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Data Article

Low entropy maps as patterns of the pathological alteration specificity of brain regions: A meta-analysis dataset

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ABSTRACT

The data presented in this article are related to the research article entitled "The alteration landscape of the cerebral cortex" (Cauda et al., 2018). Here, we applied a metric called alteration negentropy (A-negentropy) on a large human neuroimaging dataset, in order to denote the "low structural alteration variety" of the altered brain areas. Furthermore, we reported the overview of the selection strategy, as well as the description and distribution of the selected studies from the voxel-based morphometry database of BrainMap (Vanasse et al., 2018). For all of the analyzed brain areas, we reported the number of pathologies affecting them (both local maxima and mean value), as well as the peak and average values of A-negentropy. Regions altered by a small number of brain disorders exhibit high values of A-negentropy.

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Specifications table

Subject area	*Neuroscience*
More specific subject area	*Transdiagnostic Neuroscience*
Type of data	*Table, figure*
How data were acquired	*Data were acquired until March 2016 from BrainMap database using the software application Sleuth 2.4* (http://brainmap.org/sleuth/).
Data format	*Analyzed*
Experimental factors	*Data were included according to specific inclusion criteria. Data were codified on the basis of the International Statistical Classification of Diseases and Related Health Problems, 10th revision (ICD-10).*
Experimental features	*We used the negentropy metric to detect brain areas with low alteration variety.*
Data source location	*BrainMap website* (http://brainmap.org/sleuth/). *BrainMap is a registered trademark of the University of Texas Health Science Center San Antonio.*
Data accessibility	*Data are available with this article and on BrainMap database* (http://brainmap.org/sleuth/).
Related research article	F. Cauda, A. Nani, J. Manuello, D. Liloia, K. Tatu, U. Vercelli, S. Duca, P.T. Fox, T. Costa, The alteration landscape of the cerebral cortex, Neuroimage 184 (2019) 359–371. https://doi.org/10.1016/j.neuroimage.2018.09.036 [1].

Value of the data

- Alteration negentropy maps can be compared in meta-analytical studies with alteration patterns of specific disorders or categories of diseases.
- Alteration negentropy maps can be used to select regions of interests for specific investigations about brain disorders.
- Alteration negentropy maps can help researchers to reduce and better define the number of potential pathological causes of structural alterations.

1. Data

The present data provide a map of the structural alteration variety of the pathological brain. The flow chart of the data selection process is illustrated in Fig. 1. Instead, Fig. 2 shows the areas with high A-negentropy values related to the ICD-10 pathological categories. Detailed data concerning the selected experimental sample and its diagnostic labeling are available in Supplementary Table 1 and Table 1, respectively. Table 2 reports the brain areas affected by the diseases taken into consideration in Cauda et al. [1]. In addition, Table 3 reports peak and average values of normalized A-negentropy for the brain areas (for the details on normalization, please see [1]).

2. Experimental design, materials and methods

2.1. Design, materials and method

The pool of all eligible voxel-based morphometry (VBM) experiments was retrieved from the BrainMap database [2–4]. At the time of selection of studies (March 2016), the whole VBM dataset included 820 independent studies with respective diagnostic labeling (ICD-10 code). Among them, any experiment not meeting inclusion criteria was excluded. Specifically, two researchers reviewed all

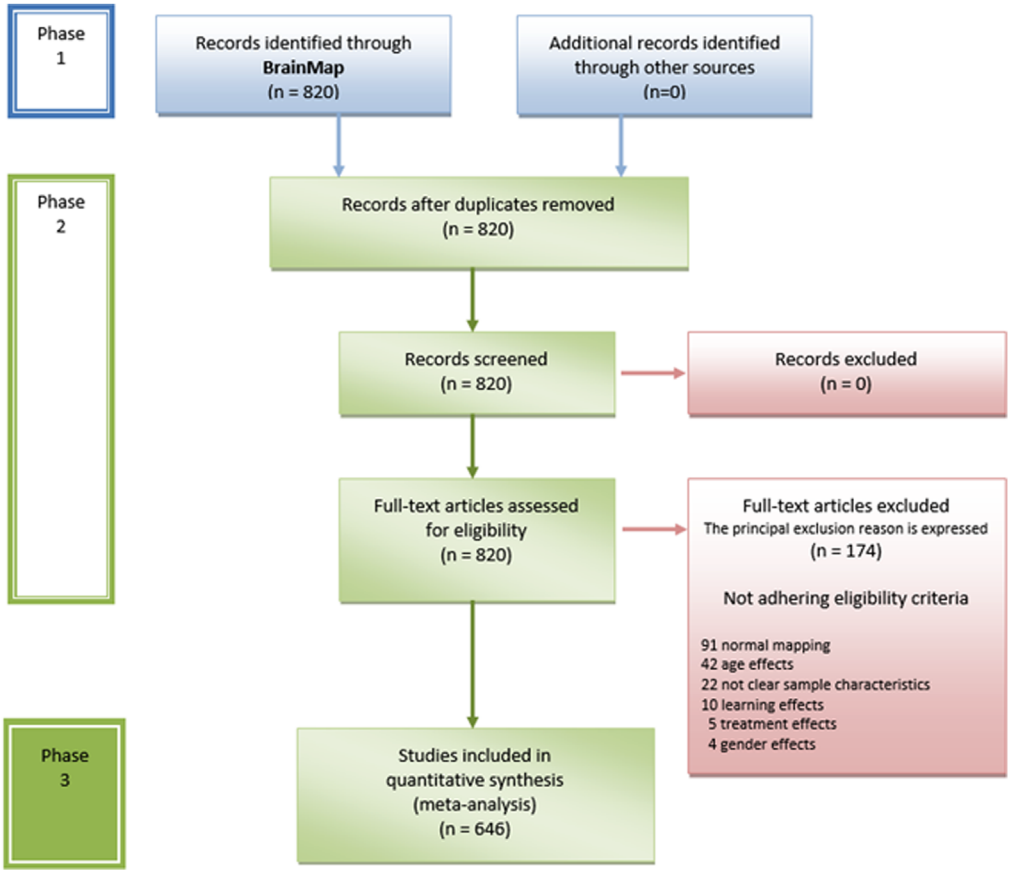

Fig. 1. PRISMA flow chart. Overview of the selection strategy.

