

USING SINGLE SWITCH TECHNOLOGY

With Individuals Who Are Deafblind With Limited Mobility

By Niall Brown, Intervenor, Toronto District School Board, Canada

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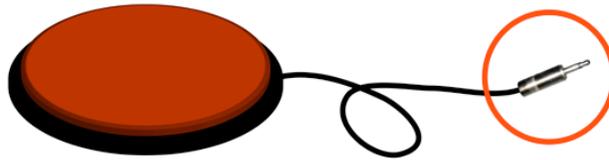
With Individuals Who Are Deafblind With Limited Mobility

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People often ask, “what is a good activity for an individual who is deafblind with limited mobility?” Using a single switch and minimal movement, an individual may be able to indicate if they want to continue an activity, end an activity, make choices or get someone’s attention. They can interact with their peers, become involved in skills of daily living, take a leading role in elements of their programming and much more. Before discussing the benefits of single switches, this article will introduce some of the switch technology that will be discussed later.

Types of standardized ¼” switches:

Switches with a ¼” mini plug are the most common type of assistive switch, and work with the greatest number of devices. ¼” refers to the size of the mini plug attachment, circled below.



These are some of the many switches available through assistive device retailers:

- Button Activates when button is pressed down (very common)
- Flap Activates when hinged pallet is pressed down (light touch)
- Blink Activates by blinking eyes
- Sip & Puff Activates by blowing air out or sucking air into mouth
- Grip Activates when squeezed
- String Activates when string is pulled
- Head Activates with head movement
- Foot Activates by pressing down with foot
- Finger Activates by finger movement
- Voice output Various switch types, plays custom message when activated

These switches can cost between \$30 and \$200 CDN, however many of them can be made with inexpensive materials found at your local hardware and electronic part stores.

A few of the switch activated toys and devices that may be purchased or adapted:



Fan With Lights



Song and Dance Dog



Vibrating Massager



Single Click Access

CAUTION: Choking hazard supervised use only.

Any individual who is at risk of putting things in their mouths should NOT be left alone with any switch or device. This includes store bought and homemade switches and adapted toys. The ¼” mini plug, jack and other parts may be a choking hazard even if they are factory sealed.



Methods of adapting toys:

There are two common methods of adapting a battery-powered device for use with a switch. Both methods add a ¼” mono mini jack in to the circuit. The switch plugs into the ¼” jack to complete the circuit when activated.

Battery interrupter with ¼” mini jack: Use the battery interrupter to block the flow of a devices circuit at the point where the battery connects to the device by reverting the current through a ¼” mono mini jack. (Instructions to build/purchase on Internet. Look up “battery interrupter” in quotations on a search engine)



Adding a mono ¼” mini jack:

Use an internal or external ¼” mono mini jack to revert the flow of a devices circuit through a ¼” mini plug switch.



Internal ¼” mono mini jack



External ¼” mono mini jack

CAUTION: Do not dismantle or modify any device that plugs in to a wall outlet.

- A Power Link 3 or equivalent device must be used to attach 120 Volt appliances or toys to a ¼” switch.
- The ¼” switch is not designed to carry the current from a 120 Volt wall outlet.

CAUTION:

- Never use a switch with a microwave.

Controlling home appliances or toys that plug in to a wall receptacle:

A Power Link 3 unit by AbleNet or equivalent device allows users to activate almost any home electrical appliance or toy that plugs in to a wall receptacle using a standardized ¼” switch. Plug the appliance and the switch into the Power Link 3, and the Power Link 3 into the wall receptacle and you’re ready to begin.



CAUTION: Do not dismantle or modify any device that plugs in to a wall outlet.

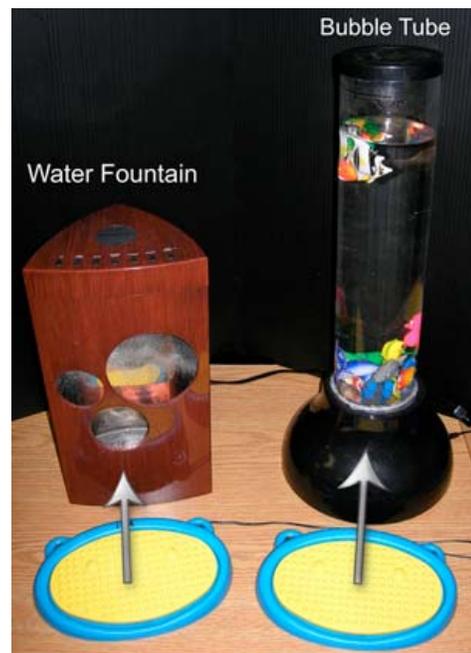
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Making choices using the Power Link 3

The new version of the Power Link allows users to activate up to 4 different devices using up to two switches at a time. The image below shows a possible configuration. The individual using this configuration may decide what device they want to interact with and for how long. This configuration could also be used for initially selecting the device the individual would like to use.



