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T . A . A . P .

TREADMILL *for Students with Autism and Apraxia Protocol*



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In my many years of treating children in the public education system, I have dedicated my delivery of physical therapy service to efficacy. I want to provide powerful therapy input that allows children to access all areas of their education. I want children to develop independent typical skills as fast as they can. I want to support my students to be the best learners. -Debra Widmer-Reyes

Introduction

This workbook is focused on describing carefully delineated issues specific to Autism (ASD-Autism Spectrum Disorders) and Apraxia. It is limited to Physical Therapy in the school setting and the treadmill protocol.

The conditions of Autism and Apraxia have unlimited domains of study. Volumes of information, theories, treatment plans, educational programs and scientific data are presented daily in all of our media systems.

The treadmill protocol is named TAAP- Treadmill for students with Autism and Apraxia Protocol. The treadmill program uses a variety of directional walking patterns to increase visual-gross motor skills. In all of my cases, I value the input of the entire team. However, this workbook, TAAP, is focused on enabling educational professionals and parents to consider and perform the TAAP protocol.

TAAP has powerful potential to provide an avenue for neurological development in the areas of gross, fine and visual development. Using this approach, improvements are faster than any other treatment philosophy for which I have been extensively trained and which I have implemented for years. Improvements are dependent on the frequency of treadmill performance.

This workbook, divided into chapters, presents the mission, protocol, and discussion. Each student on this protocol displays the minimal functional mobility of at least household independent walkers who have the diagnosis of Autism Spectrum Disorder or Apraxia. My goal has been to provide a tool that can be understood and implemented by all of the educational team.

For the students with the above diagnoses, the treadmill program increases their sitting posture stability and endurance, normalizes their walking pattern and develops their eye-hand gross motor skills. These motor improvements are necessary for students to accept, and then perform cognitive educational requests, including communication and social play. In the following chapters, I am referring only to students' abilities and skills that a physical therapist would evaluate and treat; however, as a team member I am always concerned if a motor ability rather than "behavior" is the basis of educational non-performance. In the design, trials and development of TAAP, students have reached physical therapy goals in relatively short periods of time. Although I have not completed a medically acceptable research project on this treadmill protocol, I have completed

“In the first treadmill sequences, students require very low speeds to accommodate to the moving belt and stabilize their visual field to forward gaze.”

Chapter 3: Here it is...TAAP

TAAP has 6 sequences of movements on a treadmill. The following is a description of the necessary equipment and the protocol sequences. Chapter 3 will link the brief evaluation and starting points for students. Subsequent chapters will tell the rest of the story: describe the supports to the protocol, development of the protocol, the rationale behind it, associated services that compliment the program and ideas for research. Stories of student progress will conclude this workbook in a way that will only begin your stories....

The equipment for this treadmill program is a treadmill, walker support, wheelie chair and plastic mirror (Fig.1) The three characteristics necessary for the treadmill are: speed to start at a minimum of .1mph, a motor with a directional reverse and elevation grade to 15%. In the first treadmill sequences, students require very low speeds to accommodate to the moving belt and stabilize their visual field to forward gaze. In the beginning, this must be accomplished in an atmosphere of fun rather than fear. Directional reverse refers to the treadmill motor that must be able to reverse the belt, so that the student can walk downhill. The elevation in many treadmills is 10 degrees or lower. TAAP requires a 15-degree grade potential, which is available in the rehabilitation market.



Fig. 1

When the treadmill is installed, I remove the side support bars for three reasons: first, so the walker can fit over the treadmill, second, so that the adult has full guarding access to the student and third, so that the student cannot at any time grab the side bars to hang on (Fig. 1). The walker support for sequence #1 is a large walker-type apparatus that has overhead capability with a harness to allow partial body weight support. Attached to this walker must be handlebars (Fig. 2). Sequence #2 uses the walker with the handlebars only so that the student uses full body weight support. During these sequences



Fig. 2

#1 and #2, a wheelie chair (clinic stool with wheels) at the end of the treadmill will be helpful for the therapist to sit, and then lean over to provide hands-on gait therapy.

A plastic mirror in a variety of shapes can be velcroed to the front bar of the treadmill or the support bar of the walker (Figs. 3 & 4). An adjustable mirror holder that attaches to the front treadmill bar is currently being fabricated.



Fig. 3



Fig. 4

From the immediate start of this program, provide your student with visual supports illustrating a schedule of activities and introductions to the equipment (picture 5). Have the student set up the entire session with you. This will be discussed in more detail in Chapter 3.



