

**Supplementary Table 1. Sex-specific publications listed by year of publication. Pink shaded publications are female-specific studies; blue shaded publications are male-specific studies.**

Sex-Specific Publications				
Publication	Subjects	Modality/Task	Main Results	Evoked vs. Non-evoked Paradigm
<b>2015</b>				
Farmer et al. 2015	IC/PBS= 34 HC = 32	DTI (FA)	<u>IC/PBS vs. HC</u> - Patients had ↓ FA in anterior thalamic radiation, forceps major and longitudinal fasciculus. - Patients had ↑ in superior and bilateral inferior longitudinal fasciculi	Non-evoked paradigm
Gupta et al. 2015	LPVD = 29 IBS = 29 HC = 29	Resting fMRI	<u>LPVD vs. HC</u> - Patients showed ↑ connectivity between SMA and somatosensory network - Patients had ↑connectivity between GP, aMCC, putamen and salience network, but ↓ connectivity between orbital mPFC and salience network Patients had ↑ connectivity between angular gyrus and anterior precuneus and the DMN, but ↓ connectivity between posterior precuneus, dorsal and ventral PCC and DMN	Non-evoked paradigm
Hubbard et al. 2015	IBS = 15 HC = 14	fMRI (modified flanker task)	<u>IBS vs. HC</u> - Patients had ↓ reaction times during the alerting and orienting conditions which were associated with ↑activation of aMCC and INS, and ↓activity in inferior frontal and SMA	Evoked non-pain paradigm

Kutch et al. 2015	CP/CPPS = 28 HC = 27	Resting fMRI	<u>CP/CPPS vs. HC</u> - Patients had ↑ connectivity between the motor cortex and pINS	Non-evoked paradigm
Kairys et al. 2015	IC/PBS = 33 HC = 33	MRI (GMV)	<u>IC/PBS vs. HC</u> - Patients had ↑ GMV SI, superior parietal, SMA	Non-evoked paradigm
Labus et al. 2015	IBS = 106 HC = 106	MRI (CT, GMV, shape)	<u>IBS vs. HC</u> - Morphometry of primary sensorimotor cortices is most predictive brain variable for IBS	Non-evoked paradigm
Liu et al. 2015	MIGR = 135 HC = 111	MRI (GMV); Resting fMRI; COMT val158met genotype	<u>MIGR vs. HC</u> - Val homozygote patients had ↑ HIPP GMV and ↓ HIPP functional connectivity with mPFC, OFC, PreCG, PosCG, ACC, INS, AMYG - Met carrier patients had ↑ HIPP functional connectivity with PreCG, PCC, precuneus, occipital cortex	Non-evoked paradigm
Liu et al. 2015	MIGR = 108 HC = 30	Resting fMRI	<u>MIGR vs. HC</u> - Duration of disease was correlated with number of resting state functional connectivity abnormalities - Duration of disease was correlated with connectivity strength in OFG, MFG, IFG, INS, SMA, PreCG, PosCG, IPG, and occipital cortex	Non-evoked paradigm
Lowen et al. 2015	IBS = 33 HC = 18	fMRI (habituation to distension)	<u>IBS vs. HC</u> - Patients with visceral hypersensitivity had ↑ response both to the anticipation and delivery of low intensity rectal distensions in INS, ACC, MCC - Patients without hypersensitivity had IBS-N ↓ decreasing response to repeated rectal distensions in INS, PFC, AMYG	Evoked pain paradigm
Maleki et al.	MIGR = 46	MRI (CT)	<u>MIGR vs. HC</u>	Non-evoked paradigm

2015	HC = 46		- In patients, INS does not thin with age	
Martucci et al. 2015	UCPPS = 45 HC = 45	Resting fMRI	<u>UCPPS vs. HC</u> - Patients had ↑ PCC connectivity with INS, dIPFC, THAL, GP, putamen, AMYG, HIPPO - Patients had ↓ precuneus connectivity with OFC, ACC ventromedial PFC and parietal cortices	Non-evoked paradigm
Rahm et al. 2015	FM = 11 HC = 11	fMRI (visual stimuli)	<u>FM vs. HC</u> - Patients showed ↑ BOLD activity in SMA - During “self-perspective” paradigm patients showed ↑ BOLD activity in SMA, aINS, somatosensory cortices, ACC	Evoked non-pain paradigm
Robinson et al. 2015	FM = 14 HC = 12	MRI (Volume)	<u>FM vs. HC</u> - Left AMYG volume was most informative neuroimaging feature in classifying subjects	Non-evoked paradigm
Sutton et al. 2015	PVD1 = 8 PVD2 = 7 HC = 15	MRI (GMD)	<u>PVD1 vs. PVD2</u> - PVD1 showed ↓ GMD in pain processing regions	Non-evoked paradigm
<b>2014</b>				
Bagarinao et al. 2014	CPPS = 33 HC = 33	MRI (GMD)	<u>CPPS vs. HC</u> - Patients showed ↑ GMD in SI, pre-SMA, HIPPO, AMYG	Non-evoked paradigm
Comasco et al. 2014	PMDD = 31 HC = 31	fMRI (emotion task; 5-HTTLPR and BDNF genotypes)	<u>PMDD vs. HC</u> - Patients had ↓ activation in ACC and vmPFC  <u>PMDD Met allele carriers vs. HC Met allele carriers</u> - Patients had ↓ fronto-cingulate activation	Evoked non-pain paradigm

