



CHAINING

CHARACTERISTICS OVERVIEW CHART

Verbal Skills	Grade Levels	Cognitive Level	Areas Addressed
<input checked="" type="checkbox"/> Nonverbal	<input checked="" type="checkbox"/> PK	<input checked="" type="checkbox"/> Classic	<input type="checkbox"/> (Pre)Academic/Cognitive/Academic
<input checked="" type="checkbox"/> Mixed	<input checked="" type="checkbox"/> Elementary	<input type="checkbox"/> High Functioning	<input checked="" type="checkbox"/> Adaptive Behavior/ Daily Living
<input checked="" type="checkbox"/> Verbal	<input checked="" type="checkbox"/> Middle/High		<input checked="" type="checkbox"/> Behavior <input type="checkbox"/> Communication/Speech <input checked="" type="checkbox"/> Social/Emotional

BRIEF INTRODUCTION

Chaining is an instructional strategy grounded in applied behavior analysis (ABA) theory.

Chaining is based on task analysis, whereby sub-behaviors are recognized as requirements for task mastery.

DESCRIPTION

Chaining breaks a task down into small steps and then teaches each step within the sequence by itself. For example, a child learning to wash her hands independently may start with learning to turn on the faucet. Once this skill is learned, the next step may be rinsing hands, etc. This technique is helpful in assisting children to learn a routine task that is repetitive, such as using the bathroom, brushing teeth, putting on clothes and shoes, or completing a work task.

In utilizing chaining, the teacher must (a) analyze the desired behavior, (b) break it into steps, and (c) plan for the teaching. There are two type of chaining techniques:

1. *Forward chaining.* The forward chaining technique moves a child from the first part of the task to the end. In short, each step must be mastered before the next step in the skill series is added.



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2. *Backward chaining.* The backward chaining technique involves the same process as forward chaining, except in reverse. That is, the teaching process moves from the last part of the task to the beginning. This technique is used when it is easier to teach a child a task from the last step than from the beginning.

STEPS

The steps in forward chaining:

1. The teacher teaches the child the first step in the chain.
2. When the first step is learned, the teacher adds the second step. The child is learning the second step in the routine and attaching it to the first step.
3. The third step is taught in conjunction with the first two steps once the child is able to demonstrate the first two steps.

The steps in backward chaining:

The steps in backward chaining mirror those of forward chaining except they occur in reverse.

The teacher provides the child assistance throughout the process until the last step.

1. The child is encouraged to complete the last step independently.
2. When the last step is mastered, the teacher provides assistance until the child is able to perform the step before the last one.
3. The child completes more and more ending steps independently until he masters all steps and is able to complete the task without assistance.

BRIEF EXAMPLE

One of 6-year-old Tommy's goals was to learn to brush his teeth. In order to teach Tommy this skill, his teacher decided to use backward chaining. First, the teacher conducted a task analysis



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to identify all the steps of tooth-brushing. In the beginning, the teacher guided and prompted Tommy to perform all steps except the last one: looking at the mirror and wiping his mouth with a towel. Tommy learned to perform this last step first with prompts and reinforcement. After mastering this last step, the next teaching target was the second-to-the-last step, turning off the faucet. With backward chaining, Tommy learned to brush his teeth by working on the last step first.

SUMMARY

Chaining is a behavioral strategy used to teach children with autism complex behaviors by breaking them down into smaller sequential steps. One of two methods, forward chaining and backward chaining, is selected based on the nature of the task or the skill levels of the child.

