Associations between amygdala connectivity and experienced discrimination in children

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Abstract

Discrimination is a chronic stressor linked to adverse health outcomes, particularly in racial and ethnic minorities. Understanding associations between early discrimination and the brain in childhood may help identify mechanisms through which discrimination impacts future health. Data from 4512 children (ages 9-11) and a subsample of Black, Indigenous, and People of Color (BIPOC; N = 1567) from the Adolescent Brain and Cognitive Development (ABCD) Study® was used to create linear mixed-effects models that evaluated associations between Perceived Discrimination (PD) and amygdala resting-state fMRI connectivity (AC) to the salience network (SN), default mode network (DMN), and thalamus. PD was measured using the youth self-reported PD Scale. Results indicated that greater PD significantly predicted greater AC to the right thalamus in our full sample. In secondary analyses, environmental and behavioral factors were evaluated as potential moderators for associations significant at least at a trend level in both our full sample and BIPOC subsample. In our BIPOC subsample, traumatic events experienced (TE) moderated the relationship between PD and AC to the anterior cingulate cortex (ACC; SN), such that greater TE predicted stronger positive associations between PD and this connection. Results suggest PD impacts neural connections in early life, highlighting the need to consider the impact of discrimination on risk for psychopathology.

1. Introduction

1.1. Experienced discrimination influences health outcomes

Discrimination, unfair or prejudicial treatment based on characteristics such as race, ethnicity, gender, or sexuality (Blendon & Casey, 2019; Williams et al., 2019), has been recognized as a public health crisis in the United States (Causadias & Korous, 2019; Devakumar, et al., 2020). As a chronic stressor, discrimination has been shown to increase allostatic load (Miller et al., 2021), which results in poor health outcomes, including increased inflammation (Kraynak et al., 2018), compromised immunity (Meyer et al., 2019), poor cardiovascular health (Panza et al., 2019; Paradies et al., 2015; Williams et al., 2019), and alterations in sleep (Ong et al., 2017; Slopen et al., 2016) and stress regulation (Brody et al., 2014; Gunnar & Quevedo, 2007; Mays et al., 2007; Pascoe & Richman, 2009). Discriminatory experiences are also associated with poor mental health outcomes, including increased internalizing and externalizing behaviors (Estrada-Martínez et al., 2013; Paradies et al., 2015), suicidality (Coimbra et al., 2022; Paradies et al., 2015), and post-traumatic stress symptoms (Kirkinis et al., 2018; Valentine et al., 2025; Wamser & Richardson, 2024). In the United States, Black, Indigenous, and People of Color (BIPOC) face disproportionate levels of discrimination (Bleich et al., 2019; Nagata et al., 2021), which leads to additional impacts on mental (Archibald et al., 2025; Loyd et al., 2024; Williams et al., 2018) and physical (Trejo et al., 2024) health.

In childhood, discrimination can exert an exceptional impact, disrupting the development of the brain and other biological systems (Cuevas et al., 2021; Thomas Tobin et al., 2022). Awareness of discrimination typically begins before the age of 10, and increases with age (Brody et al., 2006; Dulin-Keita et al., 2011; Scott et al., 2023). Similar to adulthood, experiences of discrimination in childhood impact sleep (Priest et al., 2024; Yip, 2015) and stress (Priest et al., 2024), increasing risk for poor health outcomes. Psychological health is particularly affected, with increased externalizing and internalizing behaviors (Benner et al., 2018; Lavner et al., 2022; Loyd et al., 2019; Marcelo & Yates, 2019; Nyborg & Curry, 2003), and feelings of hopelessness (Nyborg & Curry, 2003), and suicidality (Cahill et al., 2024; Pearlman et al., 2023) observed with increased exposure to discrimination. Discrimination appears to exacerbate the impact of childhood traumatic experiences on psychological outcomes (Bernard et al., 2021), indicating the importance of considering discriminatory experiences as a factor in clinical practice. Despite research on the adverse effects of discrimination (Cuevas et al., 2021; Priest et al., 2024; Thomas Tobin et al., 2022), little is known about how early experiences of discrimination affect the developing brain. Understanding this impact may help develop targeted interventions and improve existing ones, such as improving emotion regulatory strategies and community support (Green et al., 2024; Steers et al., 2019).

1.2. Discrimination impacts brain structure and function

Discriminatory experiences in adulthood have been linked to harmful structural changes in the brain, including reduced overall volume (Meyer et al., 2019; Fani et al., 2022a) and white matter tract integrity (Fani et al., 2022b; Palms et al., 2025). Several regions and networks involved in fear learning (Javanbakht, 2019; Thomas et al., 2019), emotion regulation (Satpute & Lindquist, 2019), and memory and perception (Frank et al., 2019; LaBar & Cabeza, 2006) are consistently impacted. Affected regions include the amygdala (Clark et al., 2018; Greer et al., 2012; Webb et al., 2022; Rosario et al., 2020), insula (Elbasheir et al., 2024; Han et al., 2020; Webb et al., 2022), anterior cingulate cortex (Akdeniz et al., 2014) and hippocampus (Zahodne et al., 2023). Large-scale networks like the salience network (SN) (Dong et al., 2023; Webb et al., 2022) and default mode network (DMN) (Dong et al., 2023; Elbasheir et al., 2024; Han et al., 2020) also consistently show changes in connectivity in response to experiences of discrimination. In terms of connectivity, the amygdala connectivity to

other structures, particularly the thalamus (Clark et al., 2018; Kral et al., 2024; Webb et al., 2022) and nodes in the SN (Clark et al., 2018; Masten et al., 2011) and DMN (Elbasheir et al., 2024; Fani et al., 2021) are consistently affected. In BIPOC adults, heightened levels of discriminatory experiences (Bleich et al., 2019; Nagata et al., 2021) may cause these connections to be further impacted. This may explain the observed intergenerational effects on amygdala connectivity (Spann et al., 2024; Kral et al., 2024) and additional impacts on mental (Archibald et al., 2025; Loyd et al., 2024; Williams et al., 2018) and physical health (Trejo et al., 2024) in this population. Due to these differences, it may be beneficial to consider BIPOC populations separately when examining these associations.