the full-text articles independently, in order to ensure that: (a) the pathological sample was characterized by gray matter changes of brain parenchyma; (b) the experiments described structural changes visible with whole-brain VBM; (c) the pathological sample was codified on the basis of the ICD-10 classification [5]; (d) the results were reported by using the Talairach or Montreal Neurological Institute stereotactic coordinates; (e) the articles were original works published in a peer-reviewed English language journal.

Based on the aforementioned criteria, 646 studies were included in the meta-analysis (Supplementary Table 1), for a total of 39 pathological blocks and 82 pathological categories (ICD-10 codes), 1827 experiments, 19,130 subjects and 20,238 coordinates of gray matter decrease/increase (Table 1). Descriptive information of interest was extracted from each qualified full-text article. In order to obtain a detailed and transparent description of the selection phase, we have adopted the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Statement international guidelines [6,7] (Fig. 1).

2.2. Meta-analysis

All statistical analyses were performed using Matlab®. We first employed an anatomical likelihood estimation (ALE) [8–10] following the recommendation suggested by Eickhoff et al. [11]. Results were family-wise error-corrected for multiple comparisons and clustered at a level of $p < 0.05$, with a cluster-forming threshold of $p < 0.001$ at voxel level. ALE map activations were evaluated with a

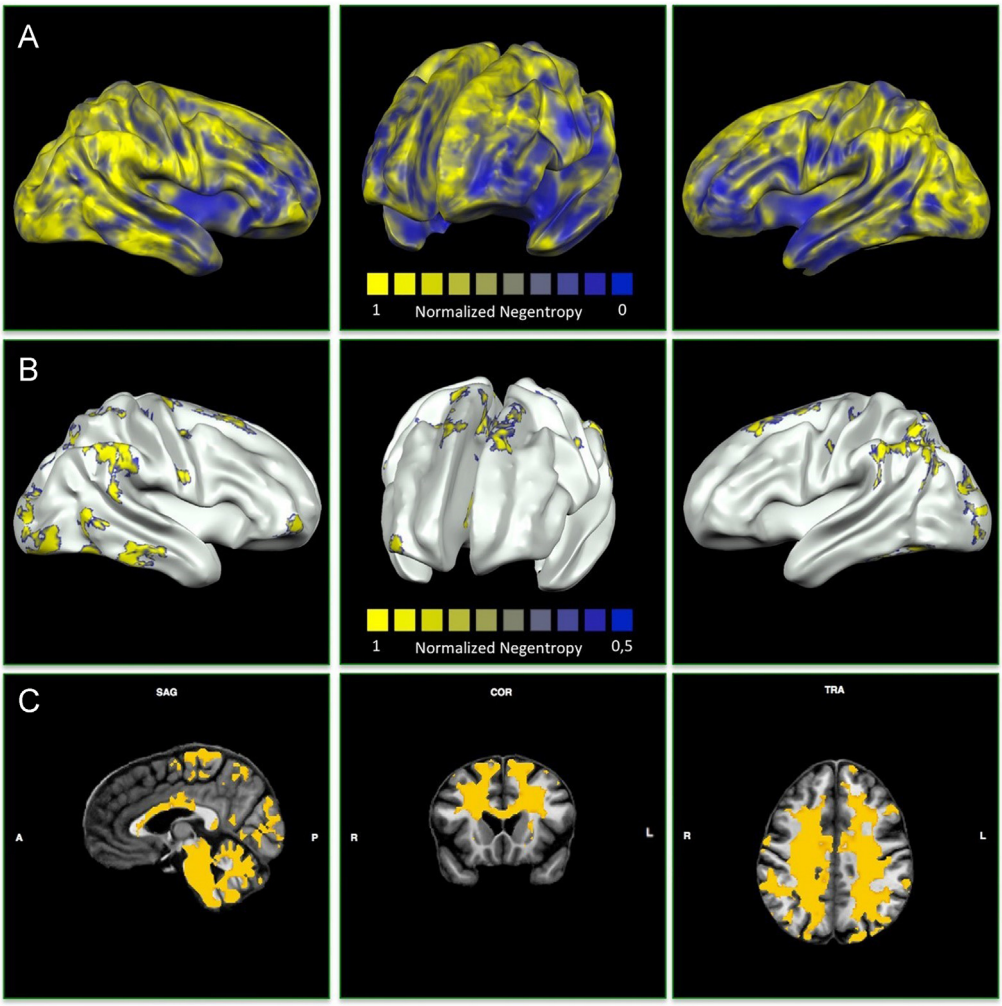

Fig. 2. 3D and 2D visualizations of disease-related alteration negentropy maps. The top panel (A) shows cortical normalized alteration negentropy (A-negentropy) maps related to the ICD-10 pathological categories (for detailed information see also Table 3). The middle panel (B) shows the cortical areas with the highest A-negentropy (i.e., the 10% with the highest values). These areas match with sensorimotor, visual, inferior temporal, and supramarginal regions. The bottom panel (C) shows subcortical normalized A-negentropy maps related to the ICD-10 pathological categories. Of note, a large part of the white matter sites show a high A-negentropy values; this result, however, is to be expected, as we queried the BrainMap database for gray matter alterations only.

permutation test that redistributed the same number of foci in the brain and calculated an ALE map. Eventually, the histogram of the scores obtained with this procedure was used to assign a threshold for *p*-values.

