



Review

Large-scale brain network interactions and motor control in chronic pain: A systematic review

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Supplementary

Search strategy

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Pubmed:

1	((((((((((("Musculoskeletal Pain"[Mesh]) OR "Facial Pain"[Mesh]) OR "Chronic Pain"[Mesh]) OR "Nociceptive Pain"[Mesh]) OR "Myofascial Pain Syndromes"[Mesh]) OR "Low Back Pain"[Mesh]) OR "Back Pain"[Mesh]) OR ("Pain"[Mesh] OR "Acute Pain"[Mesh] OR "Pelvic Girdle Pain"[Mesh] OR "Flank Pain"[Mesh] OR "Shoulder Pain"[Mesh] OR "Neck Pain"[Mesh] OR "Pelvic Pain"[Mesh])) OR "Abdominal Pain"[Mesh]) OR "Patellofemoral Pain Syndrome"[Mesh]) OR ("Fibromyalgia"[Mesh]
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	OR “Fatigue Syndrome, Chronic”[Mesh])) OR (“Osteoarthritis”[Mesh] OR “Osteoarthritis, Knee”[Mesh] OR “Osteoarthritis, Hip”[Mesh])
2	((((((((((((((((((musculoskeletal pain[Title]) OR (chronic musculoskeletal pain[Title])) OR (persistent pain[Title])) OR (chronic pain[Title])) OR (nociceptive pain[Title])) OR (myofascial pain[Title])) OR (low back pain[Title])) OR (chronic low back pain[Title])) OR (nonspecific low back pain[Title])) OR (neck pain[Title])) OR (shoulder pain[Title])) OR (knee pain[Title])) OR (hip pain[Title])) OR (osteoarthritis pain[Title])) OR (knee osteoarthritis[Title])) OR (tendinopathy pain[Title])) OR (Facial Pain[Title])) OR (Patellofemoral Pain Syndrome[Title])) OR (Osteoarthritis, Knee[Title]))
3	((((((((((((((((((musculoskeletal pain[Title/Abstract]) OR (chronic musculoskeletal pain[Title/Abstract])) OR (persistent pain[Title/Abstract])) OR (chronic pain[Title/Abstract])) OR (nociceptive pain[Title/Abstract])) OR (myofascial pain[Title/Abstract])) OR (low back pain[Title/Abstract])) OR (chronic low back pain[Title/Abstract])) OR (nonspecific low back pain[Title/Abstract])) OR (neck pain[Title/Abstract])) OR (shoulder pain[Title/Abstract])) OR (knee pain[Title/Abstract])) OR (hip pain[Title/Abstract])) OR (osteoarthritis pain[Title/Abstract])) OR (knee osteoarthritis[Title/Abstract])) OR (tendinopathy pain[Title/Abstract])) OR (Facial Pain[Title/Abstract])) OR (Patellofemoral Pain Syndrome[Title/Abstract])) OR (Osteoarthritis, Knee[Title/Abstract]))
4	#1 OR #2 OR #3
5	(((((“Limbic System”[Mesh]) OR “Prefrontal Cortex”[Mesh]) OR “Hippocampus”[Mesh]) OR “Ventral Striatum”[Mesh]) OR “Thalamus”[Mesh]) OR “Periaqueductal Gray”[Mesh] Sort by: Most Recent
6	((((((((((((((((((cingulate cortex[Title]) OR (anterior cingulate cortex[Title])) OR (ACC[Title])) OR (dorsal ACC[Title])) OR (rostral ACC[Title])) OR (ubgenual ACC[Title])) OR (cingulum[Title])) OR (cingulum bundle[Title])) OR (limbic system[Title])) OR (amygdala[Title])) OR (hippocampus[Title])) OR (insula[Title])) OR (anterior insula[Title])) OR (ventromedial prefrontal cortex[Title])) OR (vmPFC[Title])) OR (medial prefrontal cortex[Title])) OR (mPFC[Title])) OR (orbitofrontal cortex[Title])) OR (thalamus[Title])) OR (pain matrix[Title]))
7	((((((((((((((((((cingulate cortex[Title/Abstract]) OR (anterior cingulate cortex[Title/Abstract])) OR (ACC[Title/Abstract])) OR (dorsal ACC[Title/Abstract])) OR (rostral ACC[Title/Abstract])) OR (ubgenual ACC[Title/Abstract])) OR (cingulum[Title/Abstract])) OR (cingulum bundle[Title/Abstract])) OR (limbic system[Title/Abstract])) OR (amygdala[Title/Abstract])) OR (hippocampus[Title/Abstract])) OR (insula[Title/Abstract])) OR (anterior insula[Title/Abstract])) OR (ventromedial prefrontal cortex[Title/Abstract])) OR (vmPFC[Title/Abstract])) OR (medial prefrontal cortex[Title/Abstract])) OR (mPFC[Title/Abstract])) OR (orbitofrontal cortex[Title/Abstract])) OR (thalamus[Title/Abstract])) OR (pain matrix[Title/Abstract]))
8	#5 OR #6 OR #7
9	(((((“Diffusion Tensor Imaging”[Mesh]) OR “Magnetic Resonance Spectroscopy”[Mesh]) OR “Electroencephalography”[Mesh]) OR “Transcranial Magnetic Stimulation”[Mesh]) OR “Evoked Potentials, Motor”[Mesh]) OR “Cortical Excitability”[Mesh]

