"The Slotnick Scramble" : A Multi-Sensory Integration Activity Across Visual, Vestibular, Auditory, Temporal and Proprioceptive Senses

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ABSTRACT:

In the vision therapy room, activities are designed to engage the patient in order to provide opportunities for growth and learning. The optimal level of challenge scales the activity so that the patient experiences an 80 to 85% success rate. Learning takes place as the patient strives for improvement towards a goal which is perceived to be attainable. When working with individuals who are more emotionally fragile, the success rate should be closer to 90-95%: Progress may be slower, but interest and the critical feeling of success can be maintained.

The Slotnick Scramble is a powerful, dynamic vision therapy activity which can be scaled up or down in order to maintain engagement for optimal learning. It is appropriate for a wide range of ages, upwards of about age 5, with no ceiling. It is a multi-sensory integration activity, engaging visual, vestibular, auditory, temporal and proprioceptive senses.

The Slotnick Scramble requires gross motor planning, laterality and directionality, and visual information processing skills including visualization, visual planning, visual memory, and central-peripheral organization in space as well as in *time*. The activity requires minimal equipment: It is performed with a rebounder (trampoline) and two letter/number charts in landscape orientation.

The patient's awareness to timing is brought under greater focus with the use of a letter chart (providing visual input), reading the letter chart aloud (providing their own auditory input), and rebounding (stimulating proprioceptive along with vestibular input).

Visual planning, motor planning, and an elevated demand on oculomotor skills are introduced as the patient makes rapid half-turn rotations to view the chart on the facing wall, stimulating the vestibulo-ocular reflex.

Auditory and Temporal Senses

- The rebounder is a useful tool for helping the individual to understand timing, particularly when auditory processing is deficient.
- When a patient is unable to keep time with a metronome, any rebounder activity performed in tandem with visual attention can provide support.
- The synchronized inputs from the visual, auditory, proprioceptive and vestibular systems are all processed simultaneously at the level of the thalamus, reinforcing rhythm and timing.

Ocular Motility and Fixation

- When the patient breaks fixation from one chart and turns to re-fixate the chart on the facing wall, she must exert an elevated level of oculomotor control in order to re-stabilize fixation.
- She must also maintain vertical gaze stabilization during the dynamic rebounding activity.
- Rotations interrupt fixation, requiring the patient to regain his or her place on the chart. This is similar to near-far or even near-near copying tasks.

Vestibular-Proprioceptive Sense

- When rebounding, at the moment of the direction reversal (bottom of each bounce), the patient receives a strong proprioceptive signal from the muscle spindles about the feet and ankles.

- Rebounding creates a three-part cue (deceleration, reversal, acceleration) to a specific moment in time which is experienced at regular, repeating intervals.
- Rebounding stimulates the gravity-sensitive components of the vestibular system, primarily engaging the utricle with movement in a vertical direction.
- The rotational aspect of the activity provides the patient with a novel opportunity to gain oculo-motor control over optokinetic nystagmus (OKN), which results from the stimulation of the vestibulo-ocular reflex (VOR).
- The rhythm and timing of successive eye movements is a critical component for efficient reading. The rebounder can help the patient establish this sense of rhythm.

"The Slotnick Scramble," A Vision Therapy Activity

Equipment:

- Two identical letter charts are placed on opposite walls of the vision therapy room.
  - (numbers/ letters/ arrows/ mixed)
- A rebounder is placed on the floor, half way between the two charts.

R	S	P	L	E
H	A	K	M	U
F	B	O	G	C
N	Y	J	I	X

Basic Instructions:

"Bounce on the rebounder, reading one letter *every other bounce*."

Once the rhythm is established, instruct the patient to **"make a half-turn (180°) and continue reading letters on the opposite chart, without losing your place or adding/omitting a beat."**

The patient continues to make half-turn rotations at regular intervals, as outlined below.