Fig. 5

The four physical elements developed throughout the six sequences are: independence, speed, grade and time. In the beginning, Sequence #1 and Sequence #2, each activity is performed with equipment and adult assist. The focus here is to develop independence and appropriate walking pattern on the treadmill. With each activity, therapeutic handling facilitates appropriate movement. Independence and appropriate gait pattern muscle action are acquired initially at the lower speeds. Endurance is subsequently developed by increasing speed and grade on the treadmill.

Once the student is comfortable, appropriate and independent in the walking pattern, increase time. Independence is the stable treadmill skill around which therapeutic judgments are made to add speed and time. Once the student expands the independent walking pattern to backward, uphill and downhill, increase/decrease speed, grade and time to complete the patterns in each sequence.

Each treadmill session time goal is ten minutes including all sequence tasks. In the beginning, use music and singing to encourage your student to attempt to take steps. Most students with Autism and Apraxia have severe to moderate visual spatial dysfunction during movement (See Chapter 4). Their developmental plane of central focal vision during walking is frequently upward. These students have not yet developed the three subsequent planes of central focal visual processing: forward, downward and knowledge of the images behind them. Often students refuse to experience a dynamic surface in sitting (such as sitting on a large ball) which is developmentally earlier than walking. So, experiencing a dynamic surface in standing on the treadmill belt can be highly anxious for the student. To ease their anxiety, the use of favorite music or singing is helpful. Singing rhythmically as students walk steps is similar to the use of a metronome. Students can blend their step to the sound of a simple song. I invent a tune and plug in the words "Peter is walking, Peter is walking, yes he is, yes he is"...and so on. Once Peter is calm and interested, then I will sing my student's known favorite song, such as "Wheels on the bus." After a student is happy with singing, progress to counting steps. Students with Autism and/or Apraxia have difficulty reflexively linking steps. With music or counting and a moving treadmill belt, the opportunity for the student to link many symmetrical steps imitates the normal developmental stage of reflexive stepping gait.

As soon as possible, create sections of stepping to counts of 10. This helps the students quantify the tasks and increases their auditory knowledge of the start and stopping of a task (See Chapter 4).

Place the mirror, velcroed to the walker or treadmill front bar at the height of the student's eyes. Using an auditory cue, tap the mirror to encourage forward visual fields, rather than telling the student to look forward. When the student looks at himself walking, acknowledge it verbally (See Chapter 4). When the student walks in reverse, change mirror position so that the student continues to look into the mirror to hold their head still in face forward central focal visual plane.

TREADMILL for students with AUTISM AND APRAXIA PROTOCOL:

SEQUENCE #1-General

With walker, harness support, and handlebars for partial body weight support. Auditory support, visual supports, mirror, wheelie chair. For auditory support, use music, singing, then counting to 10 repetitively.

The student learns to pace their movement to the “metronomic counting.” The student internalizes a beginning and ending of the count. When a pattern is announced, he/she can match effort to beginning and end. All walking patterns and transitions can be practiced in this way.



Fig. 6

Visual supports are created to represent each of the walking patterns (Fig. 6 and Appendix A). In general, as the student comes into the therapy location, he/she arranges the visual supports (see Fig. 5) listing the therapy activities. At the treadmill location, visual supports of the treadmill walking patterns are used to organize the 10-minute treadmill session (see Fig. 6 and Appendix A). The responsibility of arranging the visual supports is a process that begins with the adult and transfers to the student.

The mirror is critical to developing appropriate developmental visual fields and visual processing as vision relates to walking. Initially, a plastic personal mirror (see Fig. 3) is attached to the front bar using Velcro systems. Remember to place the mirror at eye level. Use verbal cues and auditory cues, (therapist tapping of the mirror), to develop sustained forward visual gaze during treadmill performance. When the student avoids the mirror, use the 45-degree “V” mirror (Fig. 7). Mirror use can be interchanged to the student’s preference.



Fig. 7

Skills should be blended between sequences. For a warm-up 30 seconds, start with the previous easier task, then increase the difficulty to acceptance. Lack of acceptance can be measured when the student loses their motor form or eyes forward with stable head position.

During Sequence #1 and #2, the therapist should use a wheeled stool at the end or base of the treadmill while performing gait training. While sitting, safe gait training can easily be conducted. See Figure 8 for brief visual representation of each walking pattern and DVD for examples.



Fig. 8



Fig. 9

The first visual wall support is a general schedule for the function of the therapy space (see Fig. 5). The function of the therapy space is either a therapy session with the therapist or a motor break with a teacher, paraprofessional or therapist. If the session is for therapy, #1 will be a picture of the treadmill, #2-3 will be student choice where the student puts pictures of other therapy equipment and #4 is a picture of back to class. If the treadmill is for a motor break, then only #1-2 will appear. The student walks to the general schedule after completion of each activity to put that activity into the all done area. The treadmill picture with the word Break will appear next to #1 and #2 will be the picture of back to class.