10	((((((((((neurophysiological changes[Title]) OR (neural alterations[Title])) OR (brain activation[Title])) OR (functional connectivity[Title])) OR (resting-state connectivity[Title])) OR (rs-fMRI[Title])) OR (task-based fMRI[Title])) OR (BOLD[Title])) OR (cortical thickness[Title])) OR (white matter integrity[Title])) OR (electroencephalography[Title])) OR (neuroplasticity[Title]))
11	((((((((((neurophysiological changes[Title/Abstract]) OR (neural alterations[Title/Abstract])) OR (brain activation[Title/Abstract])) OR (functional connectivity[Title/Abstract])) OR (resting-state connectivity[Title/Abstract])) OR (rs-fMRI[Title/Abstract])) OR (task-based fMRI[Title/Abstract])) OR (BOLD[Title/Abstract])) OR (cortical thickness[Title/Abstract])) OR (white matter integrity[Title/Abstract])) OR (electroencephalography[Title/Abstract])) OR (neuroplasticity[Title/Abstract]))
12	#9 OR #10 OR #11
13	(((((("Psychomotor Performance"[Mesh]) OR "Postural Balance"[Mesh]) OR "Gait"[Mesh]) OR "Proprioception"[Mesh]) OR "Reaction Time"[Mesh]) OR "Coordination Complexes"[Mesh]) OR "Kinetics"[Mesh] Sort by: Most Recent
14	((((((((((((((((((((((motor control[Title]) OR (movement control[Title])) OR (motor planning[Title])) OR (motor execution[Title])) OR (motor performance[Title])) OR (motor variability[Title])) OR (postural control[Title])) OR (balance[Title])) OR (gait[Title])) OR (walking[Title])) OR (reaching task[Title])) OR (sensorimotor integration[Title])) OR (proprioception[Title])) OR (reaction time[Title])) OR (anticipatory postural adjustments[Title])) OR (motor learning[Title])) OR (motor adaptation[Title])) OR (coordination[Title])) OR (co-contraction[Title])) OR (kinematics[Title])) OR (kinetics[Title])) OR (ground reaction force[Title]))
15	((((((((((((((((((((((motor control[Title/Abstract]) OR (movement control[Title/Abstract])) OR (motor planning[Title/Abstract])) OR (motor execution[Title/Abstract])) OR (motor performance[Title/Abstract])) OR (motor variability[Title/Abstract])) OR (postural control[Title/Abstract])) OR (balance[Title/Abstract])) OR (gait[Title/Abstract])) OR (walking[Title/Abstract])) OR (reaching task[Title/Abstract])) OR (sensorimotor integration[Title/Abstract])) OR (proprioception[Title/Abstract])) OR (reaction time[Title/Abstract])) OR (anticipatory postural adjustments[Title/Abstract])) OR (motor learning[Title/Abstract])) OR (motor adaptation[Title/Abstract])) OR (coordination[Title/Abstract])) OR (co-contraction[Title/Abstract])) OR (kinematics[Title/Abstract])) OR (kinetics[Title/Abstract])) OR (ground reaction force[Title/Abstract]))
16	#13 OR #14 OR #15
17	#4 AND #8 AND #12 AND #16 ("Musculoskeletal Pain"[MeSH Terms] OR "Facial Pain"[MeSH Terms] OR "Chronic Pain"[MeSH Terms] OR "Nociceptive Pain"[MeSH Terms] OR "Myofascial Pain Syndromes"[MeSH Terms] OR "Low Back Pain"[MeSH Terms] OR "Back Pain"[MeSH Terms] OR ("Pain"[MeSH Terms] OR "Acute Pain"[MeSH Terms] OR "Pelvic Girdle Pain"[MeSH Terms] OR "Flank Pain"[MeSH Terms] OR "Shoulder Pain"[MeSH Terms] OR "Neck Pain"[MeSH Terms] OR "Pelvic Pain"[MeSH Terms]) OR "Abdominal Pain"[MeSH Terms] OR "Patellofemoral Pain Syndrome"[MeSH Terms] OR ("Fibromyalgia"[MeSH Terms] OR "fatigue syndrome, chronic"[MeSH Terms]) OR

