Background

- Risk taking behavior during adolescence and young adulthood is a key contributor to HIV infection and unintentional injuries.
- Increased risk-taking behavior during this developmental period has been linked to prefrontal control systems.
- Modular approaches aimed at isolating the functions of specific cortical substrates are inherently limited at delineating the mechanisms of brain dysfunction at the systems level.

Clinical Characterization of Participants

<table>
<thead>
<tr>
<th>HIV-</th>
<th>HIV+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>Gender (F)</td>
</tr>
<tr>
<td>HIV-</td>
<td>62</td>
</tr>
<tr>
<td>HIV+</td>
<td>41</td>
</tr>
</tbody>
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While most of the HIV+ participants (87.1%) were receiving highly active antiretroviral therapy, more than half (51.3%) still had detectable viral load (> 20 copies/ml).

Methods

- Resting Cerebral Blood Flow (rCBF): Pseudocontinuous arterial spin labeling (1.5 seconds labeling time, 1.2 seconds post-labeling delay) was used to measure perfusion of arterial blood into cortical and subcortical brain tissue. Acquired images have a resolution of 3.4x3.4x5.0 mm. Images were acquired on a Trio MR scanner with a 12-channel head coil.
- Iowa Gambling Task (IGT): Four decks, two decks with larger rewards and penalties, and two decks with smaller rewards and penalties. Participants were instructed to choose cards to maximize "winning." Score was calculated by subtracting scores for the first block from the last block.

IGT performance correlates with cerebral blood flow

Overlap of topological maps depicting rCBF within a distributed network of cortical and subcortical brain regions as a function of IGT performance defined for HIV− and HIV+ separately, and for the status-blind combination of HIV− and HIV+. Scales denote Pearson correlation values. Venn diagram denotes spatial overlap among maps.

IGT performance vs. rCBF in the three distinct regions. The rCBF-IGT relationship is strongest in Region-I (left) for HIV+ and in Region-III (right) for HIV−. It is equally strong for HIV+ and HIV− in Region-II (middle).

Conclusions

Reliance on attention systems in conjunction with their relative immaturity may place young adults infected with HIV at increased risk for behavioral dysfunction.

Individuals identified with attention system impairment to may benefit from more precise therapies (e.g. cognitive behavioral therapy for attention deficits)

HIV+ with neuronal impairment in attention areas recruited emotional processing areas

- The mean rCBF of Region-I and -III were negatively associated (r = -0.34, p = 0.03) across HIV+ participants. Vertical and horizontal dashed lines indicate median rCBF values of Regions-I and -III (C7 and C3), respectively, in HIV− controls. HIV+ subgroups H3 and L3 differentiated by C7, L3 subgroups H1 and L1 differentiated C3

Pseudocontinuous arterial spin labeling (Pascal, Robert H Paul, Beau M Ances, Vaida Florin)

Research was conducted and supported by the Washington University Institute of Clinical and Translational Sciences (UL1 TR000448 from the National Center for Advancing Translational Sciences) and in part by the Neuroimaging Informatics and Analysis Center (1P30NS098577).