Devices and Tools Available to Support Arm Function

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This resource aims to share information about devices and tools available to support arm function for children with physical disabilities. The information was gathered by looking for devices evaluated in scientific publications and by interviewing families. While this resource does not describe all of the devices and tools available, we hope that the information shared here is useful to help you support a child in your life.

Playskin LiftTM



Device Description: Information original from: https://academic.oup.com/ptj/article/96/3/390/2686542

"The Playskin LiftTM is an exoskeletal garment to assist children with upper extremity disabilities in lifting their arms. The device consists of a onesie or shirt made of 4-way stretch fabric (87% polyester, 13% spandex) with vinyl tunnels under each arm that requires support. The vinyl tunnels can house springs (i.e., mechanical inserts made of carbon steel wire) to assist the child in lifting their arm to the desired level of shoulder flexion. This device is most suitable for children ages 3 years and under."

Family Feedback:

Pros	Cons
 Allowed for new dimensions of play (painting, playing with toys, throwing, video games) Adjustable wires allow for desired level of movement and control Used at home, in classroom, and during play Durable and washing machine safe Provided strength training benefits Comfortable, lightweight 	 Expressed difficulty in acquiring all parts Progressive discomfort and feelings of lack of control with age due to the inability to lower arms Expressed some difficulties during dressing (taking garment on and off) Long sleeve design poses difficulties in warmer climates

Resources:

DIY Manual: *Link Here Publication: *Link Here

Flexible Spoon and Fork



Device Description:

Information original from: https://www.amazon.com/Utensils-self-feeding-Learning-Bendablesilverware/dp/B091YSZC2R/ref=asc_df_B091YSZC2R/?tag=hyprod-20&linkCode=df0&hvadid=532532665113&hvpos=&hvnetw=g&hvrand=13342340138076040829&hvp one=&hvptwo=&hvqmt=&hvdev=c&hvdvcmdl=&hvlocint=&hvlocphy=1014927&hvtargid=pla-1429015977506&th=1

"Flexible utensils allow for eating accommodations for young children and children with upper extremity difficulties. The bendable design provides versatility and aids children in learning to eat independently. Utensils of this nature are typically made of food grade materials and are dishwasher safe."

Family Feedback:

- Versatile in use as it can be bent both ways
- Can be used for right- and left-hand use
- Inexpensive

Resources:

<u>Retail Example:</u> Toddler Utensils with travel case, Baby spoon and fork set for self-feeding Learning Bendable handle silverware for kid children <u>*Link Here</u> Retail Example: EasieEaters Curved Utensils via eSpecial Needs *Link Here

Benik Elbow Splint



Device Description:

Information original from: https://www.benik.com/peds/elbow/e-505v

"This elbow splint provides light medial and lateral support and stability to the elbow using a neoprene wrap. It features an adjustable fit and removable elastic strapping to ensure stability and offer additional resistance to hyperextension. The hinged supports include malleable aluminum hinges for medial and lateral stability. The elbow can be placed statically in each of four angled positions using the supports. Each support includes 2 hinges, 8 removable/repositionable stops and a 9/64 inch allen wrench."

Family Feedback:

Pros	Cons
 Allowed for easy holding of objects Utilized during activities such as eating and playing Used at home and during therapy primarily 	 Custom hinge due to small size Bulky and hard Desired a lighter, more tolerable, more comfortable design Expressed difficulties in finding clothing to fit over device

Resources:

Benik Corp E-505V Hinged Elbow Wrap <u>*Link Here</u>

Wilmington Robotic Exoskeleton (WREX)



Device Description:

Information original from:

https://journals.lww.com/pedorthopaedics/Fulltext/2011/07000/Wilmington_Robotic_Exoskeleton__A_ Novel_Device_to.25.aspx

"The Wilmington Robotic Exoskeleton (WREX), developed by Nemours Children's Health in Wilmington, is an exoskeleton designed for kids with upper extremity weakness to increase range of motion of their arms to support performance of daily tasks. The design includes plastic, metal, and rubber components and allows for movement in three dimensions. The design proves versatile as it can be attached to both wheelchairs and jackets during wear. The adjustable and custom made design for each child allows for a personable and long term wear for each child."

