Behavioral Chains

Definition: A sequence of Rs functionally linked to the same terminal reinforcer
EO + S^D → R1 → R2 → R3 → R4 (terminal R) → Sr

Dual function of responses:
Conditioned reinforcer (Sr) for a previous R
Discriminative stimulus ($S^{D)}$ for a later R

Task analysis: Breaking down a response chain into its component parts ("links")

Components of a Behavioral Chain

EO +	S^D →	R1 →	R2 →	R3 →	R4 →	R5 →	Sr-
gas tank low	gas station sign	exit highway	enter station	stop at pump	pay at pump	pump gas	avoid empty
	S^D1 →	R1 →	Sr1				
		S^D2 →	R2 →	Sr2			
			S^D3 →	R3 →	Sr3		
				S^D4 →	R4 →	Sr4	
					S^D5 →	R5 →	(Sr-)

What about driving away? Is it part of the chain?

Chaining Procedures (Variations)

Forward chaining:
- First link is taught initially; subsequent links are added from the beginning (front) to the end (back) of the chain
- Advantage: Retains temporal order of performance
- Disadvantage: Sr provided prior to completing the chain

Backward chaining:
- Last link is taught initially, subsequent links are added from the back to the front of the chain
- Advantage: Sr always follows completion of the terminal link
- Disadvantage: Acquisition on earlier links may go unnoticed

Total task presentation:
- Entire chain is taught simultaneously, with assistance (graduated guidance) provided as needed
- Advantage: Allows for uneven response acquisition
- Disadvantage: Involves greatest response requirements

Neef, Parrish, Hannigan, Page, & Iwata (1989)

General focus: To demonstrate methods for teaching self-administration of medical procedures to children

Specific aim: To teach children self-catheterization via simulation training

Potential Advantages of Simulation Training

May facilitate skill acquisition
- Motivation (doll associated with "play")
- More frequent opportunities for training trials
- Shaping of manual dexterity

May reduce potential problems
- Embarrassment or reluctance to perform invasive procedure
- Error detection and correction under safer conditions

Procedures

Participants: 2 girls w/ neurogenic bladder (CA = 4'3" and 8'1")
Apparatus: Catheterization materials, doll, feeding tube
Task analysis (4 chains, each comprised of sub-chains):
- Preparation (6 steps)
- Mirror placement (6 steps)
- Catheterization (11 steps)
- Clean-up (9 steps)

DV: % correct during daily training sessions and probes
Reliability: Training sessions and probes, R= A/(A+D)
IV: Simulation training procedure

Simulation (doll) training:

Chaining:
- Forward: 4 main chains taught in sequence
- Whole task: All steps of a chain taught each session
- Instructional procedures: Initial demonstration, then instruction, verbal prompt, point, assistance

Consequences:
- Correct R → Praise
- Incorrect R → Next prompt
- No R → ?

Criterion: 2 (100%) sessions, then review of all trained components
Experimental design:
- BL: Doll and in vivo probes for all chains
- Training staggered across both response chains and subjects
- Doll and in vivo probes after review session for each chain

Results

Poor performance on probes prior to training

- Near-perfect performance on probes following training
- Cathy required in-vivo training on cath. chain
- Training time: 2.75 to 4.5 hr across 9 days
- Independent performance at home (3-mo follow-up)
- Theresa’s ileal loop undiverted

Implications and Extensions

Major contributions:

- Results showed both stimulus and response generalization, supporting the use of simulation training
- Systematic method for teaching self-administration of medical procedures to young children

Limitations:

- No actual data taken at home

Extensions:

- Comparison of simulation and in vivo methods
- Curriculum packaging for staff/parent training
- Application with other problems (e.g., insulin injections, wound care, etc.)