In order to obtain the probability distribution of alteration for every brain area, the untresholded ALE map of each of the 82 pathological categories was used. To find areas of low alteration variety, we used the negentropy metric. The negentropy, which is the reverse of the entropy, is a concept first introduced by Schrödinger in his famous essay "What is Life?" [12] and further developed by Brillouin [13]. We can therefore define the negentropy as:

$$NG(X) = -H(X) = I(X)$$

Table 1
Description of the whole experimental sample with the corresponding diagnostic labeling (ICD-10 codes). Subj (N) = number of subjects; Exp (N) = number of experiments.

Pathological block (ICD-10 Code)	*Pathological category (ICD-10 code)*	*Subj (N)*	*Exp (N)*
F20-F25 (N = 4214)	F20: Schizophrenia	3852	208
	F29: Psychosis	327	22
	F25: Schizoaffective disorder	35	5
G30-G32 (N = 3425)	G31: Other degenerative diseases of nervous system	1918	229
	G30: Alzheimer's disease	1312	138
F30-F39 (N = 2498)	F33: Major depressive disorder	1489	137
	F31: Bipolar disorder	1009	93
G40-G47 (N = 1722)	G40: Epilepsy and recurrent seizures	1402	137
	G47: Sleep disorders	190	15
	G43: Migraines	93	8
	G44: Idiopathic headache disorder	37	3
G20-G26 (N = 1488)	G20: Parkinson's disease	950	95
	G24: Dystonia	223	26
	G23: Progressive supranuclear palsy	160	28
	G25: Other extrapyramidal and movement disorders	155	19
F40-F49 (N = 1016)	F42: Obsessive compulsive disorder	395	44
	F43: Reaction to severe stress and adjustment disorders	374	58
	F41: Other anxiety disorders	247	17
F80-F89 (N = 735)	F84: Pervasive developmental disorders	642	63
	F88: Other disorders of psychological development	48	6
	F80: Specific developmental disorders of speech and language	45	6
G30-G37 (N = 666)	G35: Multiple sclerosis	666	32
G10-G14 (N = 545)	G10: Huntington's disease	236	17
	G11: Hereditary ataxia	169	25
	G12: Spinal muscular atrophy and related syndromes	140	15
F90-F98 (N = 363)	F90: Attention deficit/hyperactivity disorder	161	13
	F91: Conduct disorder	138	20
	F95: Tic disorder	64	5
G89-G99 (N = 313)	G90: Disorders of autonomic nervous system	158	20
	G93: Other disorders of brain	155	11
E00-E89 (N = 268)	E10: Type I diabetes	193	7
	E66: Obesity	40	4
	E70: Disorders of aromatic amino-acid metabolism	19	2
	E23: Hypofunction and other disorders of the pituitary gland	16	6
F60-F69 (N = 267)	F60: Specific personality disorders	240	55
	F65: Paraphilias	27	4
Z77-Z99 (N = 178)	Z81: Family history of mental and behavioral disorders	150	18
	Z89: Acquired absence of limb	28	4
P00-P96 (N = 176)	P07: Disorders of newborn related to short gestation and low birth weight, not elsewhere classified	176	30
R47-R49 (N = 168)	R48: Dyslexia and other symbolic dysfunctions, not elsewhere classified	141	24
	R47: Speech disturbances, not elsewhere classified	27	6
M00-M99 (N = 158)	M79: Other and unspecified soft tissue disorders, not elsewhere classified	80	11
	M26: Dentofacial anomalies	34	6
	M19: Other and unspecified osteoarthritis	26	5
	M54: Dorsalgia	18	5
Q90-Q99 (N = 140)	Q93: Monosomies and deletions from autosomes, not elsewhere classified	91	8
	Q96: Turner's syndrome	38	8
	Q90: Down syndrome	11	2
N80-N98 (N = 130)	N95: Menopausal and other perimenopausal disorders	48	2
	N94: Pain and other conditions associated with female genital Organs and menstrual cycle	46	7
	N80: Endometriosis	36	4
S00-T88 (N = 113)	S06: Intracranial injury	73	8
	T76: Adult and child abuse, neglect and other maltreatment, suspected	23	2
	S24: Injury of nerves and spinal cord at thorax level	17	1
H60-H95 (N = 105)	H90: Conductive and sensorineural hearing loss	61	4

Table 1 (*continued*)

