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Hemispatial neglect : a guide for healthcare professionals

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NORTHERN ILLINOIS UNIVERSITY

“Hemispatial Neglect: A Guide for Healthcare Professionals”

**A Thesis Submitted to the
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In Partial Fulfillment of the
Requirements of the Baccalaureate Degree
With Upper Division Honors
Department Of
Health and Human Sciences**

By

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Hemispatial Neglect: A Guide for Healthcare
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ABSTRACT: The development of hemispatial neglect is especially common after a person experiences a stroke, and the importance of this connection is immense. As the baby boomers grow older, a larger portion of the population will be composed of older adults. Additionally, we are seeing an increase in the number of individuals having strokes, and they are occurring at increasingly younger ages. This is an urgent and escalating problem, especially in the United States, where stroke is the leading cause of death. Until we can decrease the number of strokes experienced, we must learn all that we can to help alleviate the disabilities caused by stroke. Hemispatial neglect is one of the primary contributors to disability in individuals who have had a stroke, and it is a unique and interesting phenomenon. This disorder can significantly affect an individual's every day life, impacting activities of daily living and causing safety concerns. If this problem is not reduced or eliminated, it can severely impact a person's perception of their quality of life. Learning successful ways to solve this problem through rehabilitation, therefore, is of the utmost importance. Although research is still in its infancy, there are a variety of rehabilitation techniques that seem promising.

Hemispatial Neglect: A Guide for Healthcare Professionals

Introduction

Hemispatial neglect is a neurological deficit that is a major source of disability in individuals who have experienced a stroke (Rossetti, Rode, Pisella, Farne, Li, & Boisson, Perenin, 1998). It is typically caused by a lesion to the brain tissue, and although hemispatial neglect can result from other traumas, an emphasis should be placed on stroke since as high as thirty percent of stroke patients experience acute hemispatial neglect, with another two percent experiencing a more chronic and debilitating form of hemispatial neglect (Luukkainen-Markkula, Tarkka, Pitkanen, Sivenius, & Hamalainen, 2009). Problems that ensue from this condition include deficits in perception, attention, representation, and carrying out actions in the space opposite the side of the brain the stroke affected, or the contralesional hemispace. Other names that have been used synonymously for the disorder of hemispatial neglect include: unilateral neglect, hemineglect, and spatial neglect.

When the term 'hemispatial neglect' is used, it is assumed that the neglect is to the person's left. This means that the damage causing the neglect originates in the right hemisphere of the brain (Parton, Malhotra, & Husain, 2004). Damage to the left hemisphere rarely causes hemispatial neglect because of the overlap of duties associated with the right hemisphere. It is important for health professionals treating this disorder to understand that these deficits are merely neurological. Individuals with hemispatial neglect have sensory processing and visual acuity equal to a comparable population of individuals without the disorder (Marotta, McKeeff, & Behrmann, 2003).

Before an individual is diagnosed with hemispatial neglect, their families may notice strange phenomena. A person with hemispatial neglect might not detect words on the left side of a page, or they may only eat food or shave their face on the right side, or the ipsilesional side (Marotta et al., 2003). In one study, researchers observed the grasping patterns of individuals with hemispatial neglect compared to their normative peers and found a great discrepancy in the patterns of grasping (Marotta et al., 2003). Although they were still mostly successful picking up the items, the individuals with hemispatial neglect were slower to initiate movement, more unsure of their actions, and dropped more items. This coincides with a common family observation of dropped items at home. The effect can be even more extreme, though. For example, they may not notice large objects on the contralesional side, even something as large as a person (Marotta et al., 2003). This may result in interpersonal problems because this can cause the person to ignore speech, eye contact, and even bump into people on one side of their body (Baheux, Yoshizawa, Tanaka, Seki, & Handa, 2005).

This introduces an even more surprising element of hemispatial neglect. Individuals must be categorized based on the type of neglect they exhibit. An individual may have body-centered neglect, which means that he or she is not aware of anything on the contralesional side of the body (Pachalska, Franczuk, MacQueen, & Talar, 2004). The result is that as the person moves throughout three-dimensional space, he or she is missing information from the entire left hemisphere. As these individuals physically move their body, items or people may suddenly appear to them because the object or person has moved into the ipsilesional side. Alternately, an individual could have object-centered neglect (Pachalska et al., 2004). As a result, each individual item viewed is missing the left side of the picture. Even though the individual notices items in the left hemisphere overall, information is still missing because each object is subdivided

into its own hemispaces. Object-centered neglect is generally more persistent and treatment resistive (Pachalska et al., 2004).

The wide range of complex negative implications makes hemispatial neglect a particularly debilitating condition in its chronic form. An individual may have his or her privilege to drive taken away because their inattention to the contralesional side causes significant safety risks (Pachalska et al., 2004). Other safety hazards that individuals with hemispatial neglect may not be aware of are alarms and danger signals. Because there is such a possibility for unsafe behaviors, it is imperative that a caretaker or other responsible person be available. Many times this is a family member. This can cause frustration on the family's part, though, because it is a lot of work to take care of someone with this condition. As a result, the individual with hemispatial neglect may be treated as and feel like a nuisance. As mentioned earlier, this condition is often highly correlated with depression because the individual is aware of the difference between pre-stroke and post-stroke. This may add to the depression and diminished self-confidence already experienced by being denied adult responsibilities, such as driving oneself to the grocery store.