Types of single switch activation:

There are 4 types of single switch activation. The type of activation will vary depending on the device. Some devices (for example the Power Link) allow the user to choose between direct, timed or latch activation.

1. Direct
 - a. The device is activated while the switch is pressed.
 - b. The device is stopped when the switch is released.

2. Time:
 - a. The device is activated when the switch is pressed.
 - b. The device continues to function upon releasing the switch.
 - c. After a set period of time the switch is released automatically.

3. Latch:
 - a. The device is activated when the switch is pressed.
 - b. The device continues to function upon releasing the switch.
 - c. The device is stopped when the switch is pressed again.

4. Latch/
Timed
 - a. The device is activated when the switch is pressed.
 - b. The device continues to function upon releasing the switch.
 - c. The device is stopped when the switch is pressed again.
If step c is not completed, continue to step c1.
c1. After a set period of time the switch is released automatically.
(This type of activation is rare but may be found on some battery powered plush toys)

When initially introducing switches, direct activation should be used because conceptually it provides the clearest link from the switch to the device. If the switch is in a pressed state, the device is “on.” If the switch is in a released state, the device is “off.” Latch, timed, and latch/timed activation may not always directly represent a switch press with consistent feedback. For example, a switch press on a battery powered massager that uses direct activation may only activate the device. However the same action on a battery powered plush toy may activate the device, but may also stop it, unless the time has run out, then it would activate the device from the beginning. This is enough to confuse anyone. Choose the device and type of activation carefully and ensure that the individual demonstrates a complete understanding of each type of activation before proceeding to the next type.

Why use switch technology with individuals who are deafblind?

1. Cause and Effect:

Individuals who are deafblind with limited mobility may have difficulty understanding that they can cause an effect on their environment. This is due to a limited ability to stimulate their environment and distorted feedback as a result of a degree of loss of their two distance senses. Switch technology allows the individual to receive feedback about their efforts in a mode that is accessible (customized for the individual’s mobility needs) and motivating (customized feedback that provides undistorted information) to them. For example, an individual may use a switch with a vibrating massager. The output required to activate the massager is reduced by changing the original inaccessible on/off switch to a switch that is accessible to the specific individual’s mobility needs. The tactile feedback may be accessible and motivating to

many individuals who have a loss of vision and hearing. Vibrating toys are one type of device that can be attached to a switch. With almost any battery powered or 120 Volt device adaptable for switch use (may require simple homemade modifications or a Power Link), there is a device available that will be accessible and motivating to just about anyone.

2. *Encouraging movement and exploration:*

A major source of information for many individuals who are deafblind is the exploration of their environment using their tactile sense. An individual who is deafblind with limited mobility may have difficulty moving their body to explore. If the individual doesn't receive feedback about their actions, they may not know they are separate from their environment or that they can have control. It's important that any movements that are safe (approved by family or physiotherapist as safe) for the individual are recognized and encouraged. Start by observing the individual during their regular routine, looking for small movements, other than those that seem to cause pain. If for example, the individual's index finger moves slightly, a finger or flap switch activated by a gentle touch may be a good starting place. Try attaching the switch to a device that you believe would be motivating to the individual. First demonstrate the process hand under hand or hand over hand to show the outcome, then encourage the individual to try it themselves, slowly reducing the amount of prompting and physical assistance each time, until they can activate the switch themselves.

3. *Reducing physical manipulation and direction:*

Switches can be used to reduce the amount of physical manipulation and direction required for an individual to complete an activity successfully. The following are examples of an activity with and without a switch adaptation:

Without Switch Adaptation (Doing for the individual)

- a. The intervenor shows the individual the battery massager.
- b. The intervenor presses the (inaccessible) button activating the battery massager hand over hand.
- c. The individual learns that the intervenor turning on the device using the individual's hand is part of the activity.

With Switch Adaptation (Doing with the individual)

- a. The intervenor shows the individual the battery massager.
- b. The intervenor demonstrates to the individual using hand under hand or hand over hand how to press the accessible adapted switch to start the battery massager.
- c. The individual presses the switch to activate the battery massager and receives the direct feedback resulting from their efforts.
- d. Over time the individual learns to activate the switch to receive the desired feedback with information about the device, but with no physical manipulation or direction. This allows them to lead the activity or activity component.