Family Feedback:

Pros	Cons
 Multidimensional range of motion, supports elbow flexion Stabilizes the arm for activities (specifically table activities) Can be secured on a wheelchair 	 Hardness within the design and strap material leads to feelings of discomfort Difficulties in donning and doffing the device Wear lasted a few months before sizing issues Heavy and bulky

Resources:

<u>Publication:</u> Wilmington Robotic Exoskeleton A Novel Device to Maintain Arm Improvement in Muscular Disease <u>*Link Here</u>

Adjustable Bike Mount for Dressing



Device Description:

Information original from: https://www.amazon.com/Ibera-Horizontal-Bicycle-Storage-Adjustable/dp/B00MJCSBJ4/ref=asc_df_B00MJCSBJ4/?tag=hyprod-

20&linkCode=df0&hvadid=242002769514&hvpos=&hvnetw=g&hvrand=8727861308857314413&hvpo ne=&hvptwo=&hvqmt=&hvdev=c&hvdvcmdl=&hvlocint=&hvlocphy=9007460&hvtargid=pla-343408314892&psc=1

"A family reported use of an adjustable bike mount used by their child during dressing. The concept was suggested by an occupational therapist. Reports online detail similar solutions for children with upper extremity disabilities. The bike mount is typically used for indoor horizontal storage of a single bicycle. The device features two adjustable arms and a mountable back that attaches to the wall. The metal material and adjustability provide durability and easy indoor use."

Family Feedback:

Pros	Cons
 Cost effective Adjustable Allows for independent dressing 	 Only suitable for at home use - unable to travel with the device Lack of portability lead to frustrations during travel

Resources:

Retail Example: Ibera Horizontal Bicycle Bike Wall Hanger via Amazon *Link Here

Magnetic Zippers



Device Description:

Information original from: https://www.amazon.com/Inclusive-One-Handed-Abilities-Replacement-Available/dp/B08ZYZ71K4?source=ps-sl-shoppingadslpcontext&ref =fplfs&smid=A2KJAD4FMT0L02&th=1

"Magnetic zippers allow for ease in dressing for all ages and ability levels. The magnetic base with zipper teeth offers a quick "click and zip." The zippers can be sewn into typical sweatshirts and other clothing variations however it is also available for order within the sweatshirt. For ease in pulling the zipper, reports and feedback show that tying a string or tie of sorts to pull from proves beneficial."

Family Feedback:

Pros	Cons
Allows for easy zipping and dressingAge and ability friendly	- Commonly needs to be sewn or implemented into clothing by user

Resources:

<u>Retail Example:</u> ANKHGEAR MagZip Inclusive One-Handed Magnetic Zipper <u>*Link Here</u> <u>Retail Example:</u> Mens Magnetic-Zipper Hoodie with Pockets <u>*Link Here</u>

Accessible Toothbrush



Device Description:

Information original from: https://curaprox.us/info/sonic-toothbrushes/hydrosonic-easy

Suction Toothbrush

- A family reported utilization of a toothbrush with the addition of a suction cup at the bottom. This allows for easy placement of the toothbrush as well as use of the toothbrush while it is stuck to a table or countertop.

Lightweight Electric Toothbrush

- A family reported utilization of a lightweight electric toothbrush such that their child was able to easily hold and grasp the toothbrush for use.

Family Feedback:

Suction Toothbrush

- Allows for independent brushing of teeth
- User did not need to hold toothbrush in order to utilize toothbrush

Lightweight Electric Toothbrush

- Allows for independent brushing of teeth
- Lightweight and easy to grasp and hold
- More expensive than typical toothbrushes

Resources:

Source: Curaprox Lightweight Sonic Toothbrushes *<u>Link Here</u> Retail Example: Suction Cup Toothbrush via Target *<u>Link Here</u> Retail Example: Suction Cup Toothbrush via Amazon *<u>Link Here</u>

Adaptive Clothing by Tommy Hilfiger



Description:

Information original from: https://usa.tommy.com/en/tommyadaptive?%3fcid=cpc_ggl_us_bau_adaptive-branded-text_adaptive-branded-unisex_adaptiveclothing_81536253327_606867626101&gclid=Cj0KCQjw7KqZBhCBARIsAI-fTKLVCIZlhVOo5i9--RYXjAbm byztbZlSxHOyhxaad2UNAcxhg9sCA0aAtnOEALw wcB&gclsrc=aw.ds&gclsrc=aw.ds

"The adaptive clothing line by Tommy Hilfiger provides stylish and accessible clothing. The line details modified clothing with features such as one-handed zippers, magnetic buttons, Velcro, prosthetic and orthotic friendly seams, and more while maintaining traditional style. The concept allows for personal style to be expressed inclusively."