	H93: Other disorders of ear, not elsewhere classified	28	2
	H81: Disorders of vestibular function	16	1
F10-F19 (N = 68)	F15: Other stimulant related disorders	44	8
	F10: Alcohol related disorders	24	1
F10-F19 (N = 57)	I63: Cerebral infarction	57	3
F70-F79 (N = 54)	F79: Mental retardation	54	6
R51-R69 (N = 54)	R51: Headache	20	1
	R55: Syncope and collapse	18	7
	R53: Malaise and fatigue	16	1
H00-H59 (N = 49)	H54: Blindness and low vision	25	2
	H53: Visual disturbances	13	1
	H55: Nystagmus and other irregular eye movements	11	1
K00-K95 (N = 49)	K58: Irritable bowel syndrome	49	2
R90-R94 (N = 43)	R90: Abnormal findings on diagnostic imaging of central nervous system	43	1
R90-R94 (N = 36)	D57: Sickle-cell disease	36	2
D55-D59 (N = 32)	G50: Disorders of trigeminal nerve	32	5
G80-G83 (N = 26)	G83: Other paralytic syndromes	26	1
C00-D50 (N = 23)	C71: Malignant neoplasm of brain	13	2
	C91: Lymphoblastic leukemia	10	4
R43 (N = 23)	R43: Disturbances of smell and taste	22	2
Q00-Q89 (N = 19)	Q04: Other congenital malformations of brain	11	10
	Q85: Phakomatoses, not elsewhere classified	8	1
L00-L99 (N = 19)	L59: Other disorders of skin and subcutaneous tissue related to radiation	19	2
R25-R29 (N = 17)	R27: Other lack of coordination	17	8
A00-B99 (N = 17)	A81: Atypical virus infections of central nervous system	17	1
F50 (N = 14)	F50: Eating disorders	14	5
B00.4 (N = 8)	B10: Other human herpesviruses	8	1
	Total	*19,130*	*1827*

Table 2
Maximum number of pathologies (local maxima), average number of pathologies and Talairach coordinates of the different brain areas.

ID	*Brain area*	*Local maxima (Talairach)*			*Maximum number of pathologies*	*Mean number of pathologies*
		X	*Y*	*Z*		
1	Right locus coeruleus	6	−28	−8	2	1
2	Left pyramis (Cerebellum)	−1	−77	−26	2	1
3	Left tuber (Cerebellum)	−1	−75	−24	2	1
4	Left locus Coeruleus	−6	−27	−7	2	2
5	Left uvula (Cerebellum)	−4	−60	−34	3	1
6	Right substantia Nigra	13	−17	−6	4	1
7	Right dentate (Cerebellum)	18	−54	−19	4	1
8	Right fastigium (Cerebellum)	6	−48	−19	4	1
9	Left nodule (Cerebellum)	−6	−46	−26	5	1
10	Declive (Cerebellum)	0	−75	−12	5	1
11	Right culmen (Cerebellum)	6	−59	3	6	1
12	Left dentate (Cerebellum)	−11	−45	−22	12	2
13	Right medial geniculum body	14	−24	2	17	3
14	Right pons	14	−14	−19	23	1
15	Left lingual gyrus (BA 17)	0	−84	3	25	2
16	Right subthalamic nucleus	12	−13	2	25	4
17	Right culmen (Cerebellum)	5	−33	−13	25	2
18	Right postcentral gyrus (BA 5)	33	−39	57	28	4

Table 2 (*continued*)

ID	Brain area	Local maxima (Talairach)			Maximum number of pathologies	Mean number of pathologies
		X	Y	Z		
19	Left fastigium (Cerebellum)	−6	−47	−19	28	6
20	Right postcentral gyrus (BA 1)	62	−23	34	30	3
21	Left cerebellar lingual	−6	−45	−18	30	4
22	Medulla oblongata	3	−39	−42	30	2
23	Left posterior cingulate (BA 29)	−6	−41	22	31	2
24	Left substantia Nigra	−17	−20	−6	33	3
25	Left subthalamic nucleus	−11	−11	2	38	5
26	Right precentral gyrus (BA 43)	54	−3	10	39	5
27	Left lateral geniculum Body	−24	−26	−4	40	16
28	Left paracentral lobule (BA 5)	−9	−42	60	40	5
29	Right anterior cingulate (BA 33)	1	22	22	41	10
30	Left lingual gyrus (BA 17)	−4	−84	1	41	2
31	Left anterior cingulate (BA 33)	−3	22	21	43	9
32	Left postcentral gyrus (BA 1)	−56	−25	37	45	3
33	Right uvula (Cerebellum)	20	−73	−31	45	2
34	Left precentral gyrus (BA 43)	−57	−6	12	46	6
35	Right lateral geniculum body	24	−26	−3	47	9
36	Right pyramis (Cerebellum)	23	−74	−32	47	4
37	Right inferior semi-lunar lobule (Cerebellum)	24	−78	−35	47	1
38	Right tuber (Cerebellum)	27	−75	−30	47	2
39	Left cerebellar tonsil (Cerebellum)	−24	−63	−43	47	2
40	Left inferior semi-lunar lobule (Cerebellum)	−24	−66	−39	48	2
41	Right ventral anterior nucleus (Thalamus)	6	−4	2	51	18
42	Left parahippocampal gyrus (BA 30)	−18	−42	−3	51	6
43	Right superior temporal gyrus (BA 42)	57	−30	6	51	5
44	Right cingulate gyrus (BA 31)	6	−50	30	51	10
45	Left tuber (Cerebellum)	−42	−69	−23	52	3
46	Right precuneus (BA 7)	3	−60	36	52	5
47	Right cuneus (BA 19)	3	−87	25	53	5
48	Left precuneus (BA 31)	−9	−54	30	53	9
49	Left middle occipital gyrus (BA 19)	−36	−80	−9	55	5
50	Left culmen (Cerebellum)	−27	−30	−19	55	3
51	Left posterior cingulate (BA 23)	−6	−39	27	55	8
52	Left precuneus (BA 7)	−3	−63	36	56	7
53	Left parahippocampal gyrus (BA 27)	−12	−33	3	56	23
54	Right cingulate gyrus (BA 23)	0	−33	27	56	8
55	Left caudate tail	−35	−15	−11	56	19
56	Right inferior temporal gyrus (BA 20)	30	−35	−13	56	11
57	Left red nucleus	−7	−18	2	56	5
58	Right culmen (Cerebellum)	21	−25	−21	56	3
59	Left declive (Cerebellum)	−42	−69	−18	56	4
60	Left nucleus Accumbens	−9	13	−8	57	15
61	Right cuneus (BA 18)	3	−87	24	57	4
62	Right CAudate Tail	36	−16	−6	57	14
63	Left middle temporal gyrus (BA 39)	−51	−57	9	57	11
64	Left postcentral gyrus (BA 2)	−54	−19	30	58	7
65	Right ventral posterior lateral nucleus (Thalamus)	12	−16	10	59	25
66	Right nucleus accumbens	9	12	−6	59	38
67	Left ventral anterior nucleus (Thalamus)	−6	−7	3	59	20
68	Left middle occipital gyrus (BA 18)	−36	−81	−9	59	4
69	Right medial frontal gyrus (BA 8)	18	44	42	60	10
70	Right declive (Cerebellum)	15	−60	−12	61	5
71	Left anterior nucleus (Thalamus)	−6	−9	12	62	34
72	Right lateral globus pallidus	18	0	−7	63	21
73	Left medial geniculum body	−15	−24	2	63	21

