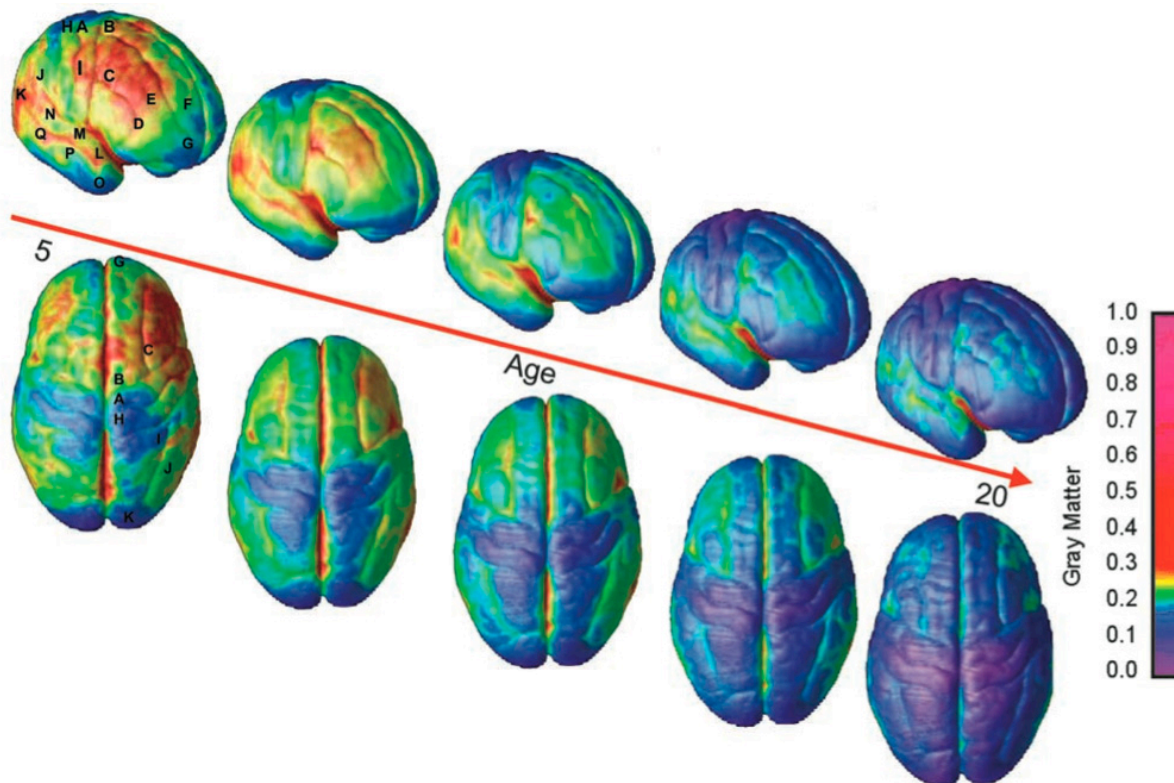


# Key Concepts: Drinking Under Age 21 and the Developing Brain

by Lisa Frederiksen

⇒ New brain imaging technologies of the past 15 years, or so, allow neuroscientists and medical professionals to study the live human brain like never before, and in so doing, identify the development of the brain and the impact of alcohol on the developing brain. As a result, scientists and medical professionals now better understand alcoholism as one of the diseases of addiction (which is a chronic, relapsing brain disease) and that **alcohol affects a young person's brain differently because of the critical brain development occurring from ages 12 through 20** and beyond.

⇒ The image below is a time-lapse of brain imaging studies that shows how the brain develops from age 5 through 20. It was thought (until these new brain imaging capabilities) that the brain was fully developed by adolescence. We now know it's not. There is a critical developmental stage identified as **pruning** and **strengthening** that goes on during the teen years and on into early adulthood. Pruning is when neural connections (called gray matter) that are not used fall away (get "pruned"), and those that are used get strengthened, which makes the remaining neural connections more efficient (like an insulated cable wire vs a non-insulated one).



