavior is shaped and automatically comes under the relevant antecedent control (the behavior is fun to emit)
- Nonverbal behavior directly reinforced by stimulation (e.g., kinesthetic, auditory, visual) related to the response product (no pairing: unconditioned automatic Sr)
- Dancing, exercise, rocking, finger flicking/tapping, foot tapping, hair twirling, humming, visual patterns, masturbation, scratch to remove an itch (automatic negative reinforcement), SIB, aggression (e.g., Iwata, et al.)

Nonverbal Autistic and Artistic

- Nonverbal behavior directly reinforced by stimulation (e.g., kinesthetic, auditory, visual) related to the response product (due to pairing: conditioned automatic reinforcement)
- Mannerisms, posture, gestures, rap singer movements, noise making, babbling, dress, jewelry, cars, hair style (Farrah Fawcett’s feathered hair) (Freud’s “Identification”)
Verbal Autistic and Artistic

- **Verbal Autistic and Artistic:** The producing verbal response operates on the behavior directly, and behavior is shaped and automatically comes under the relevant antecedent control.
- Verbal behavior directly reinforced by stimulation (e.g., kinesthetic, auditory, visual) related to the response product (due to pairing: conditioned automatic reinforcement).
- Verbal response forms that match caretaker’s or others of value, including accents, intonation, clichés, prosody, syntax and grammar, singing, fun words and sounds, verbal perseveration, delayed echolalia, obsessions (Video 2).

Some of Skinner’s Examples

- “Autistic (and artistic) verbal behavior may be....
  - The musician playing for himself
  - The dice player who calls his point before the dice come to rest
  - The parent who is reinforced when his children are praised, praises himself
  - The nostalgic who is reinforced by descriptions of old scenes constructs such descriptions himself” (Skinner, 1957 p. 165)

Automatic Contingencies Summary

- Behavior can be shaped, maintained, or eliminated by automatic contingencies not directly set up or mediated by other persons. These contingences can be very efficient and even more precise than those formally arranged.
- “Money grades and honors must be husbanded carefully, but the automatic reinforcement of being right and moving forward are inexhaustible” (Skinner, 1968, p. 158)
- “The exquisite subtlety of our verbal repertoires is shaped by contingencies of automatic reinforcement...one need not wait for the lumbering machinery of social reinforcement to swing into action” (Palmer, 1996, p. 290)

Some of Skinner’s Examples

- “The sexually aroused individual is automatically reinforced by his own discussions of sex
- The vain man is reinforced by hearing or seeing his name, and he speaks or writes it frequently
- Boasting is a way ‘to hear good things said about oneself’
- The starving man may talk about food if the net effect is reinforcing
- A happy phrase...may be repeated because of its immediately reinforcing effect” (Skinner, 1957 p. 165)
Implications and Potential Applications of Automatic Contingencies

- Early and advanced language acquisition
- Motor development
- Play and social skills
- Self-help and self care
- Leisure and independent activities (e.g., arts and crafts)
- Sports and physical activity
- Survival
- Negative behaviors (e.g., crime, SIB, stim, aggression)
- Delayed echolalia
- Academic behavior

- Reading
- Entertainment and entertainers
- Syntax and Grammar (parity)
- Professional behavior (employment)
- Craftsman's Skills

Early Language Acquisition and Automatic Contingencies

Most children around the world acquire language in a similar manner and time frame. For example, the first words occur around 12 months of age and are often related to reinforcers (e.g., mama, dada, up). When this does not happen (perhaps by 18 months), or other prerequisite behaviors (e.g., babbling and vocal play) or reinforcers (e.g., attention, physical contact) are absent, or if negative behaviors serve the communication function, intervention is warranted.

First, there is value in discussing how and why verbal behavior develops in humans.

Early Language Acquisition and Automatic Contingencies

A brief overview of a behavioral analysis of infant language acquisition (Skinner, 1957; Bijou & Baer, 1965).

First vocalizations are reflexive (respondent) or random. Learning occurs through respondent and operant conditioning.

Respondent: Crying may first be unlearned and elicited by a US (loud noise), but due to pairing later be elicited by a CS (a sibling).