Table 2 (*continued*)

ID	*Brain area*	*Local maxima (Talairach)*			*Maximum number of pathologies*	*Mean number of pathologies*
		X	*Y*	*Z*		
74	Right postcentral gyrus (BA 2)	48	−24	42	64	8
75	Right superior temporal gyrus (BA 41)	54	−24	14	64	12
76	Right lateral posterior nucleus (Thalamus)	13	−22	10	66	31
77	Left postcentral gyrus (BA 40)	−57	−27	21	66	5
78	Right ventral posterior medial nucleus (Thalamus)	12	−19	10	67	31
79	Right medial globus pallidus	8	1	−3	67	24
80	Left postcentral gyrus (BA 3)	−54	−15	30	67	5
81	Right red nucleus (Thalamus)	4	−20	2	68	9
82	Left ventral lateral nucleus (Thalamus)	−11	−16	6	68	42
83	Right postcentral gyrus (BA 3)	48	−15	42	68	5
84	Right parahippocampal gyrus (BA 27)	24	−30	−7	69	17
85	Right middle frontal gyrus (BA 46)	42	31	22	69	5
86	Left lateral dorsal nucleus (Thalamus)	−9	−20	14	69	52
87	Right posterior cingulate (BA 29)	3	−57	9	71	14
88	Right fusiform gyrus (BA 37)	29	−36	−9	71	12
89	Right ventral lateral nucleus (Thalamus)	10	−13	14	71	36
90	Left hypothalamus	−5	−3	−5	71	32
91	Left middle frontal gyrus (BA 8)	−30	39	39	71	6
92	Left parahippocampal gyrus (BA 37)	−30	−39	−12	71	17
93	Right superior temporal gyrus (BA 22)	45	−21	−3	71	11
94	Right lateral dorsal nucleus (Thalamus)	9	−20	14	73	56
95	Right superior temporal gyrus (BA 39)	54	−54	27	73	4
96	Right cerebellar tonsil	12	−45	−42	73	1
97	Right supramarginal gyrus (BA 40)	54	−53	27	74	6
98	Right putamen	27	−9	9	74	26
99	Right parahippocampal gyrus (BA 36)	24	−29	−12	75	24
100	Left precentral gyrus (BA 4)	−36	−13	52	75	8
101	Left midline nucleus (Thalamus)	−7	−19	13	75	57
102	Right hypothalamus	4	−1	−6	76	32
103	Right medial frontal gyrus (BA 11)	1	36	−11	76	2
104	Right medial frontal gyrus (BA 6)	2	36	33	76	7
105	Left lateral posterior nucleus (Thalamus)	−14	−21	9	77	44
106	Left inferior frontal gyrus (BA 45)	−36	23	3	77	8
107	Right precentral gyrus (BA 4)	48	−12	42	77	5
108	Right medial frontal gyrus (BA 9)	1	36	30	78	11
109	Left parahippocampal gyrus (BA 36)	−29	−14	−22	78	32
110	Left ventral posterior lateral nucleus (Thalamus)	−15	−18	6	78	43
111	Left medial globus pallidus	−8	0	0	78	23
112	Right middle temporal gyrus (BA 21)	48	6	−30	78	10
113	Left caudate body	−9	6	9	78	33
114	Right midline nucleus (Thalamus)	6	−18	13	78	67
115	Left cingulate gyrus (BA 32)	−4	36	29	79	29
116	Left posterior insula (BA 13)	−39	3	9	79	19
117	Left lateral globus pallidus	−24	−6	−7	79	26
118	Right parahippocampal gyrus (BA 35)	24	−22	−14	79	43
119	Right insula (BA 45)	30	23	2	79	8
120	Left middle frontal gyrus (BA 10)	−40	47	14	79	13
121	Left medial frontal gyrus (BA 11)	−2	36	−10	79	5
122	Left inferior temporal gyrus (BA 20)	−28	−12	−26	79	22
123	Left middle temporal gyrus (BA 21)	−54	−15	−18	79	14
124	Left superior temporal gyrus (BA 22)	−48	12	−6	79	10
125	Left anterior cingulate (BA 24)	−5	27	24	79	12
126	Left superior temporal gyrus (BA 41)	−48	−33	12	79	26
127	Left middle frontal gyrus (BA 46)	−40	48	15	79	10
128	Left caudate head	−3	6	−3	79	49
129	Left putamen	−24	−6	−6	79	30