RESEARCH TABLE

Number of Studies	Ages (year)	Sample Size	Area(s) Addressed	Outcome
9	3 to adult	29	Daily-living skills (drinking from a cup, Internet skills, making a snack, independent eating) escape behavior, sharing, chained vocalizations	+

STUDIES CITED IN RESEARCH TABLE

1. Rayner, C. (2011). Teaching students with autism to tie a shoelace knot using video prompting and backward chaining. *Developmental Neurorehabilitation, 14*(6), 339-347. Three students with autism were taught shoelace tying. Using video prompting, backwards chaining, modeling and verbal instruction, they learned how to tie their shoes.
2. Seiverling, L., Pantelides, M., Ruiz, H.H., & Sturmey, P. (2010). The effect of behavioral skills training with general-case training on staff chaining of child vocalizations within natural language paradigm. *Behavioral Interventions, 25*, 53-75. The purpose of this study was to evaluate behavioral skills training as a method to teach three staff members to implement a Natural Language Paradigm treatment strategy with a child with ASD. In a multiple-baseline-design-across-staff-members, all three learned to



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correctly implement teaching procedures, and 2 of the 3 children with ASD showed related increases in vocalizations. Social validity ratings by trained behavior analysts did not indicate meaningful clinical changes for the children as a result of treatment, however.

3. Twarek, M., Cihon, T., & Eshleman, J. (2010). The effects of fluent levels of big 6 + 6 skill elements on functional motor skills with children with autism. *Behavioral Interventions*, 25, 275-293.
This study reports the successful use of Precision-Teaching methodology to teach three children with ASD (aged 3-5) to engage in daily living skills related to basic motor skills such as reaching, touching, and grasping.
4. DeQuinzio, J. A., Townsend, D. B., & Poulson, C. L. (2008). The effects of forward chaining and contingent social interaction on the acquisition of complex sharing responses by children with autism. *Research in Autism Spectrum Disorders*, 2, 264-275.
Four children with autism (8 to 10 years) were taught a sharing response using forward chaining. None of the participants engaged in the sharing response chain during baseline. Systematic increases occurred for all four participants during the intervention. In addition, the children generalized responses across settings, peers, and toys.
5. Jerome, J., Frantino, E. P., & Sturmey, P. (2007). The effects of errorless learning and backward chaining on the acquisition of Internet skills in adults with developmental disabilities. *Journal of Applied Behavior Analysis*, 40, 185-189.
Three adults with autism and mental retardation were taught to access specific Internet sites using backward chaining and most-to-least intrusive prompting. Results indicated that the number of independent steps completed in the task analysis increased following training.
6. Hagopian, L., Farrell, D. A., & Amari, A. (1996). Treating total liquid refusal with backward chaining and fading. *Journal of Applied Behavior Analysis*, 29, 573-575.
This study reported on a 12-year-old boy with autism, mental retardation, and a history of severe gastrointestinal problems who presented with total refusal of liquids and food. Backward chaining was used to shape drinking from a cup, and a fading procedure was used to increase the quantity of water he was required to drink. The study illustrated how a chain of responses that is totally absent can be shaped by first targeting a simple preexisting response in the chain.
7. Lalli, J. S., Casey, S., & Kates, K. (1995). Reducing escape behavior and increasing task completion with functional communication training, extinction, and response chaining. *Journal of Applied Behavior Analysis*, 28(3), 261-268.
The effects of functional communication training, extinction, and response chaining on participants' (10, 13, 15 years of age) escape behavior by evaluating the effects of response chaining following the implementation of FCT. Participants were taught an escape response



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and then a response chaining procedure to increase their participation in the task. Results showed that the treatment reduced rates of aberrant behavior and that the chaining procedure was effective in decreasing the availability of escape.