("Osteoarthritis"[MeSH Terms] OR "osteoarthritis, knee"[MeSH Terms] OR
 "osteoarthritis, hip"[MeSH Terms]) OR ("Musculoskeletal Pain"[Title] OR "chronic
 musculoskeletal pain"[Title] OR "persistent pain"[Title] OR "Chronic Pain"[Title] OR
 "Nociceptive Pain"[Title] OR "myofascial pain"[Title] OR "Low Back Pain"[Title] OR
 "chronic low back pain"[Title] OR "nonspecific low back pain"[Title] OR "Neck
 Pain"[Title] OR "Shoulder Pain"[Title] OR "knee pain"[Title] OR "hip pain"[Title] OR
 "osteoarthritis pain"[Title] OR "knee osteoarthritis"[Title] OR "tendinopathy pain"[Title]
 OR "Facial Pain"[Title] OR "Patellofemoral Pain Syndrome"[Title] OR "osteoarthritis
 knee"[Title]) OR ("Musculoskeletal Pain"[Title/Abstract] OR "chronic musculoskeletal
 pain"[Title/Abstract] OR "persistent pain"[Title/Abstract] OR "Chronic
 Pain"[Title/Abstract] OR "Nociceptive Pain"[Title/Abstract] OR "myofascial
 pain"[Title/Abstract] OR "Low Back Pain"[Title/Abstract] OR "chronic low back
 pain"[Title/Abstract] OR "nonspecific low back pain"[Title/Abstract] OR "Neck
 Pain"[Title/Abstract] OR "Shoulder Pain"[Title/Abstract] OR "knee pain"[Title/Abstract]
 OR "hip pain"[Title/Abstract] OR "osteoarthritis pain"[Title/Abstract] OR "knee
 osteoarthritis"[Title/Abstract] OR "tendinopathy pain"[Title/Abstract] OR "Facial
 Pain"[Title/Abstract] OR "Patellofemoral Pain Syndrome"[Title/Abstract] OR
 "osteoarthritis knee"[Title/Abstract])) AND ("Limbic System"[MeSH Terms] OR
 "Prefrontal Cortex"[MeSH Terms] OR "Hippocampus"[MeSH Terms] OR "Ventral
 Striatum"[MeSH Terms] OR "Thalamus"[MeSH Terms] OR "Periaqueductal
 Gray"[MeSH Terms] OR ("cingulate cortex"[Title] OR "anterior cingulate cortex"[Title]
 OR "ACC"[Title] OR "dorsal acc"[Title] OR "rostral acc"[Title] OR ("ACC"[Title]) OR
 "cingulum"[Title] OR "cingulum bundle"[Title] OR "Limbic System"[Title] OR
 "amygdala"[Title] OR "Hippocampus"[Title] OR "insula"[Title] OR "anterior
 insula"[Title] OR "ventromedial prefrontal cortex"[Title] OR "vmPFC"[Title] OR
 "medial prefrontal cortex"[Title] OR "mPFC"[Title] OR "orbitofrontal cortex"[Title] OR
 "Thalamus"[Title] OR "pain matrix"[Title]) OR ("cingulate cortex"[Title/Abstract] OR
 "anterior cingulate cortex"[Title/Abstract] OR "ACC"[Title/Abstract] OR "dorsal
 acc"[Title/Abstract] OR "rostral acc"[Title/Abstract] OR ("ACC"[Title/Abstract]) OR
 "cingulum"[Title/Abstract] OR "cingulum bundle"[Title/Abstract] OR "Limbic
 System"[Title/Abstract] OR "amygdala"[Title/Abstract] OR
 "Hippocampus"[Title/Abstract] OR "insula"[Title/Abstract] OR "anterior
 insula"[Title/Abstract] OR "ventromedial prefrontal cortex"[Title/Abstract] OR
 "vmPFC"[Title/Abstract] OR "medial prefrontal cortex"[Title/Abstract] OR
 "mPFC"[Title/Abstract] OR "orbitofrontal cortex"[Title/Abstract] OR
 "Thalamus"[Title/Abstract] OR "pain matrix"[Title/Abstract])) AND ("Diffusion Tensor
 Imaging"[MeSH Terms] OR "Magnetic Resonance Spectroscopy"[MeSH Terms] OR
 "Electroencephalography"[MeSH Terms] OR "Transcranial Magnetic
 Stimulation"[MeSH Terms] OR "evoked potentials, motor"[MeSH Terms] OR "Cortical
 Excitability"[MeSH Terms] OR ("neurophysiological changes"[Title] OR "neural
 alterations"[Title] OR "brain activation"[Title] OR "functional connectivity"[Title] OR
 "resting state connectivity"[Title] OR "rs-fMRI"[Title] OR "task based fmri"[Title] OR
 "BOLD"[Title] OR "cortical thickness"[Title] OR "white matter integrity"[Title] OR
 "Electroencephalography"[Title] OR "neuroplasticity"[Title]) OR ("neurophysiological