Table 2 (*continued*)

ID	Brain area	Local maxima (Talairach)			Maximum number of pathologies	Mean number of pathologies
		X	Y	Z		
130	Right anterior cingulate (BA 10)	6	48	9	79	12
131	Right anterior cingulate (BA 24)	6	34	18	79	12
132	Right anterior cingulate (BA 24)	4	3	−3	79	25
133	Right anterior cingulate (BA 32)	9	45	0	79	28
134	Right caudate body	9	12	9	79	23
135	Right caudate head	6	3	1	79	38
136	Right anterior nucleus (Thalamus)	9	−12	15	79	34
137	Left mammillary body	−9	−21	6	79	33
138	Right mammillary body	9	−21	6	79	25
139	Left anterior insula (BA 13)	−37	14	−1	80	56
140	Left inferior frontal gyrus (BA 47)	−34	17	−1	80	18
141	Right anterior insula (BA 13)	42	12	6	80	48
142	Right posterior insula (BA 13)	42	−6	6	80	26
143	Left hippocampus	−25	−10	−18	80	57
144	Left amygdala	−16	−5	−12	80	77
145	Left medial frontal gyrus (BA 9)	−3	36	30	80	14
146	Left uncus (BA 28)	−15	−5	−12	80	48
147	Left parahippocampal gyrus (BA 34)	−18	6	−12	80	54
148	Left parahippocampal gyrus (BA 35)	−21	−7	−21	80	48
149	Left precentral gyrus (BA 44)	−41	6	6	80	12
150	Right amygdala	29	0	−18	80	70
151	Right parahippocampal gyrus (BA 34)	30	3	−18	80	55
152	Right superior temporal gyrus (BA 38)	30	3	−18	80	11
153	Right precentral gyrus (BA 44)	42	12	6	80	14
154	Right anterior insula (BA 13)	36	18	1	80	16
155	Right medial dorsal nucleus (Thalamus)	9	−21	12	80	67
156	Right pulvinar	6	−24	11	80	37
157	Left precentral gyrus (BA 6)	−51	0	35	80	9
158	Left medial dorsal nucleus (Thalamus)	−9	−21	9	80	67
159	Left pulvinar	−9	−21	9	80	44
160	Right hippocampus	27	−21	−9	80	53

Table 3
Maximum (local maxima) and mean values of normalized alteration negentropy, and Talairach coordinates of the different brain areas.

ID	Brain area	Local maxima (Talairach)			Maximum normalized negentropy	Mean normalized negentropy
		X	Y	Z		
1	Left locus coeruleus	−5	−25	−7	0.987	0.996
2	Left pyramis (Cerebellum)	−2	−78	−27	0.974	0.997
3	Right locus Coeruleus	6	−28	−8	0.963	0.994
4	Left tuber (Cerebellum)	−1	−75	−24	0.907	0.991
5	Left uvula (Cerebellum)	−4	−60	−34	0.836	0.994
6	Right culmen (Cerebellum)	6	−59	3	0.794	0.989
7	Right fastigium (Cerebellum)	6	−48	−19	0.788	0.981
8	Right substantia Nigra	16	−20	−6	0.786	0.981
9	Left nodule (Cerebellum)	−6	−46	−26	0.782	0.996
10	Left declive (Cerebellum)	0	−75	−12	0.683	0.972
11	Right dentate (Cerebellum)	18	−54	−18	0.683	0.988
12	Right medial geniculum body	14	−24	2	0.525	0.927
13	Left dentate (Cerebellum)	−12	−47	−18	0.513	0.969
14	Right subthalamic nucleus	11	−12	2	0.46	0.894
15	Left lingual gyrus (BA 17)	0	−84	3	0.44	0.908

Table 3 (*continued*)