While much is known about how discrimination affects the brain in adulthood, little is known about how these experiences impact the brain in childhood. In the existing literature, similar effects have been observed between childhood and adulthood. Experienced discrimination in childhood impacts the brain broadly, slowing whole-brain growth (Assari & Mincy, 2021), and affects similar structures such as the hippocampus and amygdala (Chen et al., 2025). Greater experiences accelerate the maturation of these structures (Chen et al., 2025), and affect hippocampal volume and reactivity (Dumornay et al., 2024; Hatzenbuehler et al., 2022), and amygdala connectivity (Chen et al., 2025) and volume (Dumornay et al., 2024; Mullins et al., 2024). While these associations appear to be in line with findings in adulthood, amygdala connectivity to regions most consistently impacted in adulthood (thalamus, DMN nodes, and SN nodes) has not been evaluated.

Across populations, experienced discrimination most commonly implicates the amygdala, though studies have primarily been conducted in adult populations. Given its involvement in fear processing (Thomas et al., 2019), and stress regulation across development (Feinstein et al., 2011; Ressler, 2010; Zhang et al., 2018), further examination of how discrimination impacts amygdala connectivity in childhood is warranted. Because discrimination has most consistently altered amygdala connectivity to the DMN (Dong et al., 2023), SN (Clark et al., 2018; Masten et al., 2011), and thalamus (Clark et al., 2018; Webb et al., 2022) in adulthood, it is likely that these connections are also impacted in childhood.

1.3. Behavioral and environmental factors

Behavioral and environmental factors may protect or exacerbate the influence of experienced discrimination on the brain in childhood. Internalizing and externalizing behaviors likely exacerbate its impact. The relationship between discrimination and these behaviors may be cyclical. The presence of internalizing and externalizing behaviors may increase the influence of discrimination on the brain, and discrimination may increase engagement in these behaviors (Chng & Tan, 2017; Stein et al., 2019). Both internalizing and externalizing behaviors, like discrimination, are associated with changes in amygdala volume and connectivity to regions implicated in emotion regulation (e.g., the PFC and ACC (Propp et al., 2025; Thijssen et al., 2021)), which may lead to increased reactivity to threat (Guyer et al., 2008; Thomas et al., 2024), potentially amplifying the effect of discrimination on the brain.

Some environmental factors may reduce the impact of discrimination, such as school environment and prosocial behavior. A school environment that promotes feelings of safety, teacher support, and opportunities for involvement may facilitate resilience (Luengo Kanacri et al., 2017; Luo et al., 2023; Manzano-Sánchez et al., 2021). However, there is a risk for increased exposure to discrimination in this environment which may mitigate this effect. Prosocial behaviors may also protect against the impact of discrimination (Flynn et al., 2014; Memmott-Elison et al., 2020; Sheikh et al., 2022), by facilitating social connection (Wang et al., 2024), which positively impacts the brain (Cutler & Campbell-Meiklejohn, 2019; Lockwood et al., 2022) and mental health (Sheikh et al., 2022). Social connection between peers belonging to similar racial, ethnic, or gender groups may

increase one's sense of belonging and identity, improving coping strategies and outcomes (Carter, 2007; Forsyth & Carter, 2012; Mekawi et al., 2022; Pieterse & Carter, 2010; Sellers & Shelton, 2003). A supportive school environment can foster these connections (Manzano-Sánchez et al., 2021). Therefore, school environment and prosocial behaviors should be considered when evaluating the impact of discrimination on the brain.

Other environmental factors like family conflict, language proficiency, and experienced traumatic events may exacerbate the influence of discrimination. Increased family conflict predicts poor mental health in adolescence (Sangalang et al., 2017; Scully et al., 2019), which may amplify the negative impact of discrimination on health overall (Kim et al., 2021; Lazarevic et al., 2021). Similarly, a lack of proficiency in the English language may increase the amount of discrimination one experiences (Back & Piekkari, 2024; Kubota et al., 2021; Tan et al., 2021), resulting in poor mental health outcomes, such as increased experienced distress, depression, and anxiety (Montemitro et al., 2021; Yoon et al., 2013). Additionally, experienced traumatic events may increase sensitivity to the effects of discrimination by overactivating stress-related brain regions like the amygdala, hippocampus, and PFC (Carter, 2007; Fani et al., 2021; Mekawi et al., 2021a), potentially exacerbating its impact on the brain. As a result, those who have experienced both trauma and discrimination often show greater PTSD symptoms like hyperarousal and intrusive stress symptoms (Carter, 2007; Clark et al., 1999; Mekawi et al., 2021a; Mekawi et al., 2021b). Disparities in experienced adversity between BIPOC and non-BIPOC children may explain observed neural differences between BIPOC and non-BIPOC populations (Dumornay et al., 2023; Fourie et al., 2019).