	changes"[Title/Abstract] OR "neural alterations"[Title/Abstract] OR "brain activation"[Title/Abstract] OR "functional connectivity"[Title/Abstract] OR "resting state connectivity"[Title/Abstract] OR "rs-fMRI"[Title/Abstract] OR "task based fmri"[Title/Abstract] OR "BOLD"[Title/Abstract] OR "cortical thickness"[Title/Abstract] OR "white matter integrity"[Title/Abstract] OR "Electroencephalography"[Title/Abstract] OR "neuroplasticity"[Title/Abstract])) AND ("Psychomotor Performance"[MeSH Terms] OR "Postural Balance"[MeSH Terms] OR "Gait"[MeSH Terms] OR "Proprioception"[MeSH Terms] OR "Reaction Time"[MeSH Terms] OR "Coordination Complexes"[MeSH Terms] OR "Kinetics"[MeSH Terms] OR ("motor control"[Title] OR "movement control"[Title] OR "motor planning"[Title] OR "motor execution"[Title] OR "motor performance"[Title] OR "motor variability"[Title] OR "postural control"[Title] OR "balance"[Title] OR "Gait"[Title] OR "walking"[Title] OR "reaching task"[Title] OR "sensorimotor integration"[Title] OR "Proprioception"[Title] OR "Reaction Time"[Title] OR "anticipatory postural adjustments"[Title] OR "motor learning"[Title] OR "motor adaptation"[Title] OR "coordination"[Title] OR "co-contraction"[Title] OR "kinematics"[Title] OR "Kinetics"[Title] OR "ground reaction force"[Title]) OR ("motor control"[Title/Abstract] OR "movement control"[Title/Abstract] OR "motor planning"[Title/Abstract] OR "motor execution"[Title/Abstract] OR "motor performance"[Title/Abstract] OR "motor variability"[Title/Abstract] OR "postural control"[Title/Abstract] OR "balance"[Title/Abstract] OR "Gait"[Title/Abstract] OR "walking"[Title/Abstract] OR "reaching task"[Title/Abstract] OR "sensorimotor integration"[Title] OR "Proprioception"[Title] OR "Reaction Time"[Title] OR "anticipatory postural adjustments"[Title/Abstract] OR "motor learning"[Title/Abstract] OR "motor adaptation"[Title/Abstract] OR "coordination"[Title/Abstract] OR "co-contraction"[Title/Abstract] OR "kinematics"[Title/Abstract] OR "Kinetics"[Title/Abstract] OR "ground reaction force"[Title/Abstract])) 167
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Scopus:

Scopus	TITLE-ABS-KEY (("cingulate cortex" OR "anterior cingulate cortex" OR "limbic system" OR amygdala OR insula)) AND ("motor control" OR "movement control" OR "neuromuscular control") AND ("musculoskeletal pain" OR "chronic pain") AND ("neurophysiological changes" OR "neural plasticity" OR "cortical reorganization") 53
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Google Scholar:

Google Scholar	"musculoskeletal pain" AND "motor control" AND "cingulate cortex" AND "limbic system" 201 "musculoskeletal pain" AND "motor control" ("cingulate cortex" AND "limbic system") "neurophysiological" AND "neural plasticity" 40 ("musculoskeletal pain" OR "chronic musculoskeletal pain" OR "chronic pain") AND ("cingulate cortex" OR "anterior cingulate cortex" OR "limbic system") AND ("motor control" OR "motor behavior" OR "neuromuscular control") AND ("neurophysiological
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	changes” OR “neural plasticity” OR “cortical reorganization”)1240
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Web of Science:

Web of Science	(chronic musculoskeletal pain AND (anterior cingulate cortex OR limbic system) AND motor control)5
	(chronic musculoskeletal pain AND (anterior cingulate cortex OR limbic system) AND motor control)5
	(“neurophysiological changes” OR “neural plasticity” OR “cortical reorganization” OR “central nervous system” OR “brain networks” OR “pain-related brain activity” OR “central sensitization”) AND (“cingulate cortex” OR “anterior cingulate cortex” OR “ACC” OR “limbic system” OR “insular cortex” OR insula OR amygdala OR hippocampus OR “medial prefrontal cortex”) AND (“musculoskeletal pain” OR “chronic musculoskeletal pain” OR “chronic pain” OR “neck pain” OR “low back pain” OR “myofascial pain” OR “shoulder pain”) AND (“motor control” OR “motor planning” OR “motor coordination” OR “movement control” OR “neuromuscular control” OR “sensorimotor integration” OR “motor output”)3

Ebsco:

Ebsco	(“cingulate cortex” OR “anterior cingulate cortex” OR limbic OR amygdala OR insula) (“musculoskeletal pain” OR “chronic pain”) (motor OR movement OR sensorimotor) 155
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