Over by the treadmill is also a Velcro wall section. Use a modified symbol of “First, then” as an initial visual support. This symbol, (Fig. 10) is a half circle divided into 3 sections with the progress of colors green-yellow-red. An arrow is push tabbed to the base so that it can move from green to red as the 10 minutes of the treadmill session moves along.



Fig. 10

The next series of visual supports are pictures of the TAAP-SEQUENCES (See Fig. 9). The picture supports are attached with Velcro vertically in order of the sequences and walking patterns that will be performed that day. They are moved to an “all done” area as they are completed. With the pictures close to the student, the possibility of interaction is higher. Opportunities are possible for physical gesture and/or verbal commenting on the treadmill activities. As treadmill sessions become more frequent, encourage students to

Chapter 6: It is All About Treatment

As a school and private pediatric therapist, I have utilized several treatment approaches. These approaches are difficult to use well with the constraints of public schools. Although I still use them vibrantly, I think of TAAP as a power burst for the efficacy of these approaches with children with these aforementioned diagnoses. Now, when I start with my new students, they all start with TAAP. Complimentary therapies then are chosen to support the visual-gross motor developmental level of each student. Treadmill as a motor break is facilitated as soon as possible.

During the last several years as I compare notes with other school therapists, I realize that my school system is unique. Without the “drive” of my system to facilitate optimum learning of all students, I would not have been able to add my two cents. Without the value of teaming prioritized, effective occupational and physical therapy to change student learning would not be possible. Many therapists are unable to make significant changes in the educational opportunities of their students because they cannot do it alone.

It has been a benefit in my practice to stay with a system over time to build comprehension at all levels of Physical Therapy in the educational setting.

It takes school district leaders, building personnel and classroom professionals who all preach learning as the priority to make “it” happen.

It takes the superintendent who applauds efficacy and individual growth, the principal who builds teamwork, the teacher who expands the classroom for the entire staff and related service specialists to blend their specific special knowledge together to make “it” happen.

“It” is effective learning. There are so many obstacles to integrating new discoveries. The obstacles do not need identification. When team ideas can be synthesized and put into action for better learning, students benefit.

Back to TAAP to be used as motor breaks. Often, in school buildings additional space for Occupational and Physical therapy is limited. Ayers Sensory Integration (ASI) activities require large spaces with large equipment. The large space and equipment is mandatory for effective treatment and breaks. Training of paraprofessionals and teachers to utilize therapy equipment appropriately, safely and accurately is also mandatory. ASI is a preferred approach to improve functional educational skills, but often cannot be used due to space and staff limits. TAAP is an effective alternative. As the student moves through the sequences, the last sequence offers ways to develop student independent performance of the protocol. In this way, the student can internalize and plan personal breaks.

The following paragraphs are examples of school based therapies from the Occupational, Physical and Speech and Language Therapy fields of study that are complimentary to TAAP. All of these therapies emphasize treatment. Treatment is action. Action is

performance. Performance is learning. Examples are given with a general and brief description of the therapy approach as it applies to the ASD/Apraxic student and TAAP. TAAP can be used before another therapy approach to “jump start” the therapy or integrated into the therapy approach. Specific evaluation and individual prescriptive therapy is not presented.

NDT, Neuro-Developmental Treatment was originated by Dr. Karel and Berta Bobath from London, England (7, 12). Many others have studied and augmented their approach. In NDTA, (Neuro-Developmental Treatment Approach), gross motor play is facilitated in postures/motion along the developmental sequence (13). NDTA’s genius is in the intricate observation of the multitude of interacting systems as they develop from birth. NDTA authors for several years have described gross motor development with body righting and visual reflexes. These reflexes promote function from one stage to the next. These authors describe brain development as the child’s movement patterns extend visual learning (13). Visual processing while the body moves through space yields functional movement. Functional play is the work that allows the child to explore in the physical environment. Abnormal movement is inhibited by normal development. For example, weight bearing on hands and knees increases open palm stimulation and limb girdle joint compression. Both of these improve tactile and proprioceptive registration.

As the body moves and feels in the developmental sequence, central vision fuses with peripheral in each developmental visual field and tracking and depth perception develop. Children with ASD/Apraxia find it extremely difficult to shift postures from the floor to sit and stand and onto walking and running. Frequently, by age three when they start public school, they protest all kinds of transitions: from standing to the floor, crawling, moving between learning centers and coming in the door from the bus. NDTA principles of treatment target functional vision in the developmental sequence throughout the transitions.