Family Feedback:

Pros	Cons
 Velcro allows for easy dressing (donning) In addition to Velcro back, designs feature Velcro sleeves Allows for easier bathroom use 	 Velcro poses difficulties in undressing Designs with long sleeves prove difficult

Resources:

Retail Example: Tommy Hilfiger Inclusive Style for All *Link Here

Rex Magic Arms by Abilitech Assist



Device Descriptions: Information original from: https://abilitechmedical.com/abilitech-assist#product-overview

"The Abilitech Assist device is a wearable device that helps to support patients with upper extremity weakness. The device provides assistance to shoulder and elbow areas using springs, motors, and software allowing for arm movement within existing functional limitations. The design works through a button that initiates the support in lifting the arms."

Family Feedback:

Pros	Cons
 Allows use of arms for activities such as typing, raising hands in class, "placing hand on joystick with lack of flailing" Usable in various locations Attaches to wheelchair / power chair 	 New device needed with growth Rubber bands posed snapping issues and reconstruction following the snapping brand proved difficult Slight squawking during use

Resources:

Abilitech Assist Website <u>*Link Here</u>

Medical Stroller



Device Description:

Information original from: https://www.sunrisemedical.com/manual-wheelchairs/zippie/early-intervention-strollers/kid-kart

"A medical stroller provides parents and caregivers a lightweight and foldable alternative to a standard traditional wheelchair. Devices commonly include a harness and foot petals for increased stability of the user. The adjustable back angle serves beneficial for user comfort and long-term use with user growth. A titanium or aluminum stroller frame with padded seats and standard upholstery allows optimal comfort during use. Medical wheelchairs can prove expensive however usually cover a wheelchair or stroller within each 5-year period. Alternatively, doctors can write an order for a medical wheelchair to which insurance typically covers the cost after."

Family Feedback:

Pros	Cons
 Features a tray beneficial for school activities Helpful in maintaining sitting position Helpful in taking baths and other daily activities 	 Still rather bully and heavy Unable to use on atypical terrain (sand, dirt)

Resources:

<u>Source:</u> Sunrise Medical *<u>Link Here</u>, <u>Retail Example</u>: Drive Medical Trotter Pediatric Mobility Chair by Medical EShop *<u>Link Here</u>

Durable Movement Orthotic (DMO) Suit



Device Description:

Information original from: https://www.bostonoandp.com/products/dynamic-movement-orthoses/dmo-suits/

"The device is a body orthosis in the form of a suit. The DMO suit is made of compression fabric such that it fits tightly to the body. The suit is designed to improve shoulder, torso, and hips stability and provide passive support for the user. Sources report the suit aids in distal control as well as affects muscle tone positively. The design offers easy dressing through fasteners and reinforcements. Typically worn under clothing, DMO suits are available in a variety of sleeve and leg lengths and sizes. The device is typically custom made to the user for optimal use. DMO suits are commonly used in the cerebral palsy, muscular dystrophy, spinal muscular atrophy, hypermobility disorder, and other developmental disorder communities."

Family Feedback:

Pros:		Cons:
-	Tightness provides support allowing for easier holding and independent sitting Stabilizes the body Usable for everyday activities with the exception of swimming Can be worn under everyday clothing	 Child dislikes tightness, but puts up with wear Tightness can lead to difficulties in dressing Passive sitting can result in stomach breathing due to tightness

Resources:

Source: Boston Prosthetics and Orthotics *Link Here, Source: DM Orthotics *Link Here

Homemade Sling and Clamp System for Overhead Arm Support



Device Description:

A family reported a homemade sling and clamp design featuring two sewed slings attached to portable clamps such that the slings could be used in different locations. The slings consisted of different types of TheraBand which hung loose from gooseneck style clamps. The flexibility of the TheraBand allows for range of motion and bounce while providing support to the user's arms. The family reported utilizing this design during ages 2-3 years.

