

# **Enhancing Quality of Life through Assistive Technologies in Children with AUTISM**

Functional independence skills are necessary for daily living and establishing quality of life. For ‘neuro-typical’ individuals, we exercise functional independence every day without thinking much about it. We get ourselves up, bathed, dressed, fed and out the door instinctually. For children with autism, however, these functional skills are often not always innate.

It’s important to develop these skills in order to foster greater independence. Personal hygiene and self-care are the cornerstones of functional independence skills. For people to maximize their potential, they have to understand the basic skills of bathing, feeding, and clothing themselves. To be “functionally independent” also includes communication, decision making, personal safety, recreational play and vocational skills.

Children diagnosed with Autism Spectrum Disorder (ASD) could have significant core impairments in social communication, imagination and constructive skills and may exhibit a wide variety of symptoms. In the era of technology, assistive technologies has been increasingly used by different peoples to improve their performance in self-care, social skills, behaviour, communication, academic , cognitive skills and assist in rehabilitation process especially autism. Students with ASD will most often require Information and Communications Technology (ICT)-based tools such as software or application that could assist with reading, language, organizational skills and processing information in addition to developing useful skills for the job market.

For years, different modes of technology have been used to improve the quality of life of people who have various developmental disabilities . However, the varied use of technology for children with autism continues to receive limited attention, despite the fact that technology tends to be a high interest area for many of these children.

Here we were going to discuss how various modes of technology can be used for children with autism to increase or improve their potential to became functionally independent & actively participate in the society. Assistive technology can be used to enhance:

- Overall understanding of their environment
- Expressive communication skills
- Social interaction skills
- Attention skills
- Motivation skills
- Organization skills
- Academic skills
- Self help skills
- Overall independent daily functioning skills

Technology has been widely used to help human in most of everything. Assistive technology is also relevant in context of autism spectrum disorder. It also plays an important role in assist and help persons with autism to enhance their social skill, communication skill, repetitive behavioral, functional skill and constructive skill which fostered the development of new applications from day to day

According to the Technology-Related Assistance for Individuals with Disabilities Act of 1988 (Public Law 100-407), an assistive technology means any item, piece of equipment, or product system, whether acquired commercially, off-the-shelf, modified or customized, that is used to increase, maintain, or improve functional capabilities of individuals with disabilities. Assistive technology service is any service that directly assists an individual with a disability in the selection, acquisition, or use of an assistive technology device.

Typically, children with autism process visual information easier than auditory information. Any time we use assistive technology devices with these children, we're giving them information through their strongest processing area (visual). Therefore various types of technology from "low" tech(pencil grips, picture communication systems) to "high" tech (iPads, dedicated communication devices), should be incorporated into every aspect of daily living in order to improve the functional capabilities of children with autism.

Assistive Technology is broadly used to enhance the learning abilities of children with autism. According to (Mallin et. al, 2015) assistive technology can perform as an assisting tool, encourage a rehabilitation process and as a language device for children with autism. Therefore, through assistive technology, some of the impairment among autistic children can be improved such as social skills, communication skills, repetitive behavioral and functional skills.

There are some existed Assistive Technology specifically designed for Autism Spectrum Disorder such as Virtual Learning Environment (VLE), Serious Game, Augmented Reality (AR), Virtual Reality (VR), Edutainment, and Mobile Learning Apps.

For convenient here we can discuss role of assistive technology(AT) for promotion of:

- Social Skill Development
- Behavior
- Communication
- Cognitive Development
- Academic Skills

## **AT for Social Skill Development:**

Social skills learning difficult because: The appropriate action changes with the setting and the person you are interacting with .Many social situations have unwritten rules.

Children with autism need to be directly taught various social skills in one-to-one and/or small group settings. Numerous low-tech strategies can be used for this purpose. Social skills training will also be needed to consider the child's possible difficulties in generalizing this information different social situations, which may be supported through the following visual strategies:

### **Low AT:**

***Social Stories:*** The use of Social Stories, developed by Carol Gray, provides the child with the use of visual information/strategies that will improve his understanding of various social situations and teach him specific behaviors to use when interacting with others.

***Social Scripts:*** Social scripts are similar to Social Stories; however, an actual script is developed for a specific social situation (it is specific to the child and the social situation)

***Turn Taking cards:*** Turn taking cards are used to visually represent and mark whose turn it is. This use of turn-taking cards through a visual representation mode (PCS, object, written word, etc) is very effective in teaching this social skills concept.

***Social Rule cards:*** These cards are taped to the child's desk in the classroom (e.g., "I will raise my hand and wait for the teacher to call on me"). Social "rule" cards can be made for other environments than just the classroom. A "rule" card per environment can be written on an index card, laminated, and then given to the child to carry along as a visual reminder of the social "rules" for that particular situation.

Apart from these **Comic Strip Conversations, Wait cards, Help cards, etc.** are commonly used.