1.4. Present study

While much is known about how experiences of discrimination impact the brain in adulthood, little is known about its impact in childhood, in BIPOC and non-BIPOC populations. Given similarities observed between childhood and adulthood, we anticipated that discrimination would impact amygdala connectivity to regions in the DMN (Dong et al., 2023), SN (Clark et al., 2018; Masten et al., 2011), and thalamus (Clark et al., 2018; Webb et al., 2022) in childhood. Because prior research suggests associations in BIPOC individuals may differ due to increased rates of discrimination (Bleich et al., 2019; Nagata et al., 2021) and factors like adversity (Dumornay et al., 2023; Fourie et al., 2019), we also examined these associations in a sub-sample of BIPOC children. The current study utilized a large population-based sample from the Adolescent Brain and Cognitive Development (ABCD) Study® to examine associations between these specific amygdala connections and perceived discrimination (PD). The influence of behavioral and environmental factors, such as internalizing and traumatic events, on the resulting associations was also examined. Our study aims to add insight into the impact of early experiences of discrimination on the brain in early life. Prior associations between discrimination and amygdala connectivity have been studied primarily in adult populations with smaller sample sizes (Clark et al., 2018; Webb et al., 2022) which may have yielded inflated effect sizes (Marek et al., 2022). The larger sample size in the current study may allow us to generate more reproducible and generalizable results. Examining associations between discrimination and the brain in childhood may allow us to understand the mechanisms that contribute to its negative impact, allowing clinicians to improve and develop targeted interventions.

2. Methods and materials

2.1. Participants

Participants were drawn from the ongoing ABCD study, a large-scale study following 9- to 10-year-old children recruited from 21 sites across the United States (Casey et al., 2018). The study was approved by the Institutional Review Board at the University of California, San Diego. Informed consent was provided by parents and children. Data was accessed from the National Institutes of Mental Health Data Archives. A full sample of youth and (N = 4512) a subsample of BIPOC youth (N = 1567) was analyzed. Demographic data is provided in **Table S1** and **Table S2** in Supplementary Materials. Only subjects without missing data, and with resting state data that met the criteria listed below, were included in our study.

2.2. Perceived Discrimination

Experienced discrimination was measured using the Perceived Discrimination Scale (Phinney et al., 1998) at the one-year follow-up time point. Youth rated the extent to which they had experienced general discrimination over the past year across seven items on a five-point Likert scale, where higher scores indicated greater experienced discrimination.

2.3. MRI and fMRI data acquisition and processing

Resting-state functional magnetic resonance imaging (rsfMRI) data from the ABCD study from the baseline timepoint was sourced from NDA's collection 3165-DCAN Labs ABCD-BIDS (https://nda-abcd-collection-3165.readthedocs.io/latest/pipelines/#abcd-bids-fmri/), using the ABCD downloader (https://github.com/DCAN-Labs/nda-abcd-s3-downloader). Image acquisition details are available in Hagler et al. (2019). Data was processed through an adapted version of the HCP pipeline (Glasser et al., 2013) provided by the DCAN Lab (https://github.com/DCAN-Labs/abcd-hcp-pipeline). Additional details can be found here: (https://nda-abcd-collection-3165.readthedocs.io/). After processing, to minimize head motion-related artifacts, a framewise displacement threshold of 0.2 mm was applied, and frames exceeding the threshold were removed (Power et al., 2012). All data included in our analyses met the Data Analysis, Informatics & Resource Center's quality control conditions (https://abcdstudy.org/study-sites/daic/). Analyses were restricted to participants with at least 8 minutes of usable resting-state data.

2.4. Resting-state amygdala functional connectivity

Left and right amygdala regions of interest (ROIs) were extracted from the Gordon Parcellation, which consists of 333 cortical parcels across 13 resting-state networks (see Fig. 1A, Gordon et al., 2016) in addition to 19 subcortical ROIs (see Fig. 1B) and cerebellum for a total of 352 ROIS grouped into 14 networks (Miranda-Dominguez et al., 2018). Right and left amygdala ROIs were used as seed regions to correlate with all other regions from the Gordon parcellation, and correlation values between each amygdala ROI to all other ROIs were generated. Right and left amygdala connectivity was evaluated separately. In the current study, we chose to examine right and left amygdala connectivity to the DMN, SN, and thalamus based on previous literature indicating these connections may be impacted by experienced discrimination.