**Source:** Thompson, Paul, Ph.D., **Time-Lapse Imaging Tracks Brain Developing from ages 5 to 20.** Reprinted with permission from Dr. Paul Thompson, UCLA Lab of Neuro-Imaging and Brain Mapping Division, Dept. Neurology and Brain Research Institute, <http://www.loni.ucla.edu/~thompson/DEEL/PR.html>

As you can see when looking at the image above, the brain develops from back to front (lighter to darker if viewing in black and white). This means that the **portions of the brain that deal with emotion,**

**memory, learning, motivation and judgment are the last to develop** and, as such, are the most deeply affected by alcohol abuse (such as repeated binge drinking) during ages 12 through 20, often through age 25. For example, if a young person repeatedly abuses alcohol, the neural connections associated with memories and experiences related to alcohol abuse are the ones that are strengthened and thus embedded. By the same token, neural connections damaged by or not used because of alcohol abuse (those related to learning or judgment, for example) are pruned or not strengthened. **Young adults, ages 18-20, have the highest rate of alcohol dependence (a.k.a. alcoholism) in the United States.** (U.S. Surgeon General, 2007 Call to Action)

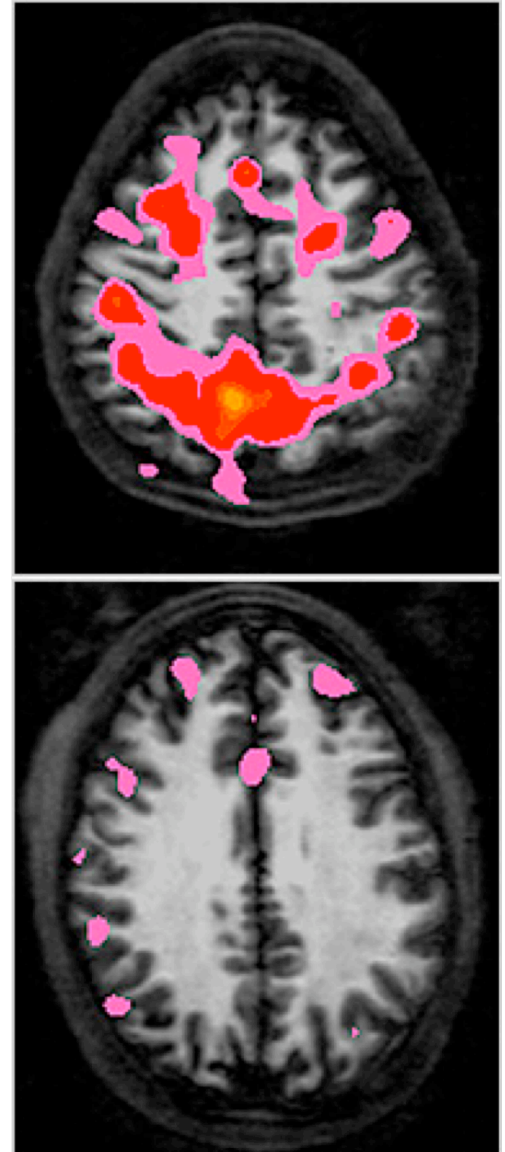
⇒ **The image to the right shows the brain of a 15-year-old NON-drinker on top and a 15-year-old heavy drinker on bottom.** The lack of pink and red coloring (overlay blobs if viewing in black and white) denotes poor brain activity during a memory task.

⇒ Because the brain is NOT fully developed, young people are **more vulnerable** than adults to many of the effects of alcohol, including memory, long-term cognitive deficits and driving skills, AND **less vulnerable** to others, such as sleepiness, loss of balance and hangovers.

⇒ The **BRAIN CAN CHANGE** and resume “normal” brain functions if alcohol abuse is stopped – something else we didn’t fully understand until these advances in brain imaging technologies.

⇒ To see/learn more about brain imaging, visit the **Amen Clinics** website, [www.amenclinics.com](http://www.amenclinics.com).

⇒ **For additional information, visit**  
[www.hbo.com/addiction](http://www.hbo.com/addiction)  
<http://www.drugfree.org/TeenBrain/>  
[www.breakingthecycles.com](http://www.breakingthecycles.com)



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Lisa Frederiksen is the author of the book, *If You Loved Me, You'd Stop! What You Really Need To Know When Your Loved One Drinks Too Much*. Visit her blog, [www.breakingthecycles.com](http://www.breakingthecycles.com), to learn more about alcohol related issues, purchase her book or schedule a consultation, presentation or workshop. Please feel free to email her at [lisaf@breakingthecycles.com](mailto:lisaf@breakingthecycles.com).

**Source:** Tapert, Susan, Ph.D., Department of Psychiatry, UC San Diego. Reprinted with permission from University of California at San Diego School of Medicine