Prism Adaptation Treatment for Improving Functional Vision and Functional Movements in Patients with Spatial Neglect

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Disclosure

• Employed by the Kessler Foundation
• Funded by the New Jersey Commission on Brain Injury Research (CBIR17PIL021) and the National Institute on Disability, Independent Living and Rehabilitation Research (90SFGE0001 & 90IFDV0001) – funding does not imply federal endorsement.
• The developer of the Kessler Foundation Neglect Assessment Process (KF-NAP®) and the Kessler Foundation Prism Adaptation Treatment (KF-PAT®).
• The inventor on the US pending patent (No. 14/278,776) related key components of the KF-PAT portable kit.
• Receives no financial benefit from sales related to KF-NAP or KF-PAT
• The content creator and editor of the following websites
  ▪ Network for Spatial neglect (kesslerfoundation.org/researchcenter/stroke/networkforspatialneglect.php)
  ▪ Kessler Foundation Learning Center (www.kflearn.org)
Objectives

- To understand the ramifications of spatial neglect and how it impairs functional vision and functional movement, describe the clinical impact of spatial neglect
- To learn the principles of prism adaptation treatment for spatial neglect
- To determine the benefits of using prism adaptation treatment to treat patients with spatial neglect
Every year more than **795,000 Americans** have a stroke, and more than 80% survive the stroke.

An estimated **7.2 million** American adults are stroke **survivors**. This number is likely to increase because the population is aging, and the stroke survival rate is improving.

However, regaining functional independence after stroke can take years. One factor prolonging this recovery significantly is **spatial neglect**.

**Spatial neglect** occurs in 50% of stroke patients and 30% of TBI patients in the **inpatient rehabilitation facility (IRF)** setting.
Spatial Neglect: A syndrome of impaired spatial attention

One of the most popular and respected actors of our time, Christopher Walken, has been in over a hundred films. Just to name a few, *King of New York*, *The Dead Zone*, *At Close Range*, and *The Deer Hunter*. He is best known for being able to portray the most intimidating characters and delivering performances with an edge of danger. Before he got his start in Hollywood, he spent his teenage years performing with a traveling circus. He acted out performances with the owner of the circus who did various lion taming tricks. But Walken can't exactly be called a lion tamer. As part of the act, he pretended to be the son of the circus owner, who did most of the actual lion taming. When the tamer was done performing tricks with several lions, he would leave Walken to face one lion on his own. Walken could easily make this lion do tricks by cracking a whip. While his lion taming act was mostly for show, spending his teenage years around lions may have helped harden him for his later roles as various dangerous men.
Spatial neglect is a disorder of spatial attention, affecting ... spatial perception (visual, auditory, tactile, proprioception), spatial representation (spatial memory, mental imagery), and motor control (directional movement, mobility).


Impact of Spatial Neglect

- Prolonged hospitalization
- Poor rehabilitation outcome
- Higher risk of in-hospital falls
- Less likely returning home after inpatient rehab

True for both stroke and TBI


Impact of Spatial Neglect …

On Family Caregivers

**Impact of Spatial Neglect … On Family Caregivers**

<table>
<thead>
<tr>
<th></th>
<th>Family caregivers of stroke survivors <em>without</em> spatial neglect</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Care and assistance</strong> (e.g., housekeeping, transportation, meals, dressing, using the bathroom, medication management, finance, etc.)</td>
<td>1.6 hours per day</td>
</tr>
<tr>
<td><strong>General supervision</strong> (i.e., keep an eye on the patient)</td>
<td>5.5 hours per day</td>
</tr>
</tbody>
</table>

# Impact of Spatial Neglect …
## On Family Caregivers

<table>
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<th>Family caregivers of stroke survivors <em>with</em> spatial neglect</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Care and assistance</strong> (e.g., housekeeping, transportation, meals, dressing, using the bathroom, medication management, finance, etc.)</td>
<td>1.6 hours per day</td>
<td>4 hours per day</td>
</tr>
<tr>
<td><strong>General supervision</strong> (i.e., keep an eye on the patient)</td>
<td>5.5 hours per day</td>
<td>17 hours per day</td>
</tr>
</tbody>
</table>

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Spatial neglect is a complex syndrome.

Spatial neglect is a disorder of spatial attention, affecting spatial perception (visual, auditory, tactile, proprioception), spatial representation (spatial memory, mental imagery), and motor control (directional movement, mobility).

- Co-occurrence of other disorders or deficits
  - Perseverative behaviors
  - Anosognosia for spatial neglect
  - Anosognosia for hemiplegia
  - Hemianopia (visual cortex injury)
  - Aphasia (left brain injury)
  - Delirium (right brain injury)
### Class IIa with level A of evidence
- prism adaptation
- visual scanning training
- optokinetic stimulation
- virtual reality
- limb activation
- mental imagery
- neck vibration combined with prism adaptation

### Class IIb with level B of evidence
- rTMS

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Volunteer?
Seminal study

Why using 20-Diopter prisms?

Answer: To induce larger and longer-lasting prism aftereffect

20 diopter prism lens shift the entire visual field for about 11.4 degrees of visual angle.

In addition to use 20-D prism lenses, blocking visual feedback of arm movement is another way to enhance prism aftereffect.

Keane et al. (2006)

Wilm & Mala (2010)


<table>
<thead>
<tr>
<th>Category</th>
<th>0 no neglect</th>
<th>1 mild neglect</th>
<th>2 moderate neglect</th>
<th>3 severe neglect</th>
<th>NA (provide reasons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Gaze orientation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Limb awareness</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>3 Auditory attention</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>4 Personal belongings</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>5 Dressing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>6 Grooming</td>
<td></td>
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<tr>
<td>7 Navigation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>8 Collisions</td>
<td></td>
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</tr>
<tr>
<td>9 Meals</td>
<td></td>
<td></td>
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<td></td>
<td>X</td>
</tr>
<tr>
<td>10 Cleaning after meals</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

Neglected side (circle one): **left-sided** spatial neglect   **right-sided** spatial neglect

Sum of assigned scores: $16 \times 10 = \text{Final score } 177.8$

Number of scored categories: $9$

Neglect severity (circle one): Absent (0); Mild (1-10); Moderate (11-20); Severe (21-30)

(video here)
Users of the KF-PAT® Portable Kit
Acknowledgement

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Questions and comments are welcome!
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