Seed-Based and Independent Component Based Analyses on Polyvictimization in Adolescents Associated with Functional Connectivity

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INTRODUCTION

Victimization in Adolescents

- Victimization exposures in adolescence have been demonstrated to have a causal relationship with adverse outcomes, such as mental health problems and neurobiological consequences
- Unfortunately, 71% of children and youth in a national sample reported that they had experienced victimizations, and 69% of them had been exposed to at least one different type of victimization in a different episode within one year

Polyvictimization

- Exposures to more than one victimization categories are defined as polyvictimization
- Adolescents who have been exposed to polyvictimization are at high risk for developing more severe consequences compared to other adolescents, such as PTSD, trauma, and depression, and the adverse impacts are in a longer term

Neuroimaging

- Resting-state functional magnetic resonance imaging (rsfMRI) is often utilized in research to examine the blood oxygen level-dependent (BOLD) signal as a neuro-physiological indicator, which displays spontaneous low-frequency fluctuations in the resting brain
- The fluctuations indicate a high degree of temporal correlation across brain regions, demonstrating structural connectivity and potential functional brain neural networks

Methods

Characteristic	Category	Total (N = 97)
Age	Mean (SD)	13.21 (2.31)
Biological Sex	Female (%)	41.24%
Race	White (%)	68.04%
Medication	On Medication (%)	36.08%
Victimization Status	Poly-Victimization (%)	74.23%
	Single Victimization (%)	14.43%
	Non-Victimization (%)	11.34%

Data

- Data: *N* = 100 adolescents, consisting of 41 females, with a mean age of 12.7 years (*SD* = 2.3, range = 9-16 years)
- Exclusion criteria: MRI contraindications, a history of head injury, an IQ < 80, lifetime or current DSM-IV-TR Axis I psychotic disorder, and current major depressive disorder, bipolar disorder, PTSD, or substance dependence

JVQ

- The study utilized the 34-item Juvenile Victimization Questionnaire (JVQ) to measure the participants' exposure to victimization across five categories, including conventional crime, child maltreatment, peer and sibling victimization, sexual victimization, and witness and indirect victimization
- The total number of JVQ subscales exposed was added in total (range 0-5) to define non-victimization (with value 0), single victimization (with value 1), and polyvictimization (with value > 1)

RESULTS

Seed-Based (ROI) Analysis

ROIs' Significant (*p-value* < 0.05) Association Results with Victimization Score

Network	ROI-ROI	Correlation (*p-value*)	ROI-ROI Visualization
Within DMN	mPFC – LP_L	-0.2096 (0.0393)	
Within SN	ACC – rPFC_L	0.2086 (0.0403)	
DMN - SN	mPFC – SMG_R	-0.3618 (0.0003)	
DMN - SN	LP_L – SMG_R	-0.2346 (0.0207)	
DMN - SN	mPFC – AI_R	-0.2241 (0.0273)	
DMN - SN	LP_R – rPFC_L	-0.2092 (0.0397)	
DMN - SN	LP_L – rPFC_L	-0.2069 (0.0421)	

ROIs' Significant (*p-value* < 0.05) t-test results

Group	Network	ROI-ROI	t-statistic (*p-value*)	ROI-ROI Visualization
Single vs Poly	DMN - SN	LP_L – rPFC_R	-2.9675 (0.0039)	
Single vs Poly	DMN - CEN	LP_L – PPC_L	2.0410 (0.0444)	
Single vs Poly	Within SN	ACC – rPFC_L	-2.0336 (0.0451)	

Independent Component Analysis

Fig 1. Significant (*p-value* < 0.05) IC Association with Victimization Score Results

Independent Component Features					
Average Amplitude	Standard Deviation		Energy		
	IC 38	0.2751 (0.0064)	IC 20	0.2489 (0.0139)	
	IC 20	0.2335 (0.0214)	IC 38	0.2475 (0.0145)	
	IC 12	0.2153 (0.0342)	IC 3	0.2059 (0.0430)	
	IC 18	0.2129 (0.0363)	IC 1	0.2014 (0.0479)	
	IC 1	0.2046 (0.0444)			
	IC 40	0.2043 (0.0447)			
	IC 30	0.2002 (0.0492)			

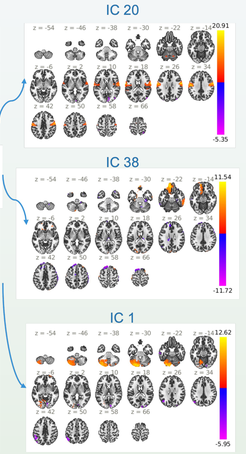


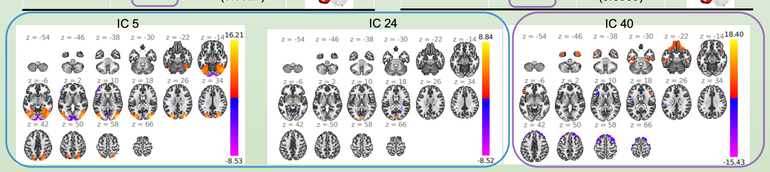
Fig 2. IC's Standard Deviation and Energy significant (*p-value* < 0.05) t-test results among Non-Vic, Single-Vic, and Poly-Vic group

Standard Deviation t-test Result

Group	IC #	t-statistic (*p-value*)	IC Visualization
Single vs Poly	IC 5	2.4226 (0.0176)	
Non vs Poly	IC 30	-2.0317 (0.0455)	
	IC 40	-2.5892 (0.0114)	
Non vs Single	IC 24	-2.2932 (0.0313)	
	IC 40	-3.3592 (0.0027)	

Energy t-test Result

Group	IC #	t-statistic (*p-value*)	IC Visualization
Single vs Poly	IC 5	2.7292 (0.0077)	
Non vs Poly	IC 22	2.0878 (0.0400)	
	IC 40	-2.4123 (0.0181)	
Non vs Single	IC 24	-2.1401 (0.0432)	
	IC 40	-3.2033 (0.0039)	



SVM Prediction Results with IC Features

IC Features	10-Fold CV Accuracy (Standard Deviation)
Average Amplitude	0.7433 ± 0.0440
Standard Deviation	0.5789 ± 0.0751
Energy	0.6922 ± 0.0725

ACKNOWLEDGMENTS

Special thanks to Dr. Aysenil Belger and Josh Bizzell for making this idea possible. Thanks to all the members in the UNC Neurocognition and Imaging Research Lab for their guidance and support throughout my undergraduate journey.