

FIX-FUSION LOOPS CARDS (TONDEL'S LOOPS) PROCEDURES

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DESCRIPTION:

The set of Fix-Fusion Loops Cards consists of 4 cards (format A4) (see figure). Each card has 7 rectangles with a pair of eccentric loops in each. Each loop is formed out of arrow shapes. Within each rectangle there is a part of a simple arithmetic sentence and one or two words. Cross fixation produces perception of eight rectangles. All of them but the two side ones have concentric rings with depth perception, complete arithmetic sentence and three words in one column. Only stable and precise alignment of the eyes allows holding such a perception. It is easy to notice, even a small disruption of the alignment, thanks to arithmetic sentences and words. In addition different cards from the set have altered details (thickness of the borders around math sentences and presence or absence of tints). This allows for easier or more difficult maintaining of fusion. The cards were designed by Grazyna Tondel, M.D., M.S., Ph.D. in cooperation with Boleslaw Kedzia, PhD.



GOALS:

The Fix-Fusion Loops Cards were designed to help in management of convergence dysfunctions.

Goals of the Fix-Fusion Loops Cards:

- vergence training in variety of near distances
- increase ranges of positive fusional vergence (also negative when transparent cards (not attached) are used)
- increase of fatigue limit for vergence
- training vergence while version eye movements are performed
- improve dynamics of vergence eye movements

Expected advantages of the cards:

- each card provides clear stimulus for accommodation (well defined black lines) that facilitate holding accommodation at the right distance
- provides clear indication and constant check for the patient if the task is performed correctly (words and/or math sentences)
- allows to find the best condition for the patient by using a variety of the card with altered details but the same conception of training
- allows controlling the eyes alignment, while horizontal version movements are performed.
- provides clear suppression cue (words, math sentences)
- colorful design make cards attractive

SET UP:

The cards do not require any set up.

GENERAL PROCEDURE

The author suggests that the card with white background and thick borders around the math sentences should be used first. Other cards can be used depends on patient performances and needs. For example, by using thin borders around math sentences the accommodation stimulus is less pronounce. The gray background provides generally less contrast. It is also possible to pick the card randomly from the set and after understanding the procedure by the patient use other cards if needed.

The procedure described below is to be used for convergence training. The chosen card should be held in front of the patient eyes with the middle rectangle in sagittal plane. The distance would depend on the patient ability to perform task. The progress will lead to gradual decrease of the distance. Initially the procedure can be explain to the patient while only 2 out of 7 rectangles are seen and the rest is covered. For this purpose 2 loops from a side of the card can be picked and they need to be put in the middle of patient view. In such condition the details of the method are similar to Life saver Card or other similar cards. The patient should look toward the 2 uncovered loops and focus at a tip of a pen placed between the loops. Next the pen should be moved closer. The patient should still look at it while observing the loops at the same time. At some point the patient will notice four loops instead of two. Using the pen prevents seeing 4 loops by aligning eyes in an exo position. After seeing 4 loops the patient should move the pen closer until the two middle one get fused and the patient will see three loops. The middle loop should be seen in depth (small loop in front or behind the big one depends on a pair of loops used). After the patient succeed with seeing three loops s/he needs to see clearly the math sentence and the column of 3 words.

When the patient understands the procedure all other loops should be uncovered. The middle rectangle should be place again in sagittal plane. Now, when aligning the eyes as described above, the patient should perceive 8 loops and all but side ones in depth. The depth perception will be possible only when neighboring loops are fused. When eyes will be crossed excessively (every other loops fused) no depth perception will be noticed. The position of the small loop with respect to the big one will alternate in neighboring loops. Next the patient can try to move attention from loop to loop performing version eye movements (small saccades). Initially while moving from loop to loop patient attention should be focused on three dimensional perception of loops and seeing complete math sentence above them. Next step is to make sure that the patient sees clearly both the complete math sentences and the column of three words. After succeeding in this step the card can be put closer to eyes making the task more challenging. In addition the card can be dynamically moved closer and further from the eyes while performing exercise. All the time the patient needs to be sure that s/he sees the expected outcome: loops in depth, sharp and complete math sentences and sharp column of three words. The patient perception will provide constant feedback allowing controlling the correct performing of the exercise. In addition, perception of math sentences or words tilted or at different height will suggest vertical components of eye misalignment. The math sentences and seen words can be read out loud. The difficulty of the task can be increased by trying to look far away and going back on the card and/or directing attention to the card's different places and trying to see as fast as possible the expected outcome. The cards can be either held in hands by the patient or placed on a stand. The second option takes away additional, perceptual information about the card distance.

POSSIBLE ALTERNATIONS AND/OR ENHANCEMENTS OF THE PROCEDURE

LENSES AND/OR PRISMS

The cards allows introducing additional lenses (e.g. +1.00 D OU or -1.00 D OU) to alter required accommodation level at given fixation distance. The level of convergence needed to perform the procedure would not be changed, thus accommodation/vergence relationship allowing clear and single vision would be altered. Also the card allows introducing BI or BO prisms in order to change required vergence levels thus making the exercise more or less challenging. In such a case accommodative demand does not change therefore the relationship between accommodation and vergence is altered again. In addition, in later stages of training a combination of prisms and lenses (BIM, BOP) can be introduced to elevate difficulty of the task, and therefore the possible benefits from training.

EYE HAND COORDINATION AND/OR CONNECTION WITH GROSS MOVEMENTS

The patient can be asked to touch the loop perceived closer. This can be done alternating touching hand while the other hand holds the card. Also when the card is on the stand both hands can touch closer loop at a same time or each hand separately. These exercises allow adding additional difficulty by combining control of hand movements while the vergence and version system work on the task. Gradually head movements can be introduced to increase plasticity of the system. The patient can also walk during exercise (for example stepping back and forth) or stay on a balanced board. This way other motor control areas can be involved in the exercise. When the card is on a stand the patient can move closer and further away while exercising.