Operant: Crying may first be unlearned and elicited by a US (hunger), but due to crying being followed by food crying becomes a learned (operant) behavior (a mand).
By 8-10 weeks different crying topographies (mands) emerge for different functions (including “fake crying”). Babbling, cooing, and vocal play increase in frequency, with a gradual increase in the vocal topographies (phonemes) of the caretakers language, and reduction of other sounds (140 total sounds).

Vocal behavior gets stronger due to maturation and environmental contingencies. Direct reinforcement and automatic reinforcement play a major role.

WHAT ECHOIC BEHAVIOR IS NOT (Skinner, 1957, p. 58)
- Echoic behavior is easily confused with responses which are self-reinforcing because they resemble the speech of others heard at some other time.
- When a sound pattern has been associated with reinforcing events, it becomes a conditioned reinforcer.
- If someone repeatedly reinforces behavior with the verbal stimulus Right!, we must not exclude the possibility of the speaker's reinforcing himself in the same way.

The young child alone in the nursery may automatically reinforce his own exploratory vocal behavior when he produces sounds which he has heard in the speech of others. The self-reinforcing property may be merely an intonation or some other idiosyncrasy of a given speaker or of speakers in general.

The adult acquires intonational patterns which are automatically reinforcing because they are characteristic of, say, a person of prestige.

Specific verbal forms arise from the same process.

The small child often acquires verbal behavior in the form of commendation used by others to reinforce him: Tommy is a good boy, just as the adult may boast of his own ability “in order to hear himself praised.”

The process is important in the automatic shaping up of standard forms of response. This is not echoic behavior, however, because a verbal stimulus of corresponding form does not immediately precede it.
Early Language Acquisition and Automatic Contingencies

Hart and Risley (1995) demonstrated that there is a strong correlation between the frequency of a parent’s child directed verbal behavior and the frequency of that child’s verbal behavior. Children who talked a lot had parents who talked to them a lot, and children who talked very little had parents who talked to them very little. Pairing and automatic reinforcement?

Research

Method

- Following a brief baseline a target vocal stimulus was presented just prior to the delivery of the assumed form of reinforcement (pairing). The number of pairings differed for each word (see Tables 1-3).
- Following the pairing condition the adult simply stopped interacting with the child, often moving away (post-pairing). The child stayed in the same setting with the same materials present.
- Target vocal responses were recorded during and after pairing, and scored as echoic, mand, tact, intraverbal, automatically reinforced, or multiply controlled.
Stimulus-Stimulus Pairing

- Focus on nonverbal and verbal autistic and artistic automatic reinforcement that is acquired through stimulus-stimulus pairing.

- Purpose of the current study:
  - Replicate and extend the finding from the previous studies on automatic reinforcement
  - Examine the circumstances where pairing does not work
  - Examine the temporary nature of pairing
  - Identify how automatically reinforced behavior comes under stimulus or motivational sources of control

Automatic Punishment

Current Study

- Participants: Three typically developing female children served as participants: Bella, 11 months old, Samantha, 20 months old, Isabella 23 months old at the start of the study.

- Setting and Materials: The study was conducted at the home of the first and second authors. Training sessions were typically conducted once per week, and lasted from approximately 60 to 150 minutes. A variety of toys and age appropriate materials were used.

- Experimental Design: A within subject, multiple baseline, with replication across subjects was used.

Method
Method

- **Dependent Variables**
  - Emission of the targeted vocal response topographies and the antecedent and consequential sources of control of those responses

- **Independent Variables**
  - Pairing a neutral vocal stimulus with an assumed form of reinforcement. Approximately 100 sounds or words were pairing with various forms of reinforcement over 10 session with the three participants

Method

- **Procedure**: Baseline (pre-pairing) was taken on the forms, frequency and functional types of vocal responses emitted by each child. Words that were not emitted during baseline, and if possible, never heard by the mother or godmother were targeted.
  - Activities and items were selected by observing each child and attempting to identify what seemed to function as reinforcement at the moment. In addition, particular items and activities were used that were known to function as reinforcement in the past (e.g., water play)