If the individual is not provided with an opportunity to lead they may come to believe that physical manipulation and direction is part of the activity (rather than an adapted method of receiving information) and that they are a passive observer, not a

participant. Single switches can provide many individuals who have limited mobility, with the ability to take a leading role in an activity or activity component. Using switches to reduce the amount of physical manipulation required places the individual who is deafblind with limited mobility firmly in control.

4. *Communication:*

Switches can be used as a communication tool. The following are ways a single switch can be used by an individual who is deafblind with limited mobility to communicate:

- An individual can indicate they want more of the switch activity by reactivating the switch once they have released it.
- An individual may remove their hand from the switch when they want to end the switch activity.
- An individual may press a voice output switch to say good morning or say their name to the class at circle time.
- An individual may use a voice output switch that says “hello my name is....” to initiate interactions.
- An individual may press a voice output switch that states a request; for example, a switch may be setup that voices the word “more” or “finished.” Another possible configuration could be “yes” or “no.” The switch can be used alone, or in some situations such as an individual who can move their head in both directions, using two switches, turning their head right means “more”, turning left means “finished”.
- An individual may be able to use a voice output switch that indicates they need attention for a variety of reasons. For example, a switch press could be taught to mean “I need attention,” or it could mean something specific like, “I have a stomach ache.”

This article only discusses the single switch, however a wide variety of switches are available for encouraging communication. These switches range from single switches that play a recorded message when pressed, to scanning computer programs that move a cursor from option to option waiting for a switch press to indicate the user’s choice. It’s important to remember that most individuals who are congenitally deafblind will need to be taught how a single switch works and will need time to build up to more complex types of devices.

5. *Inclusion in group activities:*

Switch technology can be used to facilitate interaction with an individual’s peers.

Some examples:

- Use a switch with a blender to involve the individual in a group baking activity.
- Use a switch with a musical toy to participate in a music circle.
- Use a switch with an adapted bingo wheel and cards as part of a group math activity.
- Use a single switch voice output device to allow an individual to say “good morning” to their peers during circle time.
- Use a switch with a computer story to allow the individual to lead a group story time.

6. *Participation in skills of daily living:*

Switch technology can be used to facilitate participation in skills of daily living and provide an individual with some control over their day to day environment.

Some examples:

An individual may use a switch with:

- A desk lamp to allow an individual to adjust light levels.
- A toaster or toaster oven to participate in the preparation of meals.
- A popcorn maker for auditory and olfactory feedback.
- An electric toothbrush or water pick to build on personal hygiene skills.
- A TV, radio or tape player for downtime entertainment.
- A blow dryer for personal care skills.
- A massaging hairbrush to participate in personal care.
- A fan to cool off during the summer.

7. *Learning through play and age appropriate recreation:*

A few of the switch activated toys that may be purchased or adapted:



Bubble Blower



Penguin Slide



Fan



Animatronic Toys

Toys

The typical classroom or playroom contains toys with many different functions or activities on each one; for example, one toy may have buttons, gears, bells and knobs that all have a unique function. This type of toy may keep some kids busy and teach several skills, but to others it may be overwhelming or inaccessible.



Complex toy

Although some complex toys may be made accessible through physical assistance, the single switch allows the individual to take control, make choices and feel a sense of accomplishment. It may also provide skills that are transferable to other aspects of their life. For example, if an individual can learn how to press a switch to make a sensory toy

run, they may in time learn the benefits of pressing an adapted switch to help make food in the blender. An activity using adapted switches focuses on successfully building one skill at a time. With each new switch the individual learns to activate, they acquire a new skill they may be able to generalize to other situations. For example, although an individual may start with a button switch, they may in the future learn to transfer this skill to many real life situations:

Note: Some individuals will need assistance reaching many of the following objects, however they may be able to complete the action required to manipulate them.

Button switch examples:

Using a button switch the client may learn to:

- Press a touch sensitive light switch.
- Start the clothes dryer.
- Volunteer stapling pamphlets.
- Press a wheelchair door button.
- Press a doorbell.
- Push on a paintbrush that is supported with assistance.
- Push a sponge dipped in paint to make stamps.
- Glue two pieces of a craft together by pushing one against the other.
- Become involved in making an experience book by stapling in components.
- Push on a container held with assistance when ready for help pouring.