8. Kayser, J. E., Billingsley, F. F., & Neel, R. S. (1986). A comparison of in-context and traditional instructional approaches: Total task, single trial versus backward chaining, multiple trials. *Journal of the Association for Persons with Severe Handicaps, 11*, 28-38.
This study compared the effects of total-task/single-trial and backward-chaining/multiple-trials instruction to teach eight children with severe disabilities how to make a snack. Total-task/single-trial instruction resulted in superior acquisition of independent steps in the training setting for three of the eight children and less substantial effects for two participants. For three participants, differences between the two methods were negligible or nonexistent in terms of independent steps performed. In all cases, instructional time was substantially less for total-task/single-trial instruction than for backward-chaining/multiple-trials instruction. Findings related to generalization were mixed.
9. MacArthur, J., Ballard, K. D., & Artinian, M. (1985). Teaching independent eating to a developmentally handicapped child showing chronic food refusal and disruption at mealtimes. *Australia & New Zealand Journal of Developmental Disabilities, 12*, 203-210.
This study described an intervention to establish independent eating behaviors in a 3-year-old boy with autistic-like behaviors. The first phase of the intervention, using backward chaining with prompting and fading of prompts, reduced screaming, food refusal, and related disruptive mealtime behaviors and established appropriate eating responses. The second phase of the intervention successfully taught the mother to implement the teaching strategies, and independent mealtime behaviors were established at home. In addition, follow-up showed maintenance of independent eating.

REFERENCES

- DeQuinzio, J. A., Townsend, D. B., & Poulson, C. L. (2008). The effects of forward chaining and contingent social interaction on the acquisition of complex sharing responses by children with autism. *Research in Autism Spectrum Disorders, 2*, 264-275.
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ORGANIZATIONS RECOGNIZING INTERVENTION AS EVIDENCE BASED

Centers for Medicaid and Medicare Services

National Autism Center

National Professional Development Center

RESOURCES AND MATERIALS

- Interactive Collaborative Autism Network - www.autismnetwork.org/modules/behavior/chaining/index.html
This link takes the user to an interactive educational module that includes a pre- and posttest as well as content that includes the steps to forward and backward chaining.
- Chaining – <http://www.polyxo.com/discretetrial/complex.html>.
This web site gives a brief description and example of chaining.



GENERAL RESOURCES

- Autism Internet Modules (AIM) www.autisminternetmodules.org. The Autism Internet Modules were developed with one aim in mind: to make comprehensive, up-to-date, and usable information on autism accessible and applicable to educators, other professionals, and families who support individuals with autism spectrum disorders (ASD). Written by experts from across the U.S., all online modules are free, and are designed to promote understanding of, respect for, and equality of persons with ASD.

- The Autism Web Course: http://cdd.unm.edu/swan/autism_course/about/index.htm. This web course was developed out of materials from the Interactive Collaborative Autism Network (ICAN). The Autism Programs at the University of New Mexico has updated and added information to this web course.
 - Characteristics
 - Assessment
 - Academic Interventions
 - Behavioral Interventions
 - Communication Interventions
 - Environmental Interventions
 - Social Interventions
 - Family Support Suggestions

- Indiana Resource Center for Autism (IRCA) <http://www.iidc.indiana.edu/irca/fmain1.html>. The Indiana Resource Center for Autism staff's efforts are focused on providing communities, organizations, agencies, and families with the knowledge and skills to support children and adults in typical early intervention, school, community, work, and home settings.
 - IRCA Articles: <http://www.iidc.indiana.edu/index.php?pageId=273>

- Texas Statewide Leadership for Autism www.txautism.net. The Texas Statewide Leadership for Autism in conjunction with the network of Texas Education Service center with a grant from the Texas Education Agency has developed a series of free online courses in autism. Please check the training page, www.txautism.net/training.html, for update lists of courses, course numbers and registration information. Current courses include the following:
 - Asperger Syndrome 101
 - Augmentative and Alternative Communication and the Autism Spectrum
 - Autism for the General Education Teacher
 - Autism 101: Top Ten Pieces to the Puzzle
 - Classroom Organization: The Power of Structure for Individuals with ASD
 - Communication: The Power of Communication for Individuals with ASD



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- Futures Planning for Students with Autism Spectrum Disorder
- Navigating the Social Maze: Supports and Interventions for Individuals with ASD
- Solving the Behavior Puzzle: Making Connections for Individuals with ASD