ID	*Brain area*	*Local maxima (Talairach)*			*Maximum normalized negentropy*	*Mean normalized negentropy*
		X	*Y*	*Z*		
16	Right pons	14	−14	−19	0.428	0.985
17	Left substantia Nigra	−17	−20	−6	0.375	0.926
18	Right culmen (Cerebellum)	5	−33	−13	0.3	0.926
19	Left posterior cingulate (BA 29)	−6	−41	22	0.259	0.922
20	Left subthalamic nucleus	−11	−11	2	0.258	0.817
21	Left lateral geniculum body	−24	−27	−3	0.252	0.657
22	Left anterior cingulate (BA 33)	−3	22	21	0.247	0.797
23	Right postcentral gyrus (BA 5)	6	−46	63	0.245	0.83
24	Left fastigium (Cerebellum)	−6	−47	−19	0.238	0.82
25	Right postcentral gyrus (BA 1)	62	−23	34	0.224	0.905
26	Left cerebellar lingual	−6	−45	−18	0.223	0.848
27	Medulla oblongata	3	−39	−42	0.222	0.929
28	Left lingual gyrus (BA 17)	−4	−84	1	0.216	0.95
29	Right precentral gyrus (BA 43)	54	−3	12	0.197	0.787
30	Right anterior cingulate (BA 33)	1	22	22	0.176	0.72
31	Right uvula (Cerebellum)	20	−73	−31	0.162	0.943
32	Left paracentral lobule (BA 5)	−9	−42	60	0.158	0.822
33	Right lateral geniculum body	24	−26	−3	0.144	0.806
34	Left postcentral gyrus (BA 1)	−56	−25	37	0.143	0.927
35	Left red nucleus	−7	−18	2	0.137	0.854
36	Right tuber (Cerebellum)	33	−57	−30	0.124	0.955
37	Left cerebellar tonsil	−24	−63	−45	0.124	0.956
38	Right pyramis (Cerebellum)	29	−57	−30	0.124	0.903
39	Right inferior semilunar lobule (Cerebellum)	24	−78	−35	0.124	0.973
40	Left precentral gyrus (BA 43)	−57	−6	12	0.124	0.772
41	Left inferior semilunar lobule (Cerebellum)	−24	−66	−39	0.119	0.957
42	Right ventral anterior nucleus (Thalamus)	12	−9	12	0.115	0.531
43	Right cingulate gyrus (BA 31)	6	−57	30	0.105	0.7
44	Left parahippocampal gyrus (BA 30)	−18	−42	−3	0.105	0.825
45	Left parahippocampal gyrus (BA 27)	−24	−34	−3	0.104	0.467
46	Right superior temporal gyrus (BA 42)	57	−30	6	0.101	0.837
47	Left tuber (Cerebellum)	−42	−69	−23	0.1	0.924
48	Left culmen (Cerebellum)	−24	−33	−18	0.099	0.936
49	Right culmen (Cerebellum)	12	−63	−10	0.099	0.905
50	Right precuneus (BA 7)	0	−60	36	0.096	0.84
51	Right cingulate gyrus (BA 23)	0	−33	27	0.096	0.725
52	Left nucleus accumbens	−9	13	−8	0.094	0.497
53	Left posterior cingulate (BA 23)	−6	−39	27	0.094	0.754
54	Left precuneus (BA 31)	−9	−54	30	0.093	0.728
55	Right cuneus (BA 19)	3	−87	25	0.093	0.83
56	Left caudate tail	−36	−14	−10	0.09	0.63
57	Left middle occipital gyrus (BA 19)	−54	−60	−6	0.088	0.872
58	Right caudate tail	36	−16	−6	0.088	0.647
59	Left declive (Cerebellum)	−42	−69	−18	0.086	0.871
60	Left postcentral gyrus (BA 2)	−54	−19	30	0.085	0.8
61	Left middle temporal gyrus (BA 39)	−51	−57	9	0.084	0.76
62	Right inferior temporal gyrus (BA 20)	36	−6	−36	0.084	0.689
63	Right ventral posterior lateral nucleus (Thalamus)	12	−16	10	0.082	0.512
64	Left ventral anterior nucleus (Thalamus)	−6	−7	3	0.081	0.507
65	Left middle occipital gyrus (BA 18)	−36	−81	−9	0.081	0.896
66	Left precuneus (BA 7)	−3	−63	36	0.079	0.764
67	Right cuneus (BA 18)	3	−87	24	0.078	0.866
68	Right medial frontal gyrus (BA 8)	3	42	42	0.07	0.709
69	Right nucleus accumbens	9	12	−6	0.069	0.211

Table 3 (*continued*)

ID	*Brain area*	*Local maxima (Talairach)*			*Maximum normalized negentropy*	*Mean normalized negentropy*
		X	*Y*	*Z*		
70	Right lateral posterior nucleus (Thalamus)	13	−22	12	0.069	0.427
71	Right ventral posterior medial nucleus (Thalamus)	12	−19	10	0.068	0.411
72	Right declive (Cerebellum)	15	−60	−12	0.067	0.843
73	Left medial geniculum body	−15	−24	2	0.065	0.466
74	Left anterior nucleus (Thalamus)	−6	−9	12	0.061	0.252
75	Right superior temporal gyrus (BA 41)	54	−24	14	0.057	0.66
76	Right lateral globus pallidus	18	0	−7	0.057	0.534
77	Right postcentral gyrus (BA 2)	48	−24	42	0.056	0.767
78	Right red nucleus	4	−20	2	0.053	0.791
79	Right medial globus pallidus	9	3	−3	0.052	0.477
80	Left lateral dorsal nucleus (Thalamus)	−9	−20	14	0.052	0.117
81	Left ventral lateral nucleus (Thalamus)	−6	−9	6	0.048	0.242
82	Left postcentral gyrus (BA 40)	−57	−27	21	0.046	0.849
83	Right parahippocampal gyrus (BA 27)	24	−30	−7	0.045	0.552
84	Right middle frontal gyrus (BA 46)	42	31	22	0.043	0.829
85	Left postcentral gyrus (BA 3)	−54	−15	30	0.043	0.856
86	Right postcentral gyrus (BA 3)	48	−15	42	0.042	0.821
87	Left middle frontal gyrus (BA 8)	−30	39	39	0.038	0.825
88	Left hypothalamus	−5	−3	−5	0.037	0.352
89	Right mammillary body	8	−21	5	0.032	0.53
90	Right fusiform gyrus (BA 37)	30	−36	−12	0.032	0.677
91	Right lateral dorsal nucleus (Thalamus)	10	−16	15	0.032	0.131
92	Left midline nucleus (Thalamus)	−7	−20	14	0.032	0.097
93	Right ventral lateral nucleus (Thalamus)	11	−12	15	0.031	0.323
94	Right superior temporal gyrus (BA 22)	45	−21	0	0.03	0.715
95	Left parahippocampal gyrus (BA 37)	−30	−39	−12	0.027	0.666
96	Right posterior cingulate (BA 29)	3	−57	9	0.025	0.671
97	Left mammillary body	−8	−18	3	0.024	0.43
98	Right superior temporal gyrus (BA 39)	54	−54	27	0.023	0.86
99	Right midline nucleus (Thalamus)	7	−15	15	0.021	0.058
100	Right putamen	27	−9	9	0.021	0.416
101	Right supramarginal gyrus (BA 40)	54	−53	27	0.02	0.818
102	Right cerebellar tonsil	12	−45	−42	0.02	0.963
103	Right medial frontal gyrus (BA 11)	1	36	−11	0.018	0.924
104	Left precentral gyrus (BA 4)	−36	−13	52	0.017	0.794
105	Right hypothalamus	4	−1	−6	0.016	0.401
106	Right medial frontal gyrus (BA 6)	2	36	33	0.013	0.815
107	Right parahippocampal gyrus (BA 36)	24	−29	−12	0.013	0.49
108	Right hippocampus	27	−22	−12	0.012	0.165
109	Left parahippocampal gyrus (BA 36)	−28	−15	−24	0.011	0.397
110	Right precentral gyrus (BA 4)	48	−12	42	0.01	0.84
111	Left caudate body	−9	6	9	0.01	0.404
112	Left lateral posterior nucleus (Thalamus)	−18	−21	9	0.01	0.241
113	Left superior temporal gyrus (BA 22)	−48	12	−6	0.009	0.709
114	Left inferior frontal gyrus (BA 45)	−36	24	2	0.009	0.786
115	Left lateral globus pallidus	−24	−6	−3	0.009	0.488
116	Left putamen	−24	−6	−3	0.009	0.424
117	Right caudate body	9	12	9	0.007	0.466
118	Right precentral gyrus (BA 44)	42	12	6	0.007	0.635
119	Right medial dorsal nucleus (Thalamus)	3	−21	6	0.007	0.06
120	Left medial frontal gyrus (BA 11)	−5	36	−12	0.007	0.875
121	Left medial globus pallidus	−8	0	0	0.007	0.501
122	Left precentral gyrus (BA 44)	−41	6	6	0.006	0.683
123	Left medial dorsal nucleus (Thalamus)	−6	−23	9	0.006	0.059
124	Left pulvinar	−6	−24	9	0.005	0.293
125	Left anterior cingulate (BA 24)	−3	21	−6	0.005	0.734