R	S	P	L	E
H	A	K	M	U
F	B	O	G	C
N	Y	J	I	X

Uploading/ Downloading Options:

1) Rotation Frequency

- Beginner: Have the patient rotate once at the end of each line (5 letters).
- Intermediate: Have the patient rotate every 4 letters. If they master this, try every 3 letters.
- ***Goal: Have the patient read 2 letters facing one chart, then 2 letters facing the opposite chart.**

** If the patient is capable of this, I will start the activity at this level.*

2) Direction of Rotation

- Beginner: Let the patient turn "any which way." Do not instruct them as to which direction to rotate on the first attempt.
- Intermediate: Once the patient has developed good timing for the rotations, add a level of gross motor planning:

  a) Only turn to the Right (clockwise).

  b) Only turn to the Left (counterclockwise).

  c) If there are asymmetries in performance between (a) and (b), continue to warm up with whichever direction is easier and then work on the activity in the direction which the patient finds more demanding.

****Rotational Challenge Level:**

- Turn to the Right (clockwise) for two consecutive half-turns. Then turn to the Left (counterclockwise) for two consecutive half-turns. Repeat this pattern through the end of the chart.
- A sequence of action could be:

Read two letters / Rotate Right / Read two / Rotate Right / Read two / Rotate LEFT/ Read two / Rotate Left again / Read two / Rotate RIGHT, etc.

***If the patient remains oriented to which wall s/he is facing, gross orientation in the room becomes the cue for a change in direction, rather than keeping track of the ongoing sequence of turns. (See Central-Peripheral Organization)*

3) Cognitive Loading

a) Clap on the vowels (but do not say the vowel). Clapping is a "place-holder."

b) Clap on even numbers.

c) Introduce arrows into the chart and call out the direction the arrow is pointing.

d) Add (or subtract) 1 to each number when it occurs.

e) Call out the *opposite* direction of the arrows.

f) Say the *next* letter of the alphabet (i.e., if the line reads, 'D N E Q A', they would read it as, 'E O F R B').

g) Combine different cognitive tasks on a chart, mixing letters, numbers and arrows.

Visual Information Processing Skills

Visual Planning and Visual Memory

- As the patient progresses to rotating every 2 or 3 letters, s/he must begin to exercise visual memory for the next 1-2 letters in order to maintain his/her place on the chart without losing the beat.
- It is necessary to look ahead when reading to prepare for what is next *before* speaking it.
- When patients can make rotations without adding/omitting a bounce, it is an indication that they are capable of an additional level of cognitive loading.

Motor Planning, Laterality/ Directionality

- Visual planning occurs in concert with motor planning, including body movement planning and speech planning.
- A greater level of right/left awareness can be incorporated by adding directional arrows to the chart.
- In the "rotational challenge level" the patient makes two consecutive half-turns before switching directions. This means that at any given point in time, the patient's next turn may be in *either* direction!

Central-Peripheral Organization

- When patients make two consecutive 180-degree turns to the right, they have effectively rotated 360 degrees, returning to their starting orientation.
- This is followed by two consecutive 180-degree turns to the *left*, again returning them to their starting orientation.
- This sequence provides patients with the opportunity to recognize that each time they return to their starting orientation, they change the direction of their turn.
- Patients can therefore utilize their *orientation* in the room as a cue for changing direction, rather than tracking their turns sequentially.
- This rotational "challenge level" affords patients the opportunity to re-conceptualize a complex series of movements into a single, simple command: "Change direction when you return to your starting position."
- By offering patients the opportunity to come to this recognition on their own (rather than feeding it to them), patients benefit from the experience of identifying a whole as the sum of its parts.
- This is a similar process to visual closure, except that the component parts have been presented over *time* as well as over *space*.

Visualization

- Visualizing the activity first can be the key to enabling some patients to conquer this activity.
- Visualization provides patients with the time to correct errors *before* they have been executed.
- This activity may even be introduced to older patients as a visualization exercise *first*.
- The patient is instructed to listen to the instruction set, picture herself performing the activity (at an appropriate level) in his/her mind, and observe and correct her mistakes *before* trying the activity in real time.

SUMMARY:

The Slotnick Scramble is a dynamic, engaging vision therapy activity. It can be scaled to provide a variety of opportunities for learning and development over a wide range of ages. The patient integrates awareness across multiple senses: visual, vestibular, auditory, temporal and proprioceptive. The Slotnick Scramble supports gross motor planning, laterality & directionality, visual planning, visual memory, visualization, and central-peripheral organization in space as well as in *time*.

ACKNOWLEDGEMENT:

Thanks to Curt Baxstrom, OD, whose lecture and conversations have led me down new avenues in visual thinking.

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