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CEREBRAL MORPHOLOGICAL DIFFERENTIATION BETWEEN CANNABIS ABUSERS WITH AND WITHOUT PSYCHIATRIC DISORDERS: A PILOT MRI STUDY

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Background

Nowadays, cannabis is one the most abused drug worldwide and its consume can both induce psychiatric symptoms in otherwise healthy subjects and unmask a florid psychotic picture in patients with a prior psychotic risk. Previous studies suggest that chronic and long term cannabis exposure may exert significant negative effects in brain areas enriched with cannabinoid receptors. However, whether brain alterations determined by cannabis abuse and highlighted by neuroimaging investigations will lead to a clinically significant phenotype or to a psychotic outbreak at some point of an abuser's life still remains unclear.

Objectives

The aim of this study was a) to investigate the effect of cannabis abuse on brain morphology in substance-induced psychosis (SIP) patients and cannabis abusers without a psychiatric condition and b) to correlate brain deficits with selective socio-demographic, clinical and psychosocial variables.

Methods

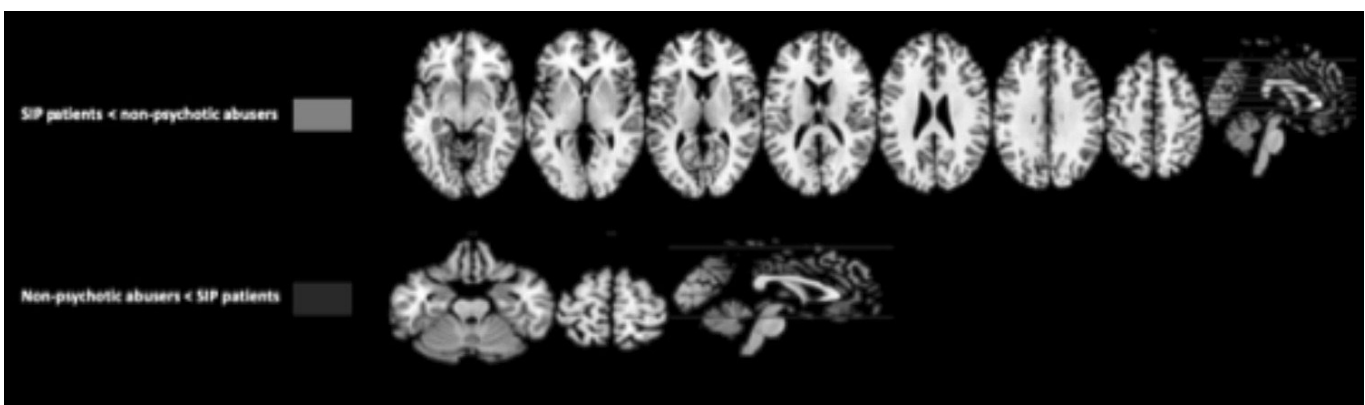
Ten SIP patients and twelve cannabis abusers without psychosis were recruited. The type of drug, the frequency and the duration, as well socio-demographic, clinical and psychosocial parameters of abuse were measured. All subjects underwent 3-T magnetic resonance imaging (MRI) scans.

Resultd

SIP patients had extensive grey matter (GM) reduction in several brain regions that are part of the prefronto-temporo-limbic network. Specifically, compared to non-psychotic abusers, they showed significant GM reduction in medial prefrontal cortex bilaterally, right superior frontal gyrus, right precentral, middle temporal gyrus bilaterally, right superior temporal gyrus, insula bilaterally, right precuneus, right medial occipital gyrus, right fusiform gyrus and left hippocampus. Furthermore, the group of non-psychotic abusers showed significant GM reductions compared to SIP patients in medial prefrontal gyrus and right cerebellum ($p < 0.001$ uncorrected; Table 1, Figure 1). Finally, in SIP patients, our results showed a negative correlation between a domain of the Brief Psychiatric Rating Scale (BPRS), BPRS-Activity, and selective GM volumes within left superior temporal cortex and left cerebellum. Moreover, the same scale was positively correlated with cuneus bilaterally, left inferior occipital gyrus, right inferior parietal lobule, right superior prefrontal cortex (all $p < 0.05$ FWE corrected).

Coclusions

Overall, our results suggest that cannabis abuse may play a critical role in favouring psychotic symptoms by affecting selective brain structures. Therefore, it seems mandatory to clarify which aspects of cannabis exposure (e.g., age at initiation, quantity, frequency, and duration) determine the greatest risk for the progression towards a cannabis use disorder or a psychiatric condition, such as the development of psychotic-related disorders. Finally, neuroimaging studies may pro-



vide a solid ground for identifying putative biomarkers associated with substance abuse, which may ultimately

help clinicians to detect those cannabis users at most risk of developing psychosis.

Table 1. VBM results. Brain regions showing significant reduced GM volumes between the SIP patients and subjects with cannabis abuse but no psychiatric condition ($P < 0.001$ uncorrected).

Gyrus	BA	Laterality	MNI coordinates			Cluster size	z-values
			x	y	z		
SIP patients < non-psychotic abusers							
Medial Frontal	10	Right	42	54	-3	22	4.0
Medial Frontal	10	Left	-10	65	12	23	3.4
Superior Frontal	10	Right	13	65	22	38	3.4
Precentral	4	Right	59	-5	26	61	3.8
Superior Temporal	22	Right	62	-7	3	146	4.2
Medial Temporal	21	Right	58	-50	-3	28	3.9
Medial Temporal	21	Left	-59	-33	0	26	3.7
Insula	13	Right	36	-21	13	142	4.1
Insula	13	Left	-33	-23	14	32	3.8
Precuneus	7	Right	6	-66	50	24	3.5
Medial Occipital	19	Right	33	-86	21	80	4.0
Fusiform	37	Left	-25	-47	-8	32	3.7
Hippocampus	-	Left	-33	-22	-5	36	3.8
Non-psychotic abusers < SIP patients							
Medial Frontal	6	Left	-7	19	62	28	4.3
Cerebellum	-	Right	21	-81	-15	28	4.1

BA (Brodmann area); SIP (Substance-Induced Psychosis); MNI (Montreal Neurological Institute)