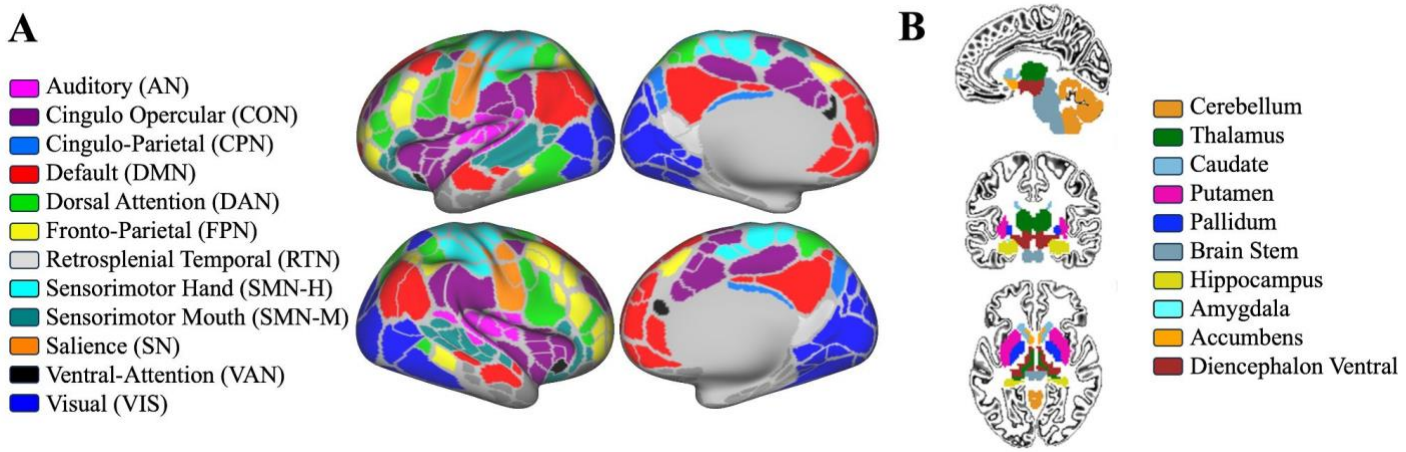

Fig 1. Cortical and subcortical parcellation schema **A.** Gordon Parcellation ROIs (Gordon et al., 2016) color-coded by functional network. **B.** Subcortical volume ROIs.

3. Statistical analyses

Linear mixed-effects models were used to identify associations between amygdala connections and PD. We evaluated left and right amygdala connectivity in two separate models. Each model included connectivity to the right and left thalamus, and all nodes in the SN and DMN. Participants with any missing data were excluded from analyses. Sex, race/ethnicity, age, handedness, parental education, puberty status, and scanner ID were included as fixed effects, with family nested in scanner type included as a random effect. All resulting p-values were FDR corrected.

4. Results

4.1. Amygdala connectivity is associated with perceived discrimination

We examined the relationship between PD right and left amygdala connections to the SN, DMN, and right and left thalamus, as indicated above, from the full youth sample and BIPOC subsample. In our full sample, results showed a significant negative association between PD and right amygdala connectivity to the right thalamus ($\beta = -0.02$ and $p < .05$), indicating lower connectivity between the right amygdala and right thalamus was linked to greater experienced discrimination (see Fig. 2). Additionally, a negative trend-level association was observed between PD and right amygdala connectivity to the left thalamus ($\beta = -0.01$ and $p < 0.1$) such that lower connectivity was associated with greater experienced discrimination. Furthermore, a positive trend-level association was observed between PD and right amygdala connectivity to a DMN region (L ventromedial PFC [vmPFC], $\beta = 0.02$ and $p < 0.1$), such that greater connectivity was associated with greater experienced discrimination.

Within the BIPOC subsample, a positive trend-level association was found between PD and right amygdala connectivity with an SN node in the L ACC ($\beta = 0.02$, $p < .1$), indicating increased connectivity between the right amygdala and L ACC was linked to greater experienced discrimination (see Fig. 3). Additionally, a positive trend level association between PD and left amygdala connectivity to a DMN region (L angular gyrus, $\beta = 0.02$, $p < .1$) and a negative trend level association between left amygdala connectivity to the left thalamus ($\beta = -.02$, $p < .1$) were found. Thus, greater experienced discrimination was linked to increased left amygdala-L angular gyrus connectivity and decreased left amygdala-left thalamus connectivity (see Fig. 3).

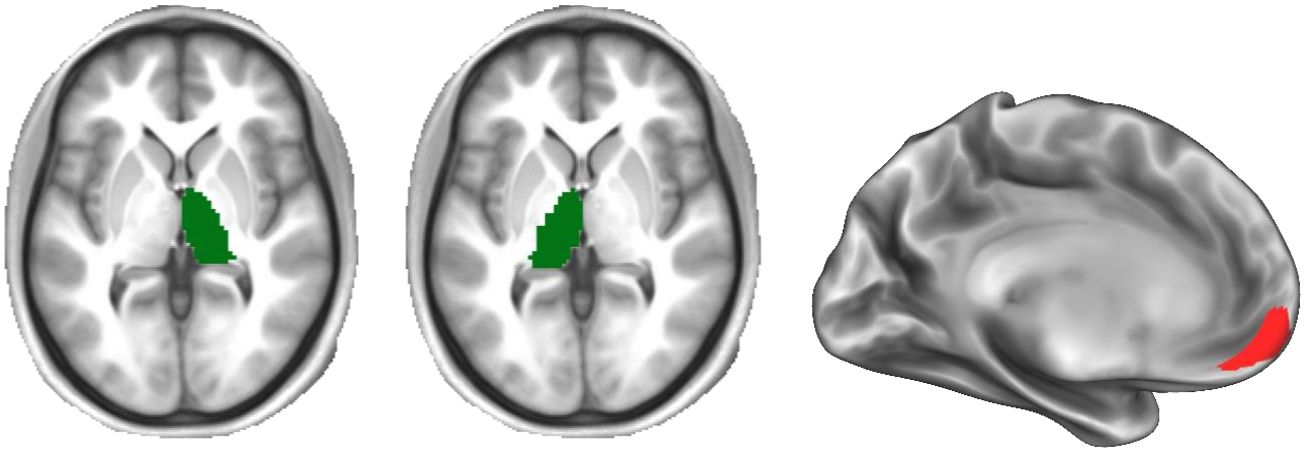

Fig 2. Right amygdala connections significantly associated with PD in the full sample. Colors represent subcortical thalamus (green) and cortical DMN (red) regions.