Grip switch examples:

Using a grip switch the client may learn to:

- Squeeze a person's hand or finger for comfort.
- Hold a spoon or cup during mealtime.
- Hold a toothbrush or hairbrush.

Pull switch examples:

Using a pull switch the client may learn to:

- Pull a door handle.
- Pull the fridge open.
- Start the washing machine.
- Pull a light switch cord.

Recreational devices

Switches can also be used to activate age appropriate recreational devices. Devices of this type may be a good introduction to switches for individuals who have outgrown children's toys.

A few of the switch activated recreational devices that may be purchased or adapted:



Disco Light



Bubble Tube



Wall Projector



Tornado Light



Toy Fish Tank

Teaching the individual to make an association between pressing the switch and the resulting feedback.

For an individual who is deafblind with limited mobility the intervenor may need to consider:

Conceptual strategies

- Use the device regularly with the same switch using consistent presentation until the individual demonstrates a solid understanding of the association.
- Use a device that provides immediate feedback. A popcorn maker or large fan take time to start up before providing stimulation back to the client. This momentary gap may be enough time for the individual to lose the association between their action and the feedback.
- Start building switch concepts by using direct activation. This type of activation provides the clearest conceptual link between the action of pressing the switch and the feedback (see Types of single switch activation Page 4).
- At the beginning of the activity show the individual the switch and position it properly for activation, with the individual making contact. Next, encourage them to wait until they have been presented with the device before activating the switch. This is meant to show that the use of the switch is conditional on the presence of the device it activates.
- Assist the individual hand under hand or hand over hand to explore the physical link between the switch, cord and device. (Wireless switches may not be suitable for teaching cause and effect)
- Demonstrate to the individual how to activate the switch hand under hand or hand over hand. This allows the individual to feel their hand guided through the motion of activating the switch. Encourage the individual to try it themselves, slowly reducing the amount of prompting and physical assistance each time, until they can activate the switch themselves.

Vision

- It may be possible to increase the individual's ability to locate and focus on the

switch or device by adding texture to a flat switch or device surface. An object with depth and texture is often easier to see than a flat object.

- Consider what the individual's colour preferences are as they may be able to focus on some colours longer than others. Cover the switch with a color that the individual has demonstrated an ability to focus on well.
- Once the colour of the switch has been determined, choose a contrasting colour to place under the switch as a background for greater visibility.
- Consider the placement of the switch and device. Determine where the switch and device will appear in the individual's visual field.

Hearing

- Consider what kinds of sounds or music the individual enjoys.
- Consider if the individual responds better to sounds that are high or low in pitch.
- Consider the volume. Will the device startle the individual?

Positioning the individual

- Consider the individual's positioning. Is she/he comfortable? If an individual is uncomfortable they may become unfocused. It's important that as much of the individual's energy as possible is focused into learning the switch concepts rather than being drained by discomfort.

Placement strategies

- Consider the proximity of the device and switch to the individual who is deafblind.
- Consider the proximity of the switch to the device. The device should be close to the switch to help the individual make an association.

Motivation

- Think about how the individual accesses information. What types of stimulation do they enjoy? Introduce switch concepts using a device that is motivating and accessible to the individual. If the individual has indicated a preference for music, start with a switch hooked up to music rather than starting with an unknown sensation.

Pacing

- Consider the client's energy level. Clients with limited mobility may become fatigued quickly. It's important to remember that one small movement may require a very significant effort physically or cognitively that may tire the individual. If necessary take a break from the activity to allow the individual to relax before trying again.

Develop a consistent routine for the use of switches in the individual's activities. Remember to reduce the number of prompts and physical manipulation as the individual begins to understand the routine that has been set out for them. This may mean starting by assisting the individual to press the switch hand over hand, then moving to tapping their wrist, then lightly on their elbow, becoming more subtle each time until the

individual no longer needs the prompts and can lead the switch components of their activities.

They are pressing the switch, but do they know that it's causing the feedback?

The individual may learn to press the switch, but do they understand that the feedback is caused by their action? Many individuals enjoy pressing the switch even if it's not connected to a device. It's important to observe the individual to find out if they understand the purpose of the switch.

How do you measure if an individual understands the concept of the switch?

1. Before pressing the switch:
 - a. The individual orients towards the device (visual, auditory)
 - b. The individual puts their free hand on the device (requires some motor skills)
 - c. The individual demonstrates a consistent behavior before pressing the switch that indicates they are anticipating the feedback. For example, the individual's free hand resting on a vibrating toy tightens just before they activate the switch.