### **Mid AT :**

***Big Mac:*** This piece of equipment is a great motivational device to focus on turn-taking activities. Countless turn-taking activities can be created and incorporated into every aspect.

***Audio taping:*** Any type of social interaction, both appropriate and inappropriate, can be taped and then replayed as a teaching method to assist the child in identifying what is an appropriate, and what is inappropriate social communicative behavior. (e.g., interrupting, asking for assistance, drawing attention, initiating varied topics, maintaining topics initiated by others, etc.). Audio taping may also be used to focus on various non verbal social communication skills such as vocal volume or emotional tone of voice.

Besides these **camera, video recorder, etc.** can be used.

### **High AT :**

***Video taping:*** Numerous social situations can be video taped and replayed to teach identification of appropriate/inappropriate social behaviors. Video taped segments can be

made of any social area in which the child might be experiencing difficulties (e.g., asking for assistance, initiating varied topics, maintaining topics initiated by others, repetitive / perseverative speech or question asking, interrupting others, etc.). Non-verbal features of social communication can also be effectively taught through video taping (e.g., tone of voice, facial expressions, body postures/language, gestures, personal space, vocal volume, etc.). In addition, video taping can be used to demonstrate how to appropriately engage and/or interact in various social contexts such as recess, lunch, music class, etc.

Besides various **Computer Software, Apps** (Pictello by AssistiveWare, Scene & Heard by Therapy Box), etc. are frequently used now a days.

## **AT for comprehension skills & Behavior:**

Increasing comprehension of tasks/activities/situations is essential in addressing skill areas such as organization, attending, self help, following directions, following rules and modifying behavior. As a result, the child becomes more independent. The following visual support strategies can be created and used to assist the child in increasing his comprehension skills and thus decreasing the occurrence of challenging behaviors:

**Schedules:** Consistent daily use of an individualized visual schedule will increase a child's organization skills and independent functioning throughout all aspects of his life and will ease transition through adulthood. Schedules can be object schedule, activity schedule, calendars, routines, etc.

In addition to schedules, comprehension skills can be increased by the following strategies:



### **INTERNATIONAL "NO"**

Use of the international "no" symbol (red circle with a line drawn through it) has proven very effective in visually communicating the very abstract concept of "no" for children with autism.

**Directions:** Low tech strategies can be used in numerous ways to give the child visual information for following directions. Use of a dry erase board or contact paper white board covering part of a notebook or schedule system to write/draw various visual directions which are given auditorilly. Sequential step directions for specific tasks/activities.

**Forewarning:** For children who need very explicit forewarning regarding when something is going to "stop/end" or be "all done", use of "go", "almost done" and "stop" cards have proven very effective in giving children this important information to assist them in making this sometimes difficult transition (to stop).

**Rules/alternate behaviors:** Putting rules in a visual form allows the child to understand the expectations, as well as what actions or alternatives are acceptable. This strategy results in

more consistent behavior. In addition, visual representation of rules and alternative behaviors allows the child to improve his self-regulation and self-management skills without needing the support of an adult.

## **AT for Communication:**

All children with autism, by definition of their diagnosis, have communication deficits.

- children without language need alternate forms of language; sign, PECs or AAC devices
- Children with emerging language need continued work on expressive and receptive skills
- Children with high verbal skills need work on pragmatics and conversational reciprocity skills

Communication has two aspects:

- Receptive Language What we hear and understand
- Expressive Language What we say to others

Children with ASD may have difficulties in one or both communication areas.

Despite the communication challenges ASD can present, an assumption should never be made that nonspeaking children with autism don't or can't communicate, or that they will never "speak". An array of Alternative and Augmentative Communication (AAC) approaches can be used to enhance, expand and develop communication skills. The three primary forms of AAC used with individuals with autism include unaided approaches (signs; gestures), "low tech" picture-based systems (for example, Picture Exchange Communication System -- PECS), communication books and boards and speech generating devices (SGDs). In addition, a variety of other assistive technology, such as portable word processors, can support effective written expression.

Goal of AT use: Language Development, Articulation, Pragmatics, Choice Making, Sound Discrimination, Build Vocabulary, Expression

### **Low Tech Tools – no voice output:**

- Unaided communication systems – rely on the user's body to convey meaning
  - Sign language
  - Gestures
- Aided communication systems require the use of equipment or objects in addition to the user's body .
  - Compartment Object Communicator

- Paper Communication Cards/Books – pages of symbols organized by topic
- Picture Exchange Communication System (PECs) – student gives a picture to another in exchange for what that picture represents
- E-Tran Frames – the student uses eye-gaze to indicate word or symbol
- Alpha Smart or Neo word processors – the student types in what they wish to say

### **Mid Tech Tools – with voice output**

- Digitized Speech – recorded messages
- Static Display – the symbols/items are fixed in a particular location and must be changed manually
- Text-to-Speech Only – student inputs text, accesses speak button and message is voiced using synthesized speech