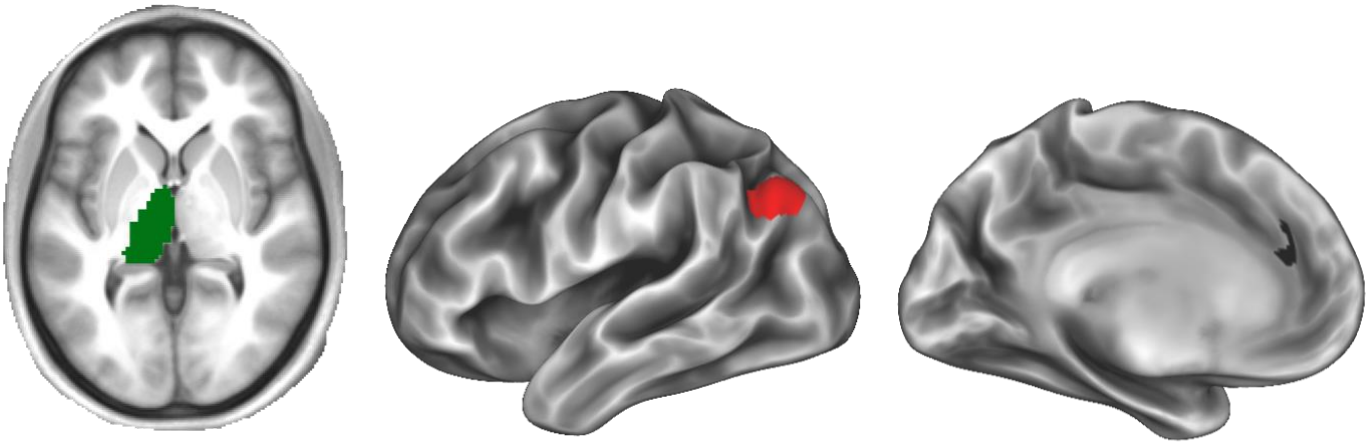

Fig 3. Amygdala connections associated with PD at a trend level ($p < .1$) in the BIPOC sample. Colors represent left amygdala-left thalamus (green) and left amygdala-left cortical DMN (red) and right amygdala-left SN (black) regions.

4.2. Traumatic events moderated the relationship between amygdala connections and perceived discrimination

Behavioral and environmental factors that may impact associations found between amygdala connectivity and PD were examined as potential moderators in a series of secondary analyses. Separate models examined internalizing, externalizing, traumatic events experienced, English proficiency, prosocial behavior, family environment, and school environment as potential moderators through the creation of interaction terms. Information about how these measures were collected can be found in our *Supplementary Materials*. Separate models were run for each amygdala connection with significant or trend-level ($p < .1$) associations with PD in both full and BIPOC samples. All analyses included sex, race/ethnicity, age, handedness, parental education, puberty status, and scanner ID as fixed effects with family nested in scanner type included as a random effect (FDR correction: $p < .05$). The following model was run for each variable to test the degree with which each variable moderated the relationship between each amygdala connection and PD:

Amygdala connectivity = intercept + d_1 + β_1(Sex) + β_2(Race/Ethnicity) + β_3(Age) + β_4(Handedness) + β_5(Parental Education) + β_6(Puberty Status) + β_7(Scanner ID) + β_8(Main Effect) + β_9(moderating variable x PD) + e,

where d_1 represents random effects, e represents error, and β represents the weighted contribution of each variable.

Results indicated that traumatic events significantly moderated the association between amygdala connectivity to the left ACC and PD in our BIPOC subsample. Specifically, BIPOC children with higher experiences of traumatic events had stronger negative associations between experienced discrimination and right amygdala connectivity to the left ACC ($\beta = -.03$, $p < .05$). Other factors examined did not moderate associations between amygdala connectivity and PD.

5. Discussion

5.1. Summary of results

The current study examined associations between amygdala connectivity and PD in a full sample and BIPOC subsample of children. In a series of secondary analyses, the potential influence of behavioral and environmental factors on associations present at least at a trend level ($p < .1$) were also examined. Our study revealed distinct relationships between amygdala connectivity and PD in the full sample versus BIPOC subsample of youth. In our full sample, stronger right amygdala connectivity to the right thalamus was significantly associated with lower levels of PD. However, only trend-level associations were found in our BIPOC subsample. In this subsample, traumatic events significantly moderated a positive trend-level association between right amygdala-left ACC connectivity and PD, such that greater experienced trauma predicted stronger positive associations between this connection and PD. Our results suggest distinct amygdala connections relate to experienced discrimination in BIPOC children, where experiences of traumatic events may further impact observed effects on this population. Broadly, our results may indicate discrimination has unique effects on minoritized populations.

5.2. Amygdala connectivity to thalamus linked to discrimination in full sample

In our full sample, greater PD was significantly linked to decreased right amygdala connectivity to the right thalamus ($p < .05$) and left thalamus at a trend level ($p < .1$). In adulthood, this connectivity pattern has been associated with lower responsivity to threat (Jenks et al., 2020; Geng et al., 2018), which may suggest children who are less likely to respond to threats experience more discrimination. Interestingly, this association contrasts with the literature in adults, which indicates that greater amygdala-thalamus activity is linked to greater experienced discrimination (Clark et al., 2018; Webb et al., 2022). However, decreased amygdala-thalamus connectivity has been linked to PTSD symptomatology (Zhu et al., 2016), and studies suggest discrimination may heighten post-traumatic stress symptoms (Bird et al., 2021; Bogart et al., 2012; Harb et al., 2023). This could potentially indicate that children with this connectivity pattern may be at risk for developing these symptoms.

In our full sample, greater PD was also linked to increased amygdala connectivity to the vmPFC. In adulthood, this connection predicts increased emotion regulation (Suzuki & Tanaka, 2021); however, this association may differ earlier in life, as patterns of amygdala connectivity change from childhood into adulthood (Gabard-Durnam et al., 2014; Gee et al., 2013; Perlman & Pelphrey, 2011). This may suggest that experiences of discrimination negatively impact emotion regulation in childhood via this neural circuitry.

