ARC^{EX} Therapy: Exercise Examples

In this resource, you will find a selection of the exercises that were used in conjunction with ARC^{EX} Therapy during the Up-LIFT trial[1]. These can be used as starter ideas for ARC^{EX} Therapy sessions. The choice of an exercise should always be tailored to the user's needs and personal goals.

Principles to uphold during ARC^{EX} Therapy

- Tailor the activities to align with the user's functional goals
- Select meaningful tasks to maintain motivation and engagement
- Remind users to actively engage in the exercises with intent and focus
- As in all motor learning, ARC^{EX} Therapy is most effective when:
  - A high number of repetitions are practiced
  - Tasks have real-life relevance for the user
  - Complex tasks are broken down into smaller parts if the full task cannot yet be performed
  - Manual, hand-over-hand assistance is limited to providing a reference for correct movement, then maximizing voluntary engagement thereafter
  - Proprioceptive feedback is emphasized, such as through closed-chain positions
  - The instructions encourage biomechanically correct movement patterns

Tips

- The height of the table in front of the user should be adjusted individually to perform the activities comfortably
- It may be beneficial to work sequentially from proximal to distal exercises to assess voluntary capability
- Consider a general warm-up before engaging into focused goal-oriented exercises

[1]Moritz, Chet, et al. "Non-invasive spinal cord stimulation for arm and hand function in chronic tetraplegia: a safety and efficacy trial." Nature Medicine, 2024.

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ARC EX

Bilateral grasp



Containers

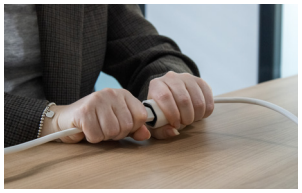
Opening and tightening container lids

Challenge

Stronger vs. pre-opened lids

Use lids with multiple seals

Fill container, open without spills



Extension cords

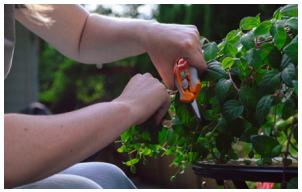
Plugging extension cords together and separating them using both hands

Challenge

Cords with stronger attachments vs. pre-loosen plugs

Perform for speed

Vary arm position



Scissors

Cutting out shapes from paper (exercise caution when handling sharp objects)

Challenge

Thickness of paper

Complexity of shapes

Change hands



Nesting boxes

Separating and placing inside each other

Challenge

Perform for speed

Hold only with fingertips



Rubik's cube

Twisting while stabilizing with one hand

Challenge

Perform for speed

Vary directions of twist

Partial turns



Cups

Flipping cups simultaneously

Challenge

Adapt weight

Size of cups

Vary movement pattern



Can opener

Squeezing the handle with one hand while rotating the lever with the other hand

Challenge

Size of cans

Change hands



Slinky

Supinating and passing slinky from one hand to the other

Challenge

Vary arm position

Fully expand slinky

Full vs. partial supination to pronation



Flexbar

Opposing twists, vertical or horizontal bar

Challenge

Vary resistance of bar

Vary trunk support

Vary arm position

ARC EX

Unilateral grasp



Cans / bottles

Bringing a bottle/can to mouth

Challenge

Adapt weight
Change hands
Vary shape of cup



TheraPutty

Cutting putty with cutlery; gripping putty in fist (exercise caution when handling sharp objects)

Challenge

Thickness of putty
Length of cuts
Vary angle of cuts
Cutlery handle



Grasp development

Grasp and release

Challenge

Hold and grasp in air
Thickness of material (towel vs. napkin)

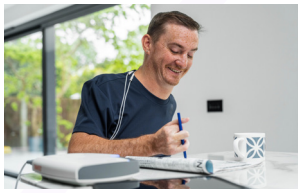


Baskets

Picking up and carrying a grocery bag or basket using a hook grasp

Challenge

Adapt weight
Vary types of handles
Change hands



Handwriting

Writing name or writing a letter to someone

Challenge

Use adaptive equipment
Vary length of sentences
Vary size of letters

Bilateral pinch



Buttons

Buttoning and unbuttoning buttons in shirts/coats/pants

Challenge

Size of buttons
Thickness of buttons
Eyes opened vs. closed



Shoes

Lacing and unlacing shoe

Challenge

Thickness of laces
Size of eyelets
Vary over/under pattern
Vary length of plastic tip on laces



Ziplocs

Opening Ziploc bags using one hand to stabilize and one hand to open

Challenge

Hold bag suspended in air vs. supported
Single vs. double zipper bags
Full vs. empty bags



Zippers

Zipping and unzipping zippers on clothes or gear

Challenge

Resistance of zippers
Zippers with curved path
Size of zipper hold
Vary the angle of pull/push



Knots

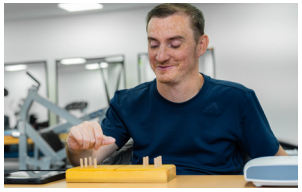
Tying variable knots, difficulty based on ability

Challenge

Vary string thickness
Vary knot complexity
Use both hands equally

ARC EX

Unilateral pinch / complex pinch



Stacking

Building using pinch (wooden stackers)

Challenge

Vary pinch (tip vs. lateral)

Pinch long side vs. short side

Vary angle of pinch and stack



Cards

Holding cards, playing cards

Challenge

Hold more cards at once

Fan cards out

Pull multiple cards while holding

Vary card-flipping direction on table



Coins

Flipping and holding coins or poker chips, putting coins into box slots, removing coins from purse or wallet

Challenge

Thickness and size of coins

Place coin in slots of varying angles



Clothespins

Pinching clothespins to paper, clothes, or other objects

Challenge

Strength of clothespins

Type of pinch

Perform for repetitions

Hang clothes from line



Stickers

Peeling stickers and placing them on surfaces (e.g., water bottles, journals)

Challenge

Size of stickers

Place on surfaces in certain orientation

Finger isolation



Keyboard

Tapping or typing on a computer keyboard with both hands, without pressing multiple keys at once

Challenge

Length of words/sentences

Keep hands floating on keyboard

Include numbers

Perform for speed



Piano

Tapping on piano keys to play music or follow a rhythm, without pressing multiple keys at once

Challenge

Keep rhythm to play a song

Use all fingers vs. one at a time

Hold notes

Trunk unsupported



Active-assist finger isolation

Therapist assisting finger flexion and extension while blocking other fingers

Challenge

Block proximal joints

Combined planar movements (opposition) vs. uniplanar



TheraPutty

Poking holes using each finger individually (can use both hands simultaneously)

Challenge

Thickness of putty

Depth of holes