Confounding Factors

Because the phenomenon of hemispatial neglect is so complicated, there is not a general consensus about which theory is most correct concerning the cause of the symptoms. There are, however, several theories that are currently accepted. One points to hemispatial neglect as caused by problems in attention (Parton et al., 2004). There is argument within this theory as to why attention is a problem. It may be because of a general bias to direct attention to the ipsilesional side. Alternately, the answer could be extinction, in which objects on the right side are chosen as a result of the competition between the left and right sides for attention. Difficulty in being able

to successfully disengage attention from the right side in order to engage fully in the left side may also be correct.

Another theory argues that it is instead a problem of the person's representation of space. Yet another theory is that the deficits related to hemispatial neglect are caused by a directional motor impairment. Pachalska et al. (2004) suggest from their case study that there may additionally be an emotional-motivational aspect to the disorder. Research may reveal yet more possibilities while discrediting others. Most likely, though, parts of each of these theories are correct. As research in hemispatial neglect has proved, there likely is no one simple answer that will satisfy all.

Although not the focus of this paper, it is important to note confounding conditions associated with hemispatial neglect. These co-occurrences can complicate both diagnosis and treatment, so it is important to be aware of their possible existence. One such condition is motor neglect, in which the individual does not use his or her contralesional limbs, even though there is no physical deficit preventing that type of movement (Parton et al., 2004). Some people may also ignore auditory stimuli from their contralesional side (Baheux et al., 2005). Still other individuals with hemispatial neglect may fail to perceive any problem with their functioning. This is termed anosognosia, and can clearly complicate treatment since the individual does not comprehend the need for treatment. Related to this is anosodiaphoria, in which the individual with hemispatial neglect shows no interest in the disability (Buxbaum, 2006). As previously indicated, depression is also a common co-occurrence (Singh-Curry & Husain, 2010).

Another confounding factor that makes research on hemispatial neglect so difficult to obtain is the wide range of types of hemispatial neglect (Baheux et al., 2005). There are many different areas of damage in the brain that can cause the same types of deficits, and although

similarity of symptoms may seem to present positive research opportunities, it is quite the contrary (Singh-Curry & Husain, 2010). Even though the observable deficiencies may be similar, the successful treatment varies depending on the specific area of the brain that was damaged. This has made it nearly impossible to come up with a single treatment that will help a wide range of subjects. This is why it is so important to use a combination of treatment methods.

Conditions for Treatment Success

Individuals with moderate to severe hemispatial neglect have a good chance at recovery within the first six months following damage to the brain (Luukkainen-Markkula et al., 2009). Therefore, it is extremely important that healthcare professionals are able to quickly and accurately diagnose individuals so that treatment can begin. Before treatment can occur, it is important for healthcare professionals to have a way to first determine that the patient is truly experiencing hemispatial neglect. A simple way to do this is to use paper and pencil tests, such as the line bisection test (Baheux et al., 2005). While this test is of diagnostic importance, a drawback is that it does not show the degree of the impairment. This is immensely important so that healthcare providers can have a baseline functioning marker to know if progress is being achieved (Parton et al., 2004). Additionally, it has been noted that this test ignores other types of neglect that may be implicated, such as those concerning auditory signals (Baheux et al., 2005). Finally, critics assert that this task is not similar to activities of daily living, so the results may not extrapolate to other more everyday tasks.

Of secondary importance is the classification of the symptoms into a subtype of neglect, so that the characteristics of the person's deficits may be more fully recognized. One way to determine whether an individual has a body-centered subtype or the object-centered subtype is to have him or her copy a picture consisting of a series of objects (Pachalska et al., 2004). Of

interest in this test is the phenomenon of confabulation. Some individuals fill in the neglected areas of their pictures of objects with made-up details. So, even though the drawing may look rather impressive and possibly even complete, confabulation indicates a problem does exist. To determine other subtypes of neglect, such as representational neglect, other tests may be useful (Parton et al., 2004). For example, an individual with hemispatial neglect that is asked to draw a clock from memory will draw a clock with only half of the numbers, as is depicted in figure 1.

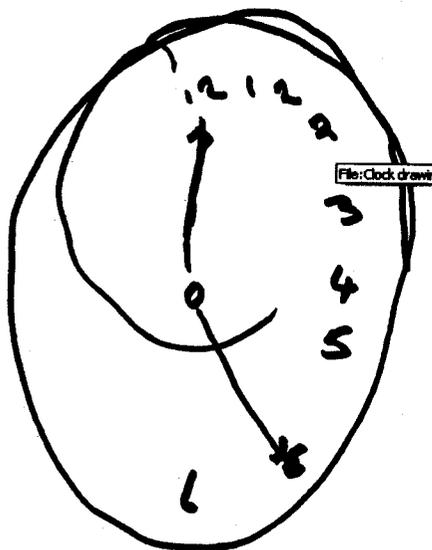


Figure 1. Clock drawing in neglect. Taken from Scholarpedia.

