

Physical Efficiency Areas

The term “physical efficiency” refers to the student’s physical and motor capabilities and limitations. It is important to have a good idea of the student’s motor abilities since this will affect how well a student will be able to access material (e.g., reading and writing material). Often adaptations and assistive technology are needed to maximize the student’s potential when a physical disability is present.

There are six physical efficiency areas:

1. Fatigue and Endurance Considerations
2. Student Positioning
3. Motor Movement & Work Surface Issues
4. Fine Motor Movement & Accessing Materials
5. Range of Motion for Material Placement
6. Communication

Fatigue and Endurance Considerations

Some students will have fatigue and endurance issues because of their physical disability (e.g., Duchenne muscular dystrophy) or as a side effect of their medication (e.g., some seizure medication). Other students will become fatigued when performing a repetitive movement, such as activating a switch to type.

In each instance, it is important to determine if there are certain activities that result in increased fatigue for the student as well as the length of time the student can engage in a particular activity before becoming fatigued. Knowing what may result in fatigue may allow the teacher to avoid these activities or make appropriate modifications. A wide range of modifications may be used, such as: scheduling more fatiguing activities earlier in the day, planning short breaks, moving a switch that the student uses to control the computer to a secondary location, or interspersing writing requirements with reading activities.

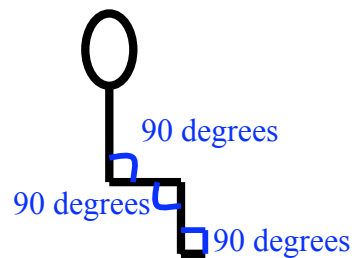
Student Positioning

How a student with a physical disability is positioned is critically important. Proper positioning will allow the student to have maximum control over his or her arm and hand movements, whereas poor positioning may impede handwriting or accessing a keyboard, or activating a switch.

Sometimes the best positioning for a student is his or her wheelchair. However, if the wheelchair has not been adapted to meet the student’s needs as he or she grows or as a disability worsens or improves, the student’s wheelchair may not provide the best positioning. Sometimes adaptive chairs will provide better positioning.

Although there are many individual factors that must be taken into account to have student optimally positioned, there are some basic considerations to take into account. Some of these are:

- Do the student's feet touch the ground or have some support?
- Is the student seated back in the chair so he or she will not fall out or go into extension?
- Is the student in a midline position in the chair?
- Is the student able to maintain proper positioning? Are more or less supports needed?
- Is the student's position at 90 degrees at angle, hip, & knee? Should it be?



When considering positioning, it is very important that the PT and OT work collaboratively with the teacher and team to determine the most optimal position to access reading and writing tools.

Motor Movement & Work Surface Issues

In order to motorically (and visually) access reading and writing material, it is important that the work surface be appropriate for the student. Teachers should check that the table is at the appropriate height for the student (e.g., not too tall) since this affects writing and fatigue. Often the table will need to be lowered or raised. When adjusting table height (and possibly looking at alternate chairs) most students will need their feet to remain on the floor for stabilization. If the table height and chair are correctly adjusted, but the feet are dangling, phone books or a box (or other such material) may need to be placed under the feet to maintain appropriate positioning.

In order to read without neck strain or optimally write, some students will require a slanted surface (or use of a slant board or three ring binder set at different slants). Teachers may experiment with different degrees of slant for reading and writing to determine what is optimal for the student. It is important to remember that the slant needed to access a book can be very different than the slant needed to write or type on a keyboard. To help determine which slant is best, teachers should observe for changes in handwriting at different degrees of slant and

changes in the ability to access more material. Students will often express an opinion as to the level of slant they prefer.

Some students will have difficulty writing (either with a pen and paper, or keyboard, or AAC device) because of slippage or movement of the writing tools on the table. Some students will need items to be stabilized. This can be done a number of different ways. A clipboard may help hold paper. Paper may be taped to the desk. The use of textured shelf paper or Dycem will stabilize books, keyboards, paper, clipboards and most other items. Dycem can be purchased through Sammons Preston (www.sammonspreston.com) and is available in rolls so that customized sizes can be created. Dycem comes in blue and clear rolls and can be easily washed and reused repeatedly.



Another issue in adapted work surface modifications has to do with visual impairments. Some students will need a sharp contrast between the items on the table and the color of the table. For example, when arranging alphabet letters on a wheelchair tray, if the tray is clear, the student may have difficulty seeing the letters against the brightly patterned pants she is wearing. Contrast modifications can easily be made by placing contrasting construction paper under the material.

Fine Motor Movement and Accessing Material

When determining which hand the student will be using for writing, picking up items, or following a line of print, it is important to determine which is the dominant hand. Optimally the dominant hand will be the one used for such activities as handwriting, although the student's physical disability may preclude the use of this hand.

For many students it will be readily apparent which hand is dominant if the student is allowed to use both hands to write or to access an item. Sometimes the student's disability will result in one hand or arm being more affected motorically than the other. When this occurs, assumptions should not be made that the least impaired hand is always the best one to use. Careful observation and the evaluation by an OT will assist in this area.

