

Hearing loss weakens skills that young cancer survivors need to master reading

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Researchers have identified factors that explain why severe hearing loss sets up pediatric brain tumor survivors for reading difficulties with far-reaching consequences. The findings lay the foundation for developing interventions to help survivors become better readers.

St. Jude Children's Research Hospital investigators led the [international study](#), which appears today in the *Journal of Clinical Oncology*.

Researchers analyzed how 260 children and adolescent brain [tumor](#) survivors, including 64 with severe [hearing](#) loss, performed on skills that are the building blocks of reading. The list included information processing speed, working memory, letter-word identification and phonological skills, which include the ability to use units of sound (phonemes) to decode words.

Compared with other survivors, those with severe hearing loss experience significant declines during treatment on all eight measures included in this analysis. After accounting for the risk factors of age at diagnosis and treatment intensity, the analysis suggested that survivors with severe hearing loss struggled the most with slowed processing speed and phonological skills.

"Reading is a [skill](#) that takes a long time to learn and that we depend on for learning our entire life," said senior and corresponding author Heather Conklin, Ph.D., a member of the St. Jude Department of Psychology. "There had been hints in the scientific literature that reading

was declining in pediatric brain tumor survivors and that hearing loss may be a contributor. But this is the first study to identify the key cognitive components that lead to reading problems."

The findings suggest that interventions should focus on improving neurocognitive and language-based skills like processing speed and phonemics before tackling more [complex tasks](#) like [reading comprehension](#), said first author Traci Olivier, Psy.D., formerly a St. Jude postdoctoral fellow and now at Our Lady of the Lake Medical Center, Baton Rouge, Louisiana.

"Younger children, those less than 7 years old, were particularly vulnerable to declines in skills that are fundamental for reading mastery," she said. "These children may benefit most from interventions."

Brain tumors and hearing loss

Brain and spinal cord tumors are the second most common childhood cancers. These tumors account for about 1 in 4 newly diagnosed pediatric cancers annually.

A recent St. Jude study found that 32 percent of brain tumor patients developed severe hearing loss within several years of treatment despite treatment with a drug, amifostine, designed to protect hair cells in the inner ear that are essential for hearing.

The analysis involved 3- to 21-year-olds with medulloblastoma and other embryonal brain tumors. All patients were enrolled in a multi-site St. Jude clinical research trial and treatment that included surgery plus risk-adapted radiation treatment and chemotherapy. All had neurocognitive and hearing testing at least twice—early and later in treatment.

Next steps

The analysis proposed multiple factors, including damage to the hearing nerve caused by the tumor itself, that complicate reading mastery for pediatric [brain](#) tumor survivors with severe hearing loss. "That suggests we have an opportunity to significantly improve the quality of life for survivors by developing more effective interventions," Conklin said.

Research is needed to determine how and when to intervene to bolster reading skills in young cancer patients. That includes tracking how cochlear implants or hearing aids affect reading and neurocognitive skills in young cancer survivors. Data on hearing aid use in this study was incomplete.

"Compared to vision loss, hearing difficulties often go undetected for longer periods. This study demonstrates the need for close audiological monitoring early in [treatment](#) so we can recognize and intervene early," Olivier said. "Parents might not realize the impact of decreased hearing on educational outcomes."

Provided by St. Jude Children's Research Hospital

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