Table 3 (*continued*)

ID	Brain area	Local maxima (Talairach)			Maximum normalized negentropy	Mean normalized negentropy
		X	Y	Z		
126	Left amygdala	−21	−9	−18	0.005	0.025
127	Left superior temporal gyrus (BA 42)	−54	−34	18	0.005	0.719
128	Right anterior nucleus (Thalamus)	9	−12	15	0.005	0.337
129	Left posterior insula (BA 13)	−40	0	8	0.005	0.555
130	Left parahippocampal gyrus (BA 34)	−21	−12	−18	0.004	0.161
131	Right middle temporal gyrus (BA 21)	48	6	−33	0.004	0.721
132	Left hippocampus	−26	−12	−22	0.004	0.106
133	Left caudate head	−6	12	−6	0.004	0.183
134	Right medial frontal gyrus (BA 9)	1	36	30	0.004	0.701
135	Right amygdala	18	−6	−21	0.003	0.046
136	Left middle temporal gyrus (BA 21)	−55	−18	−15	0.003	0.661
137	Right pulvinar	4	−24	10	0.003	0.316
138	Left superior temporal gyrus (BA 41)	−48	−33	12	0003	0.418
139	Left uncus (BA 28)	−27	−12	−25	0.003	0.211
140	Right anterior cingulate (BA 24)	1	27	23	0.003	0.723
141	Right anterior cingulate (BA 32)	3	36	21	0.002	0.456
142	Left inferior frontal gyrus (BA 47)	−36	24	0	0.002	0.646
143	Right superior temporal gyrus (BA 38)	33	18	-21	0.002	0.732
144	Right anterior cingulate (BA 10)	6	48	6	0.002	0.716
145	Left cingulate gyrus (BA 32)	-4	36	29	0.002	0.448
146	Right posterior insula (BA 13)	42	-9	3	0.002	0.465
147	Right parahippocampal gyrus (BA 34)	30	3	-18	0.002	0.155
148	Left parahippocampal gyrus (BA 35)	-24	-15	-21	0.002	0.196
149	Right parahippocampal gyrus (BA 35)	24	-24	-14	0.002	0.298
150	Left anterior insula (BA 13)	-39	3	6	0.002	0.131
151	Right anterior insula (BA 13)	3−0	18	−3	0.001	0.673
152	Left precentral gyrus (BA 6)	−51	0	35	0.001	0.779
153	Left inferior temporal gyrus (BA 20)	−57	−27	−18	0.001	0.552
154	Left middle frontal gyrus (BA 10)	−39	48	12	0.001	0.696
155	Right anterior insula (BA 13)	33	16	0	0.001	0.184
156	Right insula (BA 45)	30	24	3	0.001	0.806
157	Left medial frontal gyrus (BA 9)	−6	36	30	0.001	0.645
158	Right caudate head	6	3	−3	0.001	0.241
159	Left middle frontal gyrus (BA 46)	−40	48	15	0.001	0.763
160	Right anterior cingulate (BA 25)	4	3	−6	0.001	0.483

where $I(X)$ is the expected value of the informational content. This means that the negentropy metric is related to the mean informational content of a random variable. In our case, a voxel with high A-negentropy values is thought to have more mean informational content than a voxel with low A-negentropy values. In other words, a decrease of negentropy corresponds to a loss of information about the system, and vice versa. More detailed information about the statistical analyses are viewable in Cauda et al. [1].

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Transparency document. Supporting information

Transparency data associated with this article can be found in the online version at https://doi.org/10.1016/j.dib.2018.10.142.

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at https://doi.org/10.1016/j.dib.2018.10.142.

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