Method

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A Sample of a Pairing Session with an 11 Month old Child: Bella
Pairing "Ba" with Block Play for an 11 Month Old Child: Bella

Bella Manding “Ba” After Pairing when Blocks are Withheld

A Sample of a Pairing Session with a 23 Month Old Child: Isabella

Pairing “Pull” with the Lady Bug for the 23 Month old Child: Isabella
A Sample of a Pairing Session for a 20 Month Old Child: Sami

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Pairing “Glasses” with the Dog Wearing Glasses with a 20 Month Old Child: Sami

Discussion

- Pairing worked best with powerful forms of reinforcement
- The pairings related to strongest forms of reinforcement resulted in the emission of the response later in the evenings at the children’s home, in the car, or in other settings (e.g., “Get it,” “Boat” “Water”)
- Once a child moved to another activity the probability of emitting vocal responses related to previous pairing was low, unless the stimuli from that activity were presented and/or there was an MO at strength related to that activity.

Discussion

- Words that were not targeted, but occurred during the session and were indirectly paired with reinforcement occurred. The topography of the word was automatically shaped to a correct form (“Aggie” became “Maggie” by the third session)
- Sami emitted “Aggie” many times at home after the second session and while in the car. “Maggie” occurred mostly as a mand, but also as a tact, and as automatically reinforced behavior
- Sami emitted “Maggie” is several different “voices”
- (Video)
Discussion

- For Sami she even tried to get her cat to “get it”
- Mands were the overall highest type of verbal operant that emerged from pairing
- Discriminative stimulus control emerged due to pairing. The relevant S’s evoked both verbal and nonverbal behavior (“Maggie get it” and reaching, taking and throwing food to the dog). S control was also observed to emerge without pairing (e.g., form ball, door frame)

Discussion

- It was possible for a stranger to get successful pairing, if the MO related to the form of reinforcement was strong
- Even very brief stimulus-stimulus pairing can rapidly produce mands, tacts, echoics and vocal play
- Verbal and nonverbal behavior can be shaped, maintained, and come under relevant sources of stimulus control without mediated consequences presented by another person

Tips for Using the Stimulus-Stimulus Pairing Procedure

- Pair speech with the delivery of reinforcers. Present vocal sound prior to delivering the reinforcer. The sight of the reinforcer may block the vocal stimulus (the child is busy looking at the reinforcer rather than listening to the sound. The goal is to have the sound signal that a reinforcer is coming. This establishes the sound as a conditioned reinforcer.
- Limit the pairing of speech with aversives. You don’t want speech to become a conditioned punisher
- Pairing should be followed by quickly moving an emitted response to another operant (e.g., echoic, mand, tact, IV)

Implications and Potential Applications of Automatic Contingencies

- Automatic contingencies can accelerate learning and are essential for establishing verbal and nonverbal repertoires that match those of typically developing peers.
- Use of direct contingencies to establish skills so that automatic contingencies can take over
- Provide systematic opportunities to emit a new skill in a functional, playful, age appropriate and social manner
- For example: Listener discriminations can be formally taught is a structured teaching session followed by a game using a laser pointer in a dimly lit room to find the items
- Drawing pictures, arts and crafts, building things, etc.
Implications and Potential Applications of Automatic Contingencies

Intraverbal games (e.g., song fill-ins, guessing games, stories, reading with Q & A, trivial pursuit)
Tact games, MTS games (see Ward, 2009)
Provide developmentally appropriate materials with a careful progression
Use successive approximations to ensure success and automatic reinforcement (e.g., a puzzle piece part way in, a low and large basketball hoop, easy arts and crafts)
Add differential reinforcement to automatically reinforced behavior (extrinsic vs. intrinsic). Adults don’t object for being paid for their passion (sports, music, teaching)

Workshop exercise: Give examples of VB-MAPP milestones and come up with ways to make them functional and perhaps automatically reinforcing

Topics for Further Discussion
- Delayed echolalia
- Play and social skills
- Self-help and self care
- Leisure and independent activities (e.g., arts and crafts)
- Sports and physical activity
- Syntax and grammar (achieving parity: Palmer, 1996)
- Reading and academic behavior

Thank You!

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