Family Feedback:

- Allowed for first experiences in self-directed movement
- Usable in various locations
- Reports of help during arts and crafts, music, and in conjunction with a gripping tool

Resources:

<u>Retail Example</u>: Gooseneck clamp *<u>Link Here</u> *<u>Link Here</u> <u>Retail Example</u>: TheraBand *<u>Link Here</u> *<u>Link Here</u>

Dressing Stick



Design Description:

Information original from: https://www.healthproductsforyou.com/p-dressingstick.html?utm_source=google&utm_medium=surfaces&utm_campaign=shopping%20feed&utm_conten t=free%20google%20shopping%20clicks&gclid=CjwKCAjw4c-ZBhAEEiwAZ105RYXIMzioTPFtC0YPbsqhIQ7TzawQMnjtX4PJqGYMmHLVcVdPhIoS8RoC4rUQA vD_BwE

"The device is designed to assist individuals with limited mobility for an easier experience in everyday dressing. The lightweight design is usually made of plastic and ranges in length depending on the user with a typical length of about 2 feet long. The design consists of a double hook at one end and a c-hook or shoehorn at the other."

Family Feedback:

- Recommended by therapists
- Allows for independent dressing able to pull down pants
- Helpful in removal of braces and shoes

Resources:

<u>Retail Example</u>: Dressing Stick via HPFY *<u>Link Here</u> <u>Retail Example</u>: 24" Dressing Stick with Foam Handle via Hopkins Medical Products *<u>Link Here</u>

ErgoRest Articulating Arm Rest (dynamic arm support)



Device Description:

Information original from: https://www.ergoexperts.com/products/ergorest-articulating-armrest?variant=29634744387¤cy=USD&utm_medium=product_sync&utm_source=google&utm_co ntent=sag_organic&utm_campaign=sag_organic&gclid=CjwKCAjw79iaBhAJEiwAPYwoCKgAAGun8 GhjF8rqOSuJs_ryNpg9WTuIKRWjS9DZhNzE_ae3htNhjRoCYF4QAvD_BwE

"The ErgoRest Arm Rest is an articulating ergonomic support for elbows, forearms, and wrists designed for use at a computer. It is made from aluminum alloys and tough polyamide nylon fibers. The arm support pad is upholstered with leather for maximum comfort and durability. The durable double support structure is made of cast aluminum guaranteeing firm support and a smooth movement."

Resources:

<u>Source:</u> Additional Device Overview and FAQ <u>*Link Here</u> <u>Retail Example:</u> Ergorest Articulating Arm Rest <u>*Link Here</u>

JAECO Elevating MultiLink Mobile Arm Support (dynamic arm support)



Device Description:

Information original from: https://www.performancehealth.com/jaeco-elevating-multilink-mobile-arm-supports

"The JAECO Elevating MultiLink Mobile Arm Support features and addition of an Elevation Assist to the MultiLink that allows for a significantly greater range of motion for feeding and facial hygiene. The new design has more lifting power with fewer rubber bands. Similar to the standard MultiLink, minimal tools are required for set-up and client adjustment. The 20" will fit most clients, while the 24" is for clients over 6'2" in height pr when one of the power chair mount relocates cannot be used and attachment point for chair mount is behind the patients shoulder."

Resources:

<u>Retail Example:</u> JAECO Elevating MultiLink Mobile Arm Support via Performance Health <u>*Link Here</u> <u>Retail Example:</u> JAECO Elevating MultiLink Mobile Arm Support via Rehab Store <u>*Link Here</u>

SaeboMAS mini (dynamic arm support)



Device Description:

Information original from: https://www.saebo.com/shop/saebomasmini/?gclid=CjwKCAjw79iaBhAJEiwAPYwoCD2yl0gOQUePdYSZTJihLKF6HwmRAJS98hynWjQu8 trqyA5JqHAmaRoCmY4QAvD BwE

"The SaeboMAS mini (a zero-gravity Mobile Arm Support) provides you freedom to move your arm in any direction despite weakness or spasticity. NOW receive virtual training from a Saebo Clinician with every purchase. Each SaeboMAS mini comes with a table mount, 2 different arm cuffs, hand and elbow attachments, and accessories. For additional support in rotating your forearm and hand, select the option with the Pro/Sup attachment."