### **High Tech Tools**

- Synthesized voice output, computerized speech
- Dynamic Display – a computer screen which user can change display by touch or other input
- Dedicated Devices – limited solely to the generation of speech
- Non-dedicated Devices – computers or tablets that can be programmed to run like a dedicated device
- Dedicated Speech Generating Devices (SGDs)
- Non-dedicated Speech Generating Devices
- iPads/Androids with Communication Apps

### **AT for Cognitive Development:**

Assistive technology often used in :

- Reducing Distractibility : Clocks ,Time Timer, etc.
- Augmenting Memory Loss : Mobile Devices
- Organizational Skills : Calendars, iReward Chart,etc.
- Task Completion: Single Task, Multiple Tasks.

### **AT for Academic Skills:**

#### **WRITING :**

Writing has two distinct components:

- Motor skills (pencil/paper and keyboarding)

- Composition skills (idea generation, sequencing, spelling, grammar, vocabulary, idea integration)

### ***AT to Address Motor Skill Deficits in the Writing Process:***

#### **Low Tech Tools :**

- pencil/paper tasks
- Adapted pencils/pencil grips
- Adapted papers
- Writing Guides

#### **Mid Tech Tools:**

- Replace pencil/paper
- Portable Keyboards

#### **High Tech Tools:**

##### ***Augments pencil/paper:***

- Recording pens and paper + computer
- Echo smartpen, Sky smartpen
- Mobile tablet apps that act as a notepad and voice recorder
- Mobile tablet apps take a picture of handout, add text

##### ***Replace pencil/paper:***

- Computers with specialized software
- Mobile Tablets with specialized apps

##### ***Computer based:***

- Text-to-speech + Word Prediction, provides needed audio paring and list of most likely words based on content
- Voice Recognition, takes motor skills out of the writing process

##### ***Mobile tablet based:***

- Text-to-speech + Word Prediction apps.e.g. Abilipad, iReadWrite
- Voice Recognition, takes motor skills out of the writing process

### ***AT to Address Composition Skill Deficits in the Writing Process :***

## **Low Tech Tools for Composition Deficits**

- Word Lists
- Word Books
- Word Wall

## **Mid Tech Tools for Composition Deficits**

- Electronic Dictionary – with or without voice

## **High Tech Tools for Composition Deficits**

- Boardmaker – software that lets students who use symbols create written work
- Organizational software for writing – computer based.e.g. draft builder
- Organizational software for writing – mobile tablet based.e.g. Simplemind Popplet iOS
- Software and Apps with Spell Check
- Software and Apps with Word Prediction
- Software and Apps with Text-to-Speech
- Software and Apps with Voice Recognition

## **READING:**

- Low Tech Tools for visual tracking.e.g. removable highlighter tape, word-windows, reading filters, etc.
- Low/High Tech Tools for pairing words with visuals, paper and electronic symbol and rebus supports
- Mid Tech Tools for defining/pronunciation.e.g. Wizcom Reading, Franklin Language Master,etc.
- Mid Tech Tools spoken text to accompany print
- Mid Tech Tools, stand alone book readers.e.g. VictorReader Stream PlexTalk Pocket,etc.
- Electronic Book Services.e.g.Learning Ally (was RFB&D), BookShare
- Electronic Text Sources
  - Publisher •Internet •Scanned Documents
- High Tech Tools with text-to-speech (OCR)
  - Features to consider:
    - Speak single words
    - Speaks sentences
    - Speaks paragraphs
    - Highlights
- High Tech Tools with text-to-speech software computer based
  - Read & Write Gold/Mobile
  - Kurzweil

- ReadOutloud
- ClaroRead Plus
- High Tech Tools with text-to-speech apps used with a mobile tablet
  - Prizmo iOS
  - ZoomReader iOS
  - CapturaTalk Android

In conclusion, assistive technology plays an important role in assist childrens/persons with autism in order to enhance their constructive skills, social skills, cognitive & communication skills, behaviour and academic skills resulting functional independence so that they can actively participate in their performance areas. It is interesting to note that the majority of strategies listed in this article fall under the category of "low"-technology and should therefore be easily accessible to many at a relatively low cost. It is important to consider that all of these suggestions, from "low"-tech to "high"-tech should always be individualized to meet the unique needs of any child with autism. Most importantly, use of these varied modes of technology will greatly increase the child's independent functioning skills by decreasing the amount of direct support needed from another person.

For more information, Kindly contact:

Durga Prasad Mishra,

MOT(Developmental Disability), FAOT-NDD,PGDND, MAPC(Clinical Psychology)

Consultant, SVNIRTAR,Cuttack

e-mail: [dpmmot@gmail.com](mailto:dpmmot@gmail.com)

Mobile: 9040636376