5.3. Amygdala connectivity not significantly associated with discrimination in BIPOC sample

In our BIPOC sub-sample, trend-level associations were found between amygdala connectivity and PD. Greater experienced discrimination predicted stronger amygdala connectivity to a DMN region (angular gyrus) and SN region (ACC), and lower amygdala connectivity to the thalamus. In line with prior research, the SN and DMN have been significantly associated with discriminatory experiences (Dong et al., 2023; Elbasheir et al., 2024; Webb et al., 2022) in BIPOC adults. Similar to results in our full sample, these patterns may relate to alterations in threat response and affective processing (Jenks et al., 2020; Geng et al., 2018; Satpute & Lindquist, 2020; Schimmelpfennig et al., 2023). Unlike our full sample, we did not see a significant association between amygdala-thalamus connectivity and experienced discrimination, though a similar trend-level association was found, where greater connectivity was linked to lower discrimination. Our lack of significant findings may be explained by reduced statistical power, as our BIPOC sample size did not meet the recommended minimum for brain-wide association studies (Marek et al., 2022). Decreased between-group variance and the restricted range of discrimination scores within the BIPOC group may also explain the absence of significant associations.

5.4 Traumatic events moderated association between amygdala-ACC connectivity and discrimination in BIPOC sample

In a series of secondary analyses, behavioral (internalizing and externalizing) and environmental (school environment, prosocial behavior, English proficiency, traumatic events, and family conflict) factors were considered as potential moderators.

In our BIPOC sub-sample, experienced traumatic events moderated the relationship between amygdala connectivity to the ACC and PD, indicating that positive associations between discrimination and amygdala-ACC coupling strengthened as traumatic events experienced increased. The ACC and amygdala have often been implicated in PTSD (Felmingham et al., 2007; Harnett et al., 2023; Wolf & Herringa, 2016). Increased connectivity between these structures has been associated with greater PTSD symptoms in Black adults (Harnett et al., 2023), suggesting experiences of discrimination increase risk for developing these symptoms (Bird et al., 2021) in BIPOC individuals. Our results may indicate that discrimination-related stress in BIPOC children contributes to cumulative trauma, resulting in greater impacts on the brain, especially in regions relevant for emotional regulation and salience detection.

While not significant moderators, significant correlations were observed between PD and our environmental and behavioral factors (see **Table S2** and **Table S3)**. Significant positive correlations were seen between PD and both internalizing and externalizing behaviors in both of our samples, where individuals with more experienced discrimination exhibited greater internalizing and externalizing behaviors. While associations between amygdala connectivity and internalizing (Oshri et al., 2024; Padgaonkar et al., 2020; Rogers et al., 2017) and externalizing (Cardinale et al., 2018; Cheetham et al., 2018; Thijssen et al., 2021) have been established in many studies, connectivity may be linked to specific subtypes of these behaviors as opposed to the overall constructs (Thomas et al., 2024).

From the analyzed environmental variables, significant negative correlations were found between PD and school environment, prosocial behavior, and English proficiency in both samples. This may suggest that individuals in more supportive school environments exhibit more prosocial behavior, which facilitates social connection and resilience. Further, individuals with greater English language proficiency may experience less discrimination (Back & Piekkari, 2024; Kubota et al., 2021; Tan et al., 2021). Additionally, family conflict was positively correlated with PD, suggesting increased conflict in the home was related to greater experienced discrimination. Interrelations between school environment, prosocial behavior, language proficiency, and family

conflict, and lack of variability within these measures may explain why these factors did not individually moderate relationships between PD and the brain.

6. Limitations/Future directions

While the current study provides insight into the associations between amygdala connectivity and PD, several limitations must be acknowledged. First, relatively low variability in discrimination scores and our tested moderators may have hindered our ability to detect significant associations. Further, while experienced discrimination can be measured in childhood (Brody et al., 2006; Dulin-Keita et al., 2011; Scott et al., 2023), our measure was based on the ABCD race and ethnicity classification (Garavan et al., 2018) recommended by the NIH at the time of data collection, which may not have been the best fit for this time point (Braddock et al., 2021). Additionally, because our BIPOC subsample was created by excluding participants categorized as white, individuals of Arab, Middle Eastern, and North African descent, who may identify as people of color, were likely not included. Multiracial individuals were also not considered, as no multiracial option was provided in our racial and ethnic classification variable. Expanding racial and ethnic classifications in future studies and prioritizing the recruitment of diverse populations will allow researchers to better examine how racial discrimination contributes to discrepancies in health outcomes (Fleischer et al., 2024). The relationship between discrimination and brain connectivity may also be impacted by other factors, like additional chronic stressors, coping strategies, and social support. Future studies should consider such factors. Lastly, this study lacks in its ability to assess longitudinal alterations in neural connectivity related to PD over time. Future research should address associations between amygdala connectivity and PD using future longitudinal data from the ABCD Study.

Our study underscores the impact of experienced discrimination on neural connectivity and emphasizes the importance of addressing discrimination and trauma in minoritized youth, like BIPOC individuals who may face compounded stressors. Understanding these associations will provide a foundation for developing interventions, such as family-centered prevention programs (Brody et al., 2021), to mitigate the effects of discrimination on future health outcomes.

