What are the First Signs of Consciousness After a Severe Brain Injury?

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A severe brain injury may be caused by an accident or other trauma (traumatic brain injury) or a non-traumatic event such as a stroke or aneurysm. People may lose consciousness for days or weeks after a severe brain injury. When emerging from an unconscious or comatose state, many individuals may first enter a vegetative state, also known as Unresponsive Wakefulness Syndrome (UWS), where their eyes are open, but they show no signs of conscious awareness. Then, they may gradually show signs of consciousness, such as visually tracking a moving object, following simple commands, or answering yes/no questions. Over time, these signs may appear more consistently and may progress to more complex behaviors, such as handling familiar objects. Accurately detecting the first signs of consciousness may improve rehabilitation planning and care for people with severe brain injuries.

In a recent NIDILRR-funded study, researchers looked at records from people with severe brain injuries who transitioned from coma or UWS to a minimally conscious state. They wanted to find out which signs of consciousness appeared first in these individuals and how long it took for these signs to appear after the brain injuries. They also wanted to find out whether people with traumatic brain injuries (TBI) had different patterns of regaining consciousness compared to people with non-traumatic brain injuries.

Researchers at the Spaulding-Harvard Traumatic Brain Injury Model System Center looked at records from 79 people with severe brain injuries who were admitted to a specialized inpatient rehabilitation program for people with disorders of consciousness. About half of these individuals had a TBI, while the other half had brain injuries resulting from stroke, aneurysm, or other non-traumatic causes. The individuals were in a coma or were diagnosed with UWS on admission to the rehabilitation program, and then regained at least minimal consciousness during their inpatient stay. During their stay, the individuals were evaluated twice per week to determine whether or not they displayed any of 13 behavioral signs of consciousness, according to a standardized scale specifically designed for patients with altered states of consciousness. These included visual signs, such as fixating the eyes on and tracking a moving object; auditory signs, such as following simple verbal commands to initiate movement; motor signs such as handling objects or displaying automatic movement such as scratching or waving; and communication signs, such as answering yes/no questions either gesturally or verbally. The researchers looked at which behavioral signs of consciousness emerged first in the individuals as well as the length of time between when the injury occurred and the when first sign of consciousness was observed.
The researchers found that the three most common first signs of consciousness were:

- **Visual pursuit:** About 40% of the individuals first demonstrated conscious awareness by tracking a moving mirror with one or both eyes at least twice in any direction.
- **Command following:** 25% of the individuals first demonstrated conscious awareness by following simple movement commands, such as lifting an arm when asked to do so, at least three times.
- **Automatic movement:** 24% of the individuals, the first sign of conscious awareness was an automatic movement such as scratching an itch.

The researchers found that these first signs of conscious awareness tended to emerge about 6 weeks after injury, with a quarter of the individuals showing the first sign of conscious awareness at least 33 days after injury and three-fourths 59 days after injury. In most of the individuals (72%), only one sign of conscious awareness was detected during the first week of consciousness.

When the researchers compared the individuals with TBI to those with non-traumatic injuries, they found that both groups showed the first signs of consciousness at roughly the same length of time after injury. However, more of the individuals with TBI showed motor signs of consciousness first, such as following commands, compared with the individuals with non-traumatic injuries, who were more likely to display visual signs such as visual pursuit. For example, about 18% of those with TBI displayed automatic movement compared to about 6% of those with non-traumatic injuries; while about 25% of those with non-traumatic injuries displayed visual pursuit, compared to about 15% of those with TBI.

The authors noted that reliably detecting the first signs of consciousness may play an important role in planning care and supports for people with severe brain injuries. Based on the results of this study, clinicians may wish to develop consciousness assessments that focus on visual pursuit, command-following, and detection of automatic movements. In addition, because signs of consciousness may emerge one at a time, and may not appear consistently at first, clinicians may want to ensure that assessments are performed frequently and examine a variety of different behaviors. Future research may be useful to further investigate the possible differences in recovery trajectories between people with TBI and non-traumatic brain injuries.

**To Learn More**

The Model Systems Knowledge Translation Center (MSKTC) works with the Model System centers to develop a diverse collection of research-based, consumer-tested information resources on TBI. These include factsheets on Severe TBI and Vegetative and Minimally Conscious States After TBI, and Acute Inpatient Rehabilitation, among others.
The Brain Injury Association of America offers a wealth of information and support resources for brain injury survivors, families, and health professionals. In addition, state affiliates can connect individuals to local resources and support groups.

To Learn More About this Study

Research In Focus is a publication of the National Rehabilitation Information Center (NARIC), a library and information center focusing on disability and rehabilitation research, with a special focus on the research funded by NIDILRR. NARIC provides information, referral, and document delivery on a wide range of disability and rehabilitation topics. To learn more about this study and the work of the greater NIDILRR grantee community, visit NARIC at www.naric.com or call 800/346-2742 to speak to an information specialist.

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