How the student currently and optimally accesses material is important. Sometimes it will be with one of the student's hands, but other times the student may access material through the use of eyegaze (looking at the item), pointing (with body part or object), or scanning (where

choices are presented sequentially and student selects by making a noise or movement). (For further information look in the Reliable Means of Response and the Reading and Writing sections of this monograph).

The student's ability to use his hands is important for literacy instruction. If the student is unable to access material with his hands due to severe physical impairment (e.g., missing arms and no prosthetic, arms with severe contractures), alternate access will be important through the use of assistive technology and modifications. A thorough AT assessment will be needed. For some ideas, refer to the Reading and Writing considerations sections of this monograph. Also, GPAT (www.gpat.org) has on-line material (AT Consideration Checklist, AT Consideration Resource Guide) to assist in deliberations regarding possible modifications and AT use.

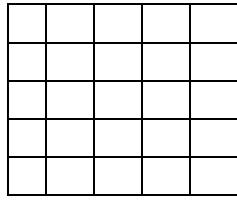
Range of Motion (ROM) for Material Placement

Placement of Material. Some students will be limited in how far they are able to reach. Their range of motion (how far they can reach) may be fixed (e.g., due to contractures) or fluctuate (e.g., increases in tone due to excitement, startle, or fatigue). Determining a student's range of motion is important to be sure the student will be able to reach everything needed for an activity. For example, a student's range of motion may be limited, resulting in an inability to access a standard keyboard. Another student may be unable to reach certain symbols on an AAC device. Still another student may be unable to touch the desired word to construct a sentence because it is out of reach. Sometimes student's answers are mistakenly recorded as incorrect due to a problem with the student's range of motion, for example, rather than a learning error.

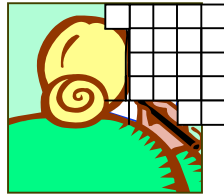
To help avoid errors due to motor ability, it is important that items be placed in the appropriate range of motion. One way of doing this is to:

- Make a grid (piece of paper with horizontal and vertical lines)
- Put the grid directly in front of the student.
- Ask the student to touch different parts of the paper, such as top right, top left, top, right, left, bottom right, bottom left, and bottom. (An alternative would be to have the student draw with a marker or pick up reinforcing items scattered on the grid.)
- Map out on the grid how far the student was able to reach.
- Try the same thing with the grid to the right or left (if the student appears to be able to move farther to one side than another).
- Try the same thing with the grid at different slants.
- The teacher may need to try this at different times of the day if student has fluctuating tone.

Example grid:



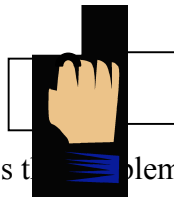
In this next example (see below), a student is drawing marks on a grid to determine her ROM. For this girl, the grid is placed to her right side, since it was determined that she could not move her hand toward midline or to the left side.



As seen in the grid below, the teacher made marks as to where the student was able to touch. The grid was placed in midline (directly in front of the student) and the student touched the squares with her right hand (as she cannot use her left). This indicates that the student does not have the range of motion to access items on the left and cannot access items that are within four inches of her body. This portion of the assessment indicates that items need to be placed on the right side and at least four inches away (according to grid size). Next, the teacher will try the grid placed to the right of midline to determine how far items should be placed on the right to get an accurate range of motion for this side.

			X	X	X
			X	X	X
			X	X	X

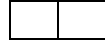
Size and Spacing of Target. After determining where items can be placed, it is important to determine the size and spacing of items for physical access. Some students will select two items when they point or touch due to motoric problems. For example, in the picture below, there are 2 squares, and it is difficult to tell which one the student is selecting due to the student's inability to precisely touch the one he wants.



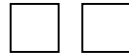
Two ways to address this problem of not clearly pointing to one item are as follows:
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- 1) Items or pictures can be made larger so that the student can easily touch the one he or she wants.
- 2) The items can be spaced further apart to make touching the intended item more accurate.

Instead of this close:



Or this close



They may need to be this far apart, or even farther apart:



The distance will depend upon the student's physical ability. If the student also has a visual impairment, it will be important to determine if the items appear blurred to the student if they are arranged too close together or if the student can not see all of them if they arranged too far apart (due to restrictions in the student's visual field).

Number of Items. How many items a student will be able to access will depend on the student's range of motion, vision, and cognitive ability. Some students will only be able to touch four items due to a restricted range of motion, thus requiring items to be spaced apart. Some students will cognitively only be able to handle three choices. The teacher will need to determine the optimum number of items that can be displayed at one time.

Some student's range of motion greatly varies depending upon the time of day, activity, and antispasticity medication. Some students will need their range of motion checked prior to starting the activity to be sure the student can access all items. This can be done using the grid, but may be accomplished by having the student touch the periphery of the material (e.g., on a QWERTY keyboard, touch the q, p, ?, z, 7 and space bar).

Communication

Communication is the last physical efficiency area. Due to the importance of communicating well during literacy skills instruction, a separate section on communication is provided (see the following section on Communication).