Resources:

Retail Example: SaeboMas Mini via Saebo *Link Here

Hybrid Assistive Limb



Device Description:

Information original from: https://brooksrehab.org/technology/hybrid-assistive-limb-hal/

"Those living with impairments that restrict their movement have more reason to be hopeful as technology progresses. Robotics departments are currently putting their inventions to use in medical settings for physical therapy, bringing scenes from science-fiction movies to real life, for real results. As an institution dedicated to incorporating the latest cutting-edge medical innovations into its therapies, Brooks Rehabilitation offers the Hybrid Assistive Limb (HAL) robotic exoskeleton as a treatment option for patients with a variety of lower-limb movement or balance issues. Those who suffer from these types of injuries or diseases can progress towards their desired recovery as a result of this futuristic treatment."

Resources:

Source: Brooks Rehabilitation Hybrid Assistive Limb Webpage *Link Here

Armeo Spring



Device Description:

Information original from: https://marianjoy.org/rehab-technology/tellabs/armeospring.aspx#:~:text=Armeo%20Spring&text=The%20Armeo%C2%AE%20is%20an,facilitate%20arm% 20and%20hand%20recovery

"The Armeo® is an arm and hand rehabilitation exoskeleton. With robotic technology and virtual reality simulation, the Armeo® Spring uses functional, intensive, task-specific and self-initiated skills to facilitate arm and hand recovery." Ergonomic and adjustable, the Armeo embraces the whole arm, from shoulder to hand, counterbalancing the weight of the patient's arm. It enhances any residual function and neuromuscular control, assisting active movement across a large 3D workspace. Patients complete tasks from a large library of real-life simulation movement exercises, supported by a virtual-reality training environment. A pressure-sensitive handgrip, which detects even small amounts of grip force, facilitates grasp-and-release exercises."

Resources:

<u>Source:</u> Hocoma Armeo Spring Overview and Details *<u>Link Here</u> <u>Source:</u> Marianjoy Rehabilitation Hospital Tellabs Center for Neurorehabilitation and Neuroplasticity Armeo Spring *<u>Link Here</u>

Armon Edero



Device Description: Information original from: https://armonproducts.com/cms/products/edero/

"The Armon Edero is an arm support, especially designed for those who only have limited strength in their arms and hands, or for those that can only use their muscular strength for a limited time. This can be the result of a spinal cord injury, RSI /CANS, cerebral infarction, or one of the many muscular diseases. The device compensates the full weight of the arm by a spring compensation system. This is a simple, one-time setting. The Armon follows the natural movement of the user, this allows the arm to move easily in all directions. The arm support distinguishes itself from similar products because unlike many other products, the user keeps the control. The user makes the movement and not the device."

Resources:

<u>Source:</u> Armon Products Overview of Armon Edero *<u>Link Here</u> <u>Retail Example:</u> Armon Edero via Activity Mobility Company *<u>Link Here</u>

Gloreha Sinfonia



Device Description:

Information original from: <u>https://www.gloreha.com/sinfonia/;</u> https://www.gloreha.com/wp-content/uploads/2018/11/Bilateral-Training.pdf

"Sinfonia is the most advanced device for functional hand rehabilitation, equipped with a robotic glove able to mobilize fingers, detect patient's active movements and perform mirror bimanual training" (Description via Gloreha <u>Website</u>). "Gloreha Sinfonia offers a peculiar and innovative kind of therapy that enhances the benefits of conventional Mirror Therapy, beyond the illusion of the movement. Gloreha Sinfonia combines the concepts of Mirror Therapy with Virtual Reality, assisted mobilization, and bilateral tasks" (Description via Bilateral Training <u>Overview</u> via Gloreha).

Resources:

Source: Gloreha Sinfonia Device Overview *Link Here

RAPAEL Smart Glove



Device Description: Information original from: <u>https://www.neofect.com/us/smart-glove;</u> https://brooksrehab.org/technology/rapael-smart-glove/

"Neofect Smart Glove is a high-tech rehab device that measures movements of the forearm, wrist, and digits with accelerometer and bending sensors" (Neofect Smart Glove <u>Webpage</u>). "The Smart Glove is a highly advanced Bluetooth enabled glove that helps patients train their arm and hand strength in by playing dynamic virtual reality games. RAPAEL Smart Glove therapy centers on the idea that patients thrive when presented with achievable challenges" (Description via Brooks Rehabilitation Rapael Smart Glove <u>Webpage</u>).