Yet, trying to add visual games to these activities while maintaining appropriate input often requires frequent therapist handling when children may refuse being touched. Independent participation is often difficult to sustain. Children emotionally avoid parts or the entire fabulous activity (even when one is in their best creative therapist mode). I believe this difficulty for the ASD/Apraxic child happens consistently because of the delay of visual-gross motor processing. If a child only has visual upward field development, he tends to avoid changing body positions. A student often “fixes” his body in a rigid position and is not able to weight shift to add movement. The child denies or ignores the games presented. After TAAP gets going, these same games and activities are easily introduced when the visual part of the tasks are the ongoing focus. Then, these NDTA oriented activities can be brought into the classroom for practice and interaction with peers

Ayers Sensory Integration Therapy is complex (14). Dr. Ayers, an Occupational Therapist, was a faculty professor at University of Southern California after earning advanced degrees from USC and UCLA. From my first days of introduction to Ayers Sensory Introduction, in the 70’s also at USC, the neuro-science of this approach has

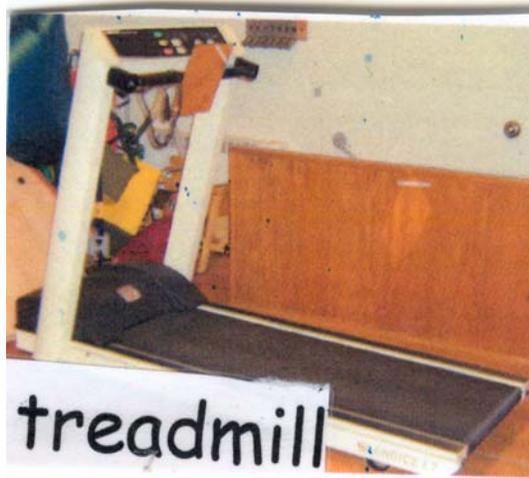
been addicting. Her primary observation suggests that children with learning differences often have visual perceptual problems (5, 14). Dr. Ayers' writes that all sensory stimuli and the hidden processing of that information must stay hovering in the background as a constant feedback template to refine vision- motor output for typical learning to occur (5). I believe the most important component to treatment is supporting the students' independent participation and elevated performance during the treatment session. In general, Ayers dictates that students have opportunities to make several combinations and choices of obstacle course type play as a work out. Students set up their experience, use it, change it and put it away. Therapists imbed this process with multifaceted opportunities for sensory input leading to dynamic infinite possibilities of movement sequences to explore. In the school setting, the ASD/Apraxic child often wants to copy and repeat the same movement sequences. Trying to expand their acceptance may take weeks if not longer. Then, just when they are advancing, they may regress. Students are so anxious about change of activities that they may attach specific work out equipment and routines with certain adults and not allow mingling. This pattern of frenzied attachment is exacerbated in most school environments; there is limited physical space to have a large amount of ASI oriented equipment during a therapy session. After TAAP Sequence #3 is progressing to Sequence #4, the students' anxieties decrease so that they may be exposed to many movement activities with less equipment. By Sequence #3 and 4, visual field use has markedly improved, so that students are able to be more flexible with pieces of ASI sessions. All activities and obstacle courses should have visual targeting as the primary focus. Best results are immediately after the TAAP 10-minutes.

Theratogs by Beverly Cusick are used in two ways (15). In the beginning of TAAP when Physical Therapy evaluation dictates that a potential joint misalignment requires support for the student to perform repetitive walking, *Theratogs* is my answer. I have used the pediatric system, the sensory dysfunction system and the dorsiflexion foot wrap. Initially, I only used the system to support alignment and appropriate walking pattern motion when I could not facilitate the motion through handling alone. For example, the hipster and dorsiflexion foot wraps are used while I handle the trunk and head position. I may use the top to support head and trunk position while I handle the hips and feet. As the head, trunk and hips align while walking, I may use the foot wraps when I advance the student to a more difficult Sequence. The use of the *Theratog* systems again speeds progress through the Sequences of TAAP. I discontinue use of *Theratogs* during TAAP as soon as I observe normal function. Paraprofessionals do not use TAAP as a motor break when a student requires Physical Therapist attention in this way. The second way I use *Theratogs* is as carry over outside of TAAP. Some students progress quickly through Sequences #1, 2, 3. As they are in Sequence #4 and their participation and performance in therapy is improving, their classroom and home learning behaviors may follow ups and downs. Often our children have complicated worlds that are difficult to analyze effectively. As *Theratogs* systems dictates, students may choose to wear the system during class and at home. To link appropriate sensory-motor postural and walking behaviors for these students, I will put the *Theratog* system on at the end of the TAAP session as the student returns to class. The student dictates his/her wear time of the suit. In my experience, the student often requests to wear the entire *Theratog* system throughout the school day. Some students elect to wear the suits at home as well.

Appendix A: TAAP Visuals



Treadmill with LiteGait



Treadmill