2. When the individual has been positioned to activate the switch they will:
 - a. Wait with prompts until they are presented with the device the switch activates before pressing down.
 - b. Wait independently until they are presented with the device that the switch activates before pressing down.

3. When a device that is only activated by a switch is presented, an individual with some mobility may:
 - a. Physically search the immediate area to locate the switch.
 - b. Connect the switch to the device.
 - c. Retrieve the switch from its storage place.

Example observation of an individual: (Included with permission by family)

A clear behavioral response can be seen when a small fan is directed towards the individual. The individual's responds to the fan by laughing. This response has been described by his parents as a "happy" and "positive" response. When the fan is connected to a flap switch the individual will activate it independently, without prompts. Seconds before activating the switch with his hand the individual will close his eyes and turn his head and body to the right.

Observation findings:

The individual has made an association between pressing the switch and the sensation of air on his face that follows. The individual is able to accurately anticipate the outcome of pressing the switch.

The low-tech approach to communication with limited mobility,

Technology is not the only solution for individuals who are deafblind with limited mobility. Individuals who are deafblind require a hands-on approach that technology alone cannot provide. If switches are used with appropriate intervention they can be valuable tools, but they should not replace communication that can be achieved directly by the individual. Communication expressed directly from the individual is made by

tools that are always accessible to them; for example, shaking their head for “no” is possible even on a family vacation with no technology. The use of the individual’s own body to communicate means that they always have access to the tools they need to express themselves, and with practice may even lead to improved function of that method of expression. For example, using a vocalization is similar to a switch in that it is on or off, however vocalizations can produce a wider range of tones that can augment the meaning of the message. Constant use of this method of expression may also lead to more controlled use, for example, a greater range of vocalizations or speech.

The following are methods of expression an individual with limited mobility may be able to use without the use of technology:

Some examples:

- The individual pushes or pulls lightly on a musical instrument to indicate they are ready to be assisted shaking it.
- The individual, during music circle, drops the instrument in their lap to indicate they are finished the activity.
- The individual raises their arm slightly to indicate they need attention.
- The individual smiles to indicate a desire for more.
- The individual shakes their head for finished.
- The individual squeezes your finger or reaches slightly for your arm to get your attention.
- The individual presses on their stomach to indicate they have a stomach ache.
- The individual presses on their lap to indicate they need a change.
- The individual moves their leg to indicate a desire for more swinging.
- The individual gazes more frequently at one of two objects or colours being presented, demonstrating a possible preference for one over the other.
- The individual fixates on their choice when two objects or colours are presented in their visual field, indicating a choice.
- The individual presses down on one of two objects presented under their hands to indicate their choice. The objects should have distinct textures or shapes to help the individual differentiate between them.
- The individual turns their head slightly towards the sound of one of two instruments they want to use for music circle.
- The individual pulls their hand slightly towards one of two objects on either side of their hand.
- The individual pushes lightly on the page of a book to indicate they are ready for the next page.
- The individual pushes on their cup to ask for assistance drinking, if they do not have the mobility to lift their cup independently.
- The individual pushes their cup/bowl away when they are finished drinking/eating.
- The individual makes a voice to communicate they are ready to move on to the next step of an activity’s routine. For example, during a baking activity, the intervenor may pause before assisting the individual to pour an ingredient, and wait for the individual to make a voice (or other communication) that indicates

- it's okay to proceed with the pouring.
- The individual presses lightly on the intervenor's forearm, knowing that within the context of a particular activity, the intervenor will make a consistent response (i.e. making a funny face or sound each time).

Hands on teaching

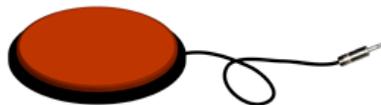
Congenital deafblindness is a complex disability. Teaching new skills cannot be left to chance, as individuals who are deafblind often do not learn incidentally and may have difficulty generalizing the knowledge they have acquired, to new situations. Things we take for granted such as turning on a switch can become a significant hurdle to an individual who is deafblind. It's important to take a hands on approach when introducing all new program elements.

Conclusion:

Switch technology may provide an individual who is deafblind with limited mobility an opportunity to develop a greater understanding of cause and effect. Switches may encourage movement and exploration of the environment, reduce the need for physical manipulation and allow for inclusion in group activities. As well, switches may encourage communication and allow the individual to participate in skills of daily living. The single switch may allow an individual with one small movement to make choices, acquire information, speak out, and take some control over their environment.

With thanks to:

Dr. Linda Mamer, Carolyn Monaco, Cheryl Ramey
for their support and advice while preparing this article and workshop.



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