Resources:

<u>Source:</u> Neofect Rapael Smart Glove Overview and Details *<u>Link Here</u> <u>Source:</u> Brooks Rehabilitation Rapael Smart Glove Uses and Review *<u>Link Here</u>

Haptic Master & NJIT-RAVR



Device Description:

Information original from: https://jneuroengrehab.biomedcentral.com/articles/10.1186/1743-0003-6-40#:~:text=The%20NJIT%2DRAVR%20system%20consists,interact%20with%20rich%20virtual%20en vironments

"The NJIT-RAVR system consists of the Haptic Master, 6 degrees of freedom, admittance controlled robot and a suite of rehabilitation simulations that provide adaptive algorithms for the Haptic Master, allowing the user to interact with rich virtual environments" (Qui et al. 2009).

Resources:

<u>Reference Article:</u> The New Jersey Institute of Technology Robot Assisted Virtual Rehabilitation (NJIT-RAVR) system for children with cerebral palsy: a feasibility study *<u>Link Here</u>

In Motion2 Robot



Device Description: Information original from: https://bioniklabs.com/inmotion-arm/

"BIONIK's modular, "gym-of-robots" systems approach to neurorehabilitation is the only system designed to optimize the use of robotics for neurorehabilitation in a manner that is consistent with the latest clinical research and neuroscience, taking into account the latest understandings on motor learning interference and motor memory consolidation. For instance, training planar and vertical (antigravity) movements in alternate days leads to better outcomes than training during the same session.2 By measuring patient kinematic and kinetic data objectively, BIONIK's InMotion® Robots have shown that for severe to moderate brain injury the effectiveness of therapy is optimized by allowing the robots to focus on reducing impairment and allowing the therapist to assist on translating the gains in impairment into function" (Description via BIONIK InMotion Arm for Neurological Rehabilitation <u>Webpage</u>)

Resources:

Source: BIONIK InMotion Arm Overview and Uses *Link Here

REAPlan



Device Description: *Information original from: https://www.axinesis.com/en/our-solutions/reaplan/*

"The REAplan® upper limb rehabilitation robot enables intensive therapy of up to 1.000 movements per session, supported by personalized therapeutic gamification. The end-effector structure allows practice of a wide range of functional tasks, without requiring morphological adaptation, making it easy to integrate into your clinical routine. The REAlab software enables real-time auto-adaptive movement assistance ranging from passive to resisted active. This allows a very early start to upper limb rehabilitation, and ensures therapy adapts to each patient's motor performance and stage of recovery" (Device Description via Axinesis Upper Extremity Robotic Rehabilitation <u>Webpage</u>).

Resources:

Source: Axinesis Overview and Details of REAplan *Link Here

Amadeo Hand Robot System



Device Description: Information original from: https://www.nrcclinic.com/services/robotic-therapy/amadeo/

"The AMADEO is the latest in a long row of clinically tried and tested robotic- and computer-assisted therapy devices for fingers and hands. The new design and the specially developed tyroS software make the AMADEO more flexible and offer an expanded spectrum of therapy options. Thus, the AMADEO is the most advanced robotic-assisted finger-hand therapy device world-wide. The AMADEO is suitable for all phases of finger-hand-rehabilitation. The AMADEO can be adapted to the needs of each individual patient. Small or big hands. All or single fingers. For neurological, orthopedic, and pediatric applications. In cases of limited mobility of the fingers, specific exercises on the therapy device help improve motor- and sensory functions. The finger movements stimulate the brain and thus the neoformation of synapses" (Device Description via Neurological Recovery Center Amadeo <u>Webpage</u>).

Resources:

<u>Source:</u> Neurological Recovery Center Amadeo Review *<u>Link Here</u> <u>Source:</u> TryoMotion (Manufacturer) Amadeo Finger-Hand-Rehabilitation Overview and Use *<u>Link Here</u>