When research on treatments for hemispatial neglect first began, the primary intervention consisted of trying to direct the person's attention to the neglected side (Parton et al., 2004). Eventually, as treatment concluded, the person with hemispatial neglect became in charge of directing attention to the neglected side. Research shows that this is generally ineffective because it requires the individual to be aware that they are neglecting one side. As discussed previously, this is a definite problem when some people have anosognosia, thus further limiting their ability to self correct.

Some other treatment types have been more successful in selected cases. According to research by Parton et al. (2004), caloric or vestibular stimulation, contralesional limb activation, trunk rotation, neck muscle vibration, and electrical stimulation of the neck have proved helpful. These methods all provide a bridge between the current behavior and the desired behavior, so the learning is more automatic than the previous method. Because of this, there is a better chance in general for individuals to carry these behaviors into their everyday tasks. Although these techniques surely provide positive results, there are some drawbacks.

Caloric stimulation, for example, is used by introducing cold water to the contralesional ear (Parton et al., 2004). Alternately, warm water introduced to the ipsilesional ear produces the same result: a shift in balance that thus shifts the attention to the neglected side. The short term effects of this treatment unfortunately did not outweigh the discomfort of the individual with hemispatial neglect. Trunk rotation proved more successful in terms of patient comfort levels. If an individual with hemispatial neglect has their trunk rotated to the left while their head and eyes stay straight, they performed much better on tasks. Individuals that move a limb on the neglected side are also better able to perform on these tasks. According to Parton et al. (2004), the most promising technique combines neck muscle vibration with scanning training, with progress noted even after two months.

Perhaps the most noted of all of the rehabilitation techniques is prism adaptation (Rossetti et al., 1998). This groundbreaking study has been mentioned in most publications addressing research of hemispatial neglect. The theory behind this therapy is that hemispatial neglect causes a midline shift to the right. This is subjective, so by wearing prismatic glasses while performing tests, the researchers were able to shift the midline to the extreme left. After removing the glasses, the individuals with hemispatial neglect thus experienced somewhat of a balance

between hemispatial neglect-related and prism glasses-induced perception of the midline (Singh-Curry & Husain, 2010). The result was that the majority of the subjects were able to approximate the correct anatomical midline after wearing the glasses.

Although not appropriate for all cases of hemispatial neglect, pharmacology can be a great asset in treatment (Parton et al., 2004). Nonadrenergic drugs or cholinergic compounds, such as acetylcholinesterase inhibitors, have helped people with Alzheimer's disease and vascular dementia to improve their cognitive deficits. In the same way, there is a promising future for which these same drugs may help repair the inability to sustain attention found in people with hemispatial neglect. Another up and coming rehabilitative technique is the use of virtual reality (Baheux et al., 2005). Because the tasks are three-dimensional, the high technology is able to track the movement patterns of the contralesional limb and eyes compared to the ipsilesional. This is important for tracking rehabilitation progress, as well as for developing future research project ideas. It is also able to model more real life situations while keeping the individual interested in continuing therapy. While it seems like a promising idea, there is indeed much more work to be done before it is ready to be used in an actual clinical setting.

Other areas also warrant further research. For example, there have been rare differences noted in which the person with hemispatial neglect shows a difference in performance with near space versus far space. Additionally, some individuals divide hemispaces superiorly and inferiorly, rather than the traditionally studied right and left hemispaces. Research in hemispatial neglect is still in its infant stages, but information sources are numerous. It is critical that more case studies be performed in order to document rare cases such as these, but it is equally

imperative that larger group studies be done in order to determine if there are certain therapies or theories that can help group together the various types of hemispatial neglect.

Clinical and Healthcare Practice Implications

Although the condition of hemispatial neglect is merely alluded to in the course of a student's undergraduate career in healthcare, it is all too commonly seen in the real world. The development of hemispatial neglect is an occurrence especially common after a person experiences a stroke, and the importance of this connection is immense. As the baby boomers grow older, a larger portion of the population will be composed of older adults. Additionally, we are seeing an increase in the number of individuals having strokes, and they are occurring at earlier and earlier ages. This is an urgent and escalating problem, especially in the United States, where stroke is a leading cause of death according to the Centers for Disease Control and Prevention's website. Until we can decrease the number of strokes experienced, we must learn all that we can to help alleviate the disabilities caused by stroke.

Hemispatial neglect is one of the primary contributors to disability in individuals who have had a stroke, and it is a unique and interesting phenomenon. Some might be amused at the absurdity of a person physically being able to see an object, but yet not being able to actually detect it due to a problem in the brain. Although interesting indeed, this condition is no laughing matter. This disorder can significantly affect an individual's everyday life, impacting activities of daily living and potentially even causing safety concerns. If this problem is not reduced or eliminated, it can severely impact a person's quality of life. It is of particular importance for healthcare professionals in gerontology, physical therapy, and occupational therapy to be able to take the lead in identification and treatment of this disorder. Learning successful ways to solve

this problem through rehabilitation, therefore, is of the utmost importance, and the first step is for healthcare professionals to educate themselves on this issue.

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