Grey Matter Depletion in Conduct Disorder Adolescents through Magnetic Resonance Imaging Studies

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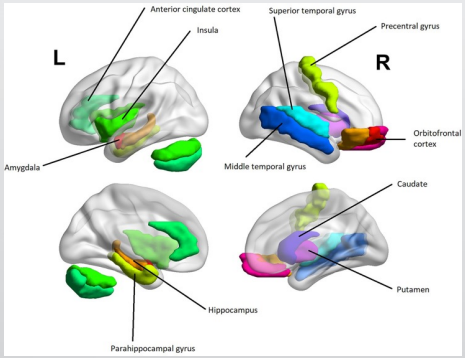
BACKGROUND

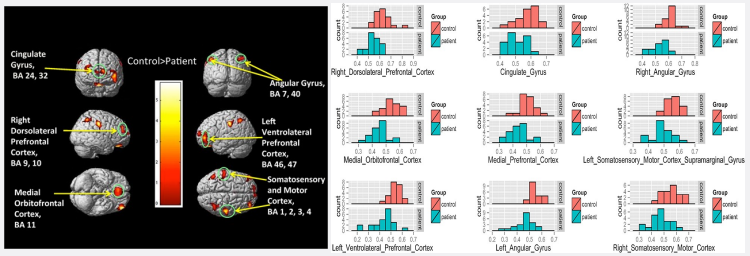
- Conduct disorder (CD) refers to a collection of adolescent behavioral and emotional disorders that present with a six-month history of socially unacceptable mannerisms such as hostility, aggression, and violation of established rules.[5]
- Total grey matter volume (GMV) is lower in patients with CD, and abnormal changes in specific areas for socioemotional stimuli processing were found.
- Psychiatric diagnoses of various behavioral disorders have been increasingly supplemented with both functional and structural magnetic resonance imaging (MRI) to analyze and measure architectural changes within the brain; therefore, MRI has the potential to detect markers for CD diagnosis.
- This systematic review demonstrates how CD can be linked to radiographic imaging of grey matter regions involved in socioemotional stimuli processing found in female and male adolescents.



Anatomical map of brain regions responsive to interpersonal-affective psychological traits.[11]

METHODS AND MATERIALS

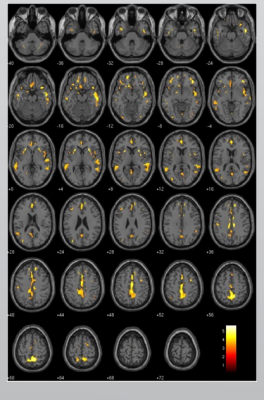
- A systematic literature search was conducted in electronic databases, including PubMed, ScienceDirect, and Google Scholar.
- Studies published between June 2011 and February 2023 that used MRI to investigate socioemotional-related grey matter depletion in CD were included.
- The search terms included "Conduct Disorder," "MRI," and "grey matter."
- Studies of CD patients who expressed obsessive-compulsive disorder, Alzheimer's disease, and bipolar disorder were excluded. The inclusion criteria were limited to human studies published in English.
- A total of 20 studies met the inclusion criteria and were included in this review.



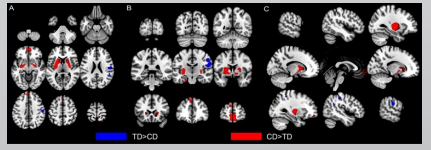
Female adolescents demonstrating conduct problems had a lower GMV in various limbic and para-limbic regions.[3] The color bar in the left photo represents t-values with respect to volume depletion.

RESULTS

- Adolescents with CD were shown to have a strong association with decreased total GMV as seen in MRI scans.
- Specifically, the total GMV was most commonly reduced in the prefrontal cortex, anterior cingulate gyrus, insula, temporal gyrus, orbitofrontal cortex, cingulate cortex, supramarginal gyrus, and frontal gyrus.
- Depletion of GMV in the temporal lobe, frontal lobe, parietal lobe, and cerebellum posterior lobe was also identified.
- Other potential findings in CD are increased cortical folding or reduced volume in the parahippocampal gyrus, right ventral striatum, or lingual gyrus were observed and require further analysis.
- The effects on the amygdala and putamen, however, presented conflicting discoveries in size changes due to CD, and thus require additional investigation.
- Some studies have indicated sex-dependent differences in cortical thickness, gyrification, and surface area in patients with CD, but the results are inconclusive.



(Left) Callous-unemotional male adolescents exhibited reduced grey matter volume, especially in the limbic and para-limbic regions.[2] The color bar represents t-values with respect to volume depletion.



(Above) Male adolescents with conduct disorder (CD) were compared with typically developing (TD) youths.[9] Significantly decreased GMV in CD youths compared to their TD counterparts are marked with blue, while significantly increased GMV is marked with red.

CONCLUSION

- We found a suggestive association between conduct disorder and consistent radiographic findings of reduced grey matter involved in emotion and behavioral processing through MRI scans as observed in various studies and evaluated their findings.
- These radiographic discoveries may present a more tangible method to identify CD while offering the potential for medical imaging to be used as a diagnostic criterion in psychiatric illnesses in the future.
- More research is needed to fully characterize the trends seen in MRI data in conjunction with CD, and further investigation of the potential for neuroimaging to be used as a tool to understand socio-behavioral disorders is desired.

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