

White matter alterations and the conversion to psychosis: a combined diffusion tensor imaging and glutamate ¹H MRS study

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Supplementary Material

Supplementary Table 1. Fractional anisotropy in clinical high-risk individuals that transitioned to psychosis, individuals that did not transition and healthy controls.

Region of Interest	Mean FA (\pm SD)			Statistics
	CHR-T	CHR-N	Controls	
Whole-brain FA Average	0.48 (0.024)	0.48 (0.013)	0.48 (0.011)	$F_{[2, 67]} = 0.39, p = 0.68$
Genu of Corpus Callosum	0.72 (0.022)	0.72 (0.023)	0.71 (0.025)	$F_{[2, 67]} = 1.48, p = 0.23$
Body of Corpus Callosum	0.67 (0.045)	0.68 (0.031)	0.68 (0.030)	$F_{[2, 67]} = 0.36, p = 0.70$
Splenium of Corpus Callosum	0.77 (0.022)	0.78 (0.019)	0.78 (0.024)	$F_{[2, 67]} = 0.33, p = 0.72$
Corpus Callosum	0.72 (0.022)	0.73 (0.018)	0.72 (0.019)	$F_{[2, 67]} = 0.68, p = 0.51$
Corona Radiata	0.52 (0.036)	0.51 (0.015)	0.52 (0.017)	$F_{[2, 67]} = 0.28, p = 0.78$
Fornix	0.49 (0.056)	0.49 (0.035)	0.49 (0.031)	$F_{[2, 67]} = 0.33, p = 0.72$
Corticospinal Tract	0.63 (0.050)	0.61 (0.030)	0.61 (0.027)	$F_{[2, 67]} = 1.03, p = 0.36$
Anterior Limb of Internal Capsule	0.59 (0.024)	0.60 (0.026)	0.60 (0.026)	$F_{[2, 67]} = 0.57, p = 0.57$

Internal Capsule	0.64 (0.026)	0.64 (0.017)	0.64 (0.021)	$F_{[2, 67]} = 0.07, p = 0.93$
Posterior Limb of Internal Capsule	0.71 (0.039)	0.71 (0.021)	0.70 (0.024)	$F_{[2, 67]} = 0.90, p = 0.41$
Retrolicular part of Internal Capsule	0.62 (0.032)	0.61 (0.023)	0.61 (0.023)	$F_{[2, 67]} = .57, p = 0.57$
Anterior Corona Radiata	0.50 (0.046)	0.49 (0.024)	0.50 (0.023)	$F_{[2, 67]} = 0.63, p = 0.53$
Superior Corona Radiata	0.53 (0.043)	0.52 (0.020)	0.52 (0.022)	$F_{[2, 67]} = 0.17, p = 0.84$
Posterior Corona Radiata	0.52 (0.027)	0.53 (0.020)	0.53 (0.020)	$F_{[2, 67]} = 1.29, p = 0.28$
Posterior Thalamic Radiation	0.61 (0.029)	0.64 (0.021)	0.63 (0.025)	$F_{[2, 67]} = 3.44, p = 0.04$ ^{a, b}
Sagittal Stratum	0.56 (0.021)	0.57 (0.030)	0.57 (0.022)	$F_{[2, 67]} = 0.29, p = 0.75$
External Capsule	0.50 (0.020)	0.51 (0.017)	0.51 (0.018)	$F_{[2, 67]} = 1.11, p = 0.34$
Cingulum	0.62 (0.030)	0.63 (0.024)	0.64 (0.038)	$F_{[2, 67]} = 2.27, p = 0.11$
Cingulum (Hippocampal portion)	0.53 (0.051)	0.53 (0.036)	0.55 (0.043)	$F_{[2, 67]} = 1.93, p = 0.15$
Fornix Stria Terminalis	0.57 (0.046)	0.57 (0.027)	0.57 (0.036)	$F_{[2, 67]} = 0.20, p = 0.81$
Superior Longitudinal Fasciculus	0.53 (0.019)	0.53 (0.020)	0.57 (0.034)	$F_{[2, 67]} = 0.97, p = 0.38$
Superior Fronto-Occipital Fasciculus	0.55 (0.032)	0.55 (0.036)	0.55 (0.038)	$F_{[2, 67]} = 0.01, p = 0.99$
Inferior Fronto-Occipital Fasciculus	0.51 (0.058)	0.53 (0.036)	0.53 (0.036)	$F_{[2, 67]} = 1.47, p = 0.24$
Uncinate	0.60 (0.041)	0.59 (0.048)	0.60 (0.037)	$F_{[2, 67]} = 0.15, p = 0.86$

Significant post hoc pair-wise comparisons with Bonferroni correction ($p < 0.05$) are indicated: ^a CHR-T < CHR-N, ^b CHR-T < Healthy controls. CHR-T, Clinical high risk that transitioned to psychosis; CHR-N, Clinical high risk that did not transition to psychosis; FA, Fractional anisotropy.