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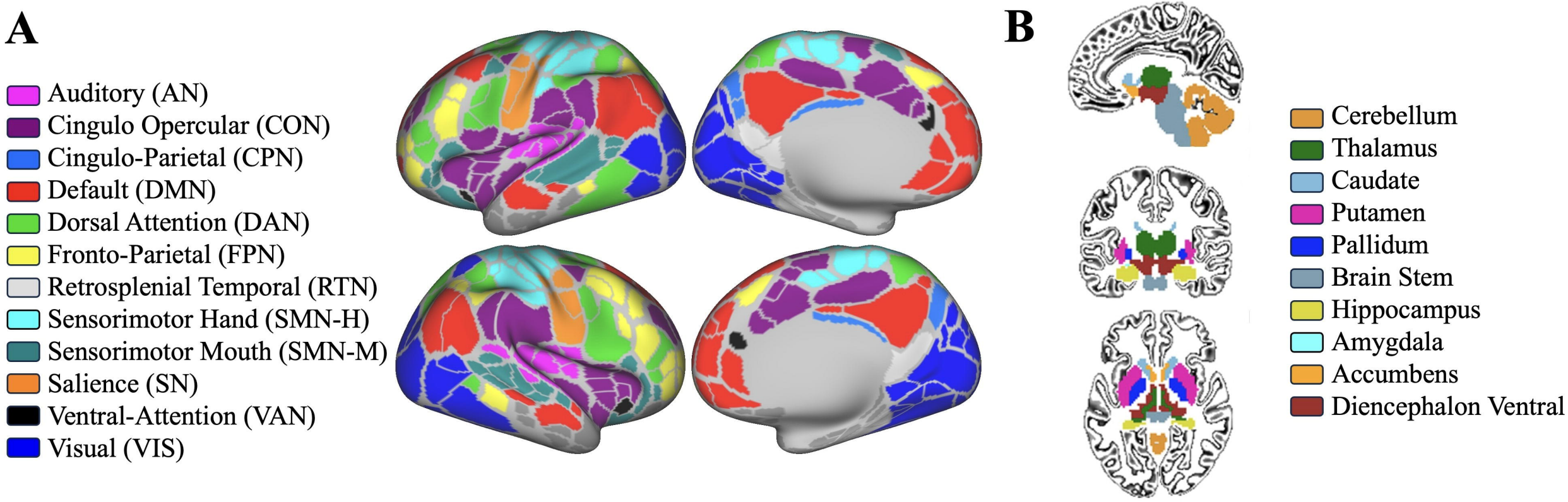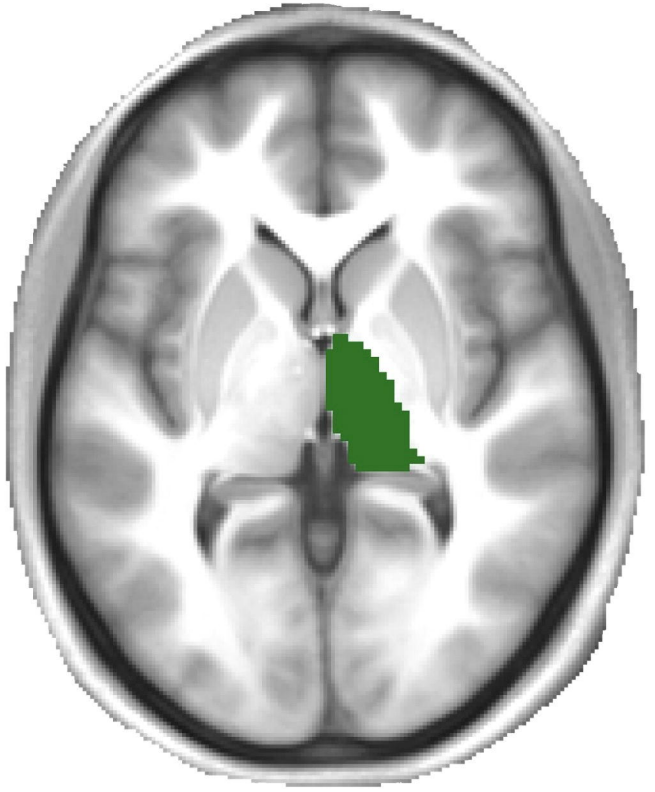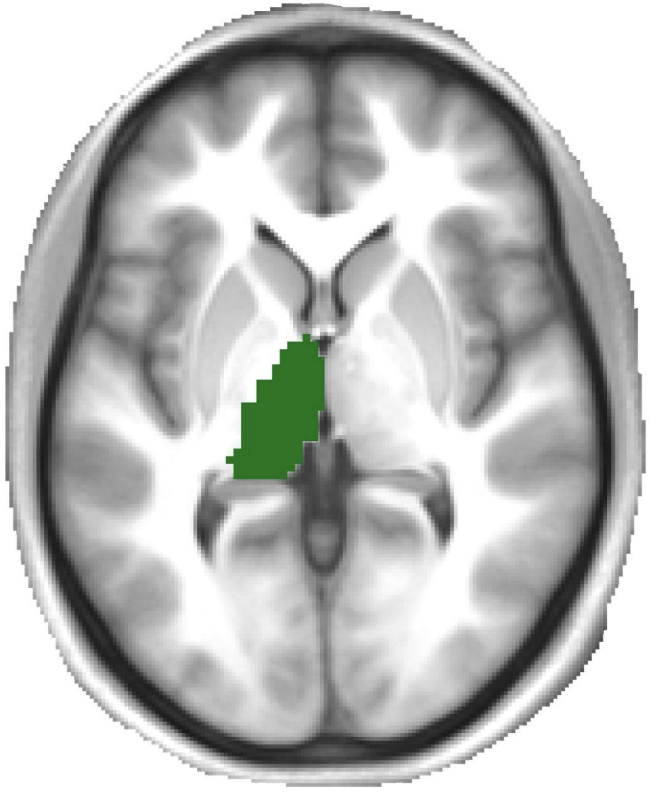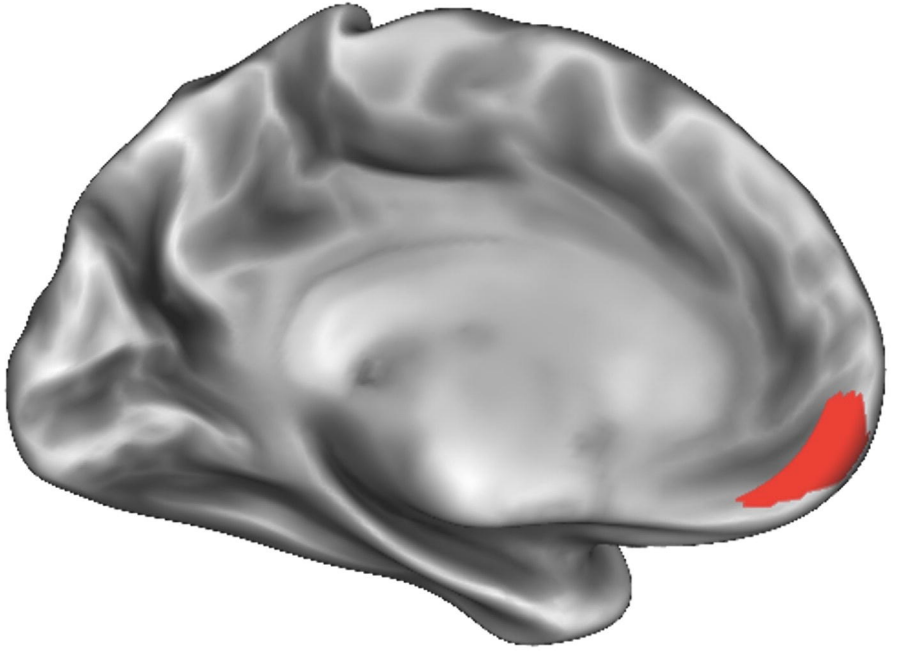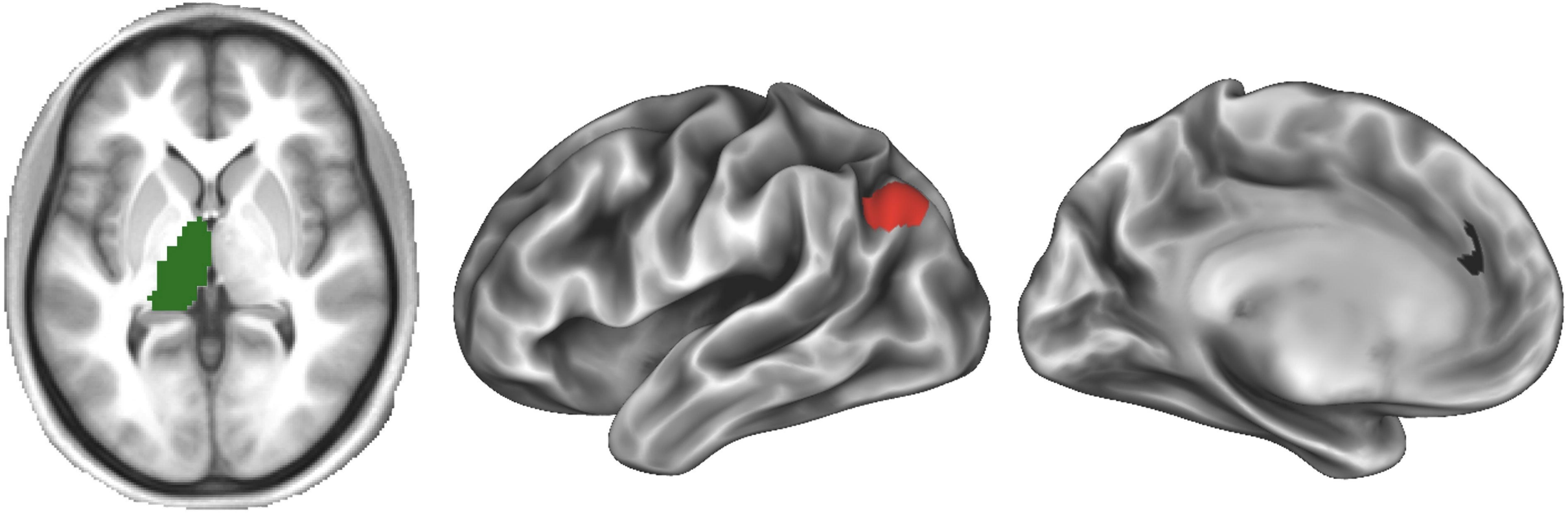
A
Auditory (AN)
Cingulo Opercular (CON)
Cingulo-Parietal (CPN)
Default (DMN)
Dorsal Attention (DAN)
Fronto-Parietal (FPN)
Retrosplenial Temporal (RTN)
Sensorimotor Hand (SMN-H)
Sensorimotor Mouth (SMN-M)
Salience (SN)
Ventral-Attention (VAN)
Visual (VIS)
B
Cerebellum
Thalamus
Caudate
Putamen
Pallidum
Brain Stem
Hippocampus
Amygdala
Accumbens
Diencephalon Ventral