Supplementary Table 2. Relationships between fractional anisotropy values and glutamate levels in clinical high-risk individuals that transitioned to psychosis, individuals that did not transition and healthy controls.

Region of Interest	Glutamate levels		
	Pearson r (p Value)		
	CHR-T	CHR-N	Controls
Whole-brain FA Average	0.51 (0.30)	0.26 (0.19)	0.17 (0.31)
Genu of Corpus Callosum	0.28 (0.59)	0.27 (0.18)	0.25 (0.13)
Body of Corpus Callosum	-0.79 (0.06)	-0.17 (0.42)	0.24 (0.14)
Splenium of Corpus Callosum	-0.09 (0.86)	-0.05 (0.82)	0.09 (0.59)
Corpus Callosum	-0.53 (0.28)	-0.12 (0.58)	0.28 (0.09)
Corona Radiata	0.79 (0.06)	0.01 (0.98)	0.04 (0.82)
Fornix	-0.53 (0.28)	0.04 (0.85)	0.08 (0.65)
Corticospinal Tract	-0.22 (0.67)	-0.01 (0.98)	0.25 (0.13)
Anterior Limb of Internal Capsule	0.10 (0.84)	-0.09 (0.67)	0.09 (0.61)
Internal Capsule	0.58 (0.23)	-0.04 (0.88)	0.09 (0.59)
Posterior Limb of Internal Capsule	0.36 (0.48)	0.14 (0.49)	0.17 (0.31)
Retrolicular part of Internal Capsule	0.89 (0.02)	-0.09 (0.66)	-0.02 (0.89)
Anterior Corona Radiata	0.58 (0.22)	-0.05 (0.83)	-0.01 (0.99)
Superior Corona Radiata	0.81 (0.05)	0.01 (0.99)	0.09 (0.61)
Posterior Corona Radiata	0.79 (0.06)	0.06 (0.77)	0.01 (0.98)

Posterior Thalamic Radiation	0.88 (0.02)	0.02 (0.94)	0.09 (0.63)
Sagittal Stratum	0.75 (0.08)	-0.07 (0.74)	-0.06 (0.72)
External Capsule	0.01 (0.99)	-0.04 (0.85)	-0.13 (0.44)
Cingulum	-0.83 (0.04)	-0.29 (0.15)	0.02 (0.90)
Cingulum (Hippocampal portion)	0.05 (0.92)	0.05 (0.82)	0.14 (0.41)
Fornix Stria Terminalis	-0.44 (0.39)	-0.11 (0.59)	0.13 (0.45)
Superior Longitudinal Fasciculus	0.71 (0.11)	-0.07 (0.79)	0.13 (0.44)
Superior Fronto-Occipital Fasciculus	0.32 (0.53)	-0.31 (0.14)	0.04 (0.83)
Inferior Fronto-Occipital Fasciculus	0.03 (0.95)	0.06 (0.78)	-0.01 (0.97)
Uncinate	0.68 (0.14)	-0.09 (0.67)	0.27 (0.10)

Significant correlations ($p < 0.05$) are indicated. CHR-T, Clinical high risk that transitioned to psychosis; CHR-N, Clinical high risk that did not transition to psychosis; FA, Fractional anisotropy.

Supplementary Table 3. Voxel tissue composition and spectral quality values in clinical high risk individuals that did not transition, individuals that transitioned to psychosis and healthy controls.

Measure	Mean (\pm SD)			Statistic
	Healthy Controls	CHR- N	CHR-T	
Glutamate levels (I.U.)	8.29 (0.79)	8.38 (0.93)	8.27 (1.16)	$F_{[2, 66]} = 0.10, p = 0.91$
Voxel grey matter fraction	0.17 (0.05)	0.18 (0.06)	0.20 (0.11)	$F_{[2, 66]} = 0.44 p = 0.65$
Voxel white matter fraction	0.81 (0.05)	0.81 (0.06)	0.80 (0.11)	$F_{[2, 66]} = 0.31 p = 0.73$
Voxel cerebrospinal fluid fraction	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)	$F_{[2, 66]} = 0.95 p = 0.39$
Signal-to-noise ratio	16.32 (2.29)	17.19 (3.06)	15.67 (3.33)	$F_{[2, 66]} = 1.19 p = 0.31$
FWHM	0.057 (0.01)	0.057 (0.01)	0.058 (0.02)	$F_{[2, 66]} = 0.05 p = 0.95$

CHR-N, Clinical high risk that did not transition to psychosis; CHR-T, Clinical high risk that transitioned to psychosis; I.U., Institutional units; FWHM, Full-width at half maximum.