			in luteal phase	
Ichesco et al. 2014	FM = 18 HC = 18	Resting fMRI	<u>FM vs. HC</u> Patients showed ↑ functional connectivity between - 1. Right mINS cortex and right mid/poster cingulate cortex - 2. Right pINS cortex and left cingulate cortex - 3. Right aINS cortex and left STG  HCs showed ↑ functional connectivity between - 1. Left aINS cortex and bilateral medial frontal gyrus, ACC - 2. Left pINS cortex and right SFG	Non-evoked paradigm
Khan et al. 2014	BMS = 9 HC = 9	MRI (GMV); Resting fMRI; DTI (FA)	<u>BMS vs. HC:</u> - Patients had ↑ GMV and lower FA in HIPP and ↓ GMV in mPFC. - Patients had ↑ mPFC-HIPP connectivity - mPFC connectivity was ↑ with ACC, AMYG, vmPFC, occipital cortex during high pain state compared to lower pain state in patients	Non-evoked paradigm
Kilpatrick et al. 2014	IC/PBS = 82 HC = 85	Resting fMRI	<u>IC/PBS vs. HC</u> - Patients showed ↑ INS frequency; ↓ sensorimotor frequency (PosCG, paracentral, SMA); ↑ sensorimotor functional connectivity with midbrain and cerebellum	Non-evoked paradigm
Kim et al. 2014	MIGR = 56 HC = 34	MRI (CT)	<u>MIGR vs. HC</u> - Patients showed ↑ CT in MFG, PosCG	Non-evoked paradigm
Labus et al. 2014	IBS = 82 HC = 119	MRI (GMV)	<u>IBS vs. HC</u> - Patients had ↓ volumes in bilateral SFG, INS, HIPP, mOFG, left cingulate, left gyrus rectus, brainstem and left putamen	Non-evoked paradigm

			- Patients had ↑ volumes in the left PosCG	
Lopez-Sola et al. 2014	FM = 35 HC = 25	fMRI (Non-painful multi-sensory stimuli)	<u>FM vs. HC</u> - Female FM showed ↓ responses in visual and auditory areas - Female FM showed ↑ response in INS	Evoked non-pain paradigm
Martinsen et al. 2014	FM = 29 HC = 31	fMRI (Stroop Color Word Task)	<u>FM vs. HC</u> Patients showed ↑ reaction times, particularly during the incongruent task, and ↓ activity in caudate nucleus, lingual gyrus, temporal areas, and HIPPO during the incongruent task	Evoked non-pain paradigm
Pujol et al 2014	FM = 40 HC = 36	Resting fMRI	<u>FM vs. HC</u> - Patients showed ↓ functional connectivity between PAG and aINS and between SII and primary somatosensory/visual/auditory cortices - Patients showed ↑ functional connectivity between SII and DMN	Non-evoked paradigm
Schmidt-Wilcke et al. 2014	FM = 18 HC = 14	fMRI (Go/No Go Task)	<u>FM vs. HC</u> - Patients showed an association between the extent of body pain distribution and ↓ activity in ACC, aMCC, SMA	Evoked non-pain paradigm
Shin et al. 2014	Vestibular MIGR = 2	PET (FDG)	<u>Ictal vs. Interictal</u> - Activation of bilateral cerebellum and frontal cortices - Deactivation of bilateral posterior parietal and occipitotemporal areas	Non-evoked paradigm
Sundermann et al. 2014	FM = 17 RA = 16 HC = 17	Resting fMRI	<u>FM vs. RA vs. HC</u> - Multivariate pattern analysis did not differentiate groups beyond trends	Non-evoked paradigm
Zhao et al. 2014	MIGR = 19 HC = 20	Resting fMRI (ReHo)	<u>MIGR vs. HC</u> - Abnormal regional homogeneity changes found in patients in the putamen, OFC, SII, brainstem and THAL	Non-evoked paradigm

<b>2013</b>				
Baller et al. 2013	PMDD = 15 (PET), 14 (fMRI) HC = 15 (PET), 14 (fMRI)	PET, fMRI (n-back task)	<u>PMDD vs. HC</u> - Patients had ↑ PFC activation	Evoked non-pain paradigm
Berman et al. 2013	PMDD = 12 HC = 13	MRI (GMV)	<u>PMDD vs. HCs</u> - Patients had ↑ GMV in posterior cerebellum	Non-evoked paradigm
Bouhassira et al. 2013	IBS = 20 HCs = 11	fMRI (rectal distension)	<u>IBS with RIII facilitation vs. IBS with RIII inhibition</u> - No significant activation differences  <u>IBS vs. HCs</u> - No significant activation differences	Evoked pain paradigm
Ceko et al. 2013	Young FM = 14 Older FM = 14 Young HC = 14 Older HC = 14	MRI (GMV, WMV)	<u>Young FM vs. Older FM</u> - Older patients showed ↓ GMV and WMV. - Younger patients showed ↑ GMV in the BG and INS	Non-evoked paradigm
Fallon et al. 2013	FM = 16 HC = 15	MRI (VBM)	<u>FM vs. HC</u> - Patients showed shape alterations of the lower brainstem, ↓ GMV in the brainstem and precuneus, and ↑ GMV in SI	Non-evoked paradigm
Gingnell et al. 2013	PMDD = 18 HC = 16	fMRI (emotional stimuli)	<u>PMDD vs. HC</u> - During luteal phase, patients had ↑ PFC reactivity during anticipation correlated with progesterone	Evoked non-pain paradigm
Gonzalez de la	MIGR = 27	PMRS	<u>MIGR vs. HC</u>	Non-evoked paradigm

Aleja 2013	HC = 19		<ul style="list-style-type: none"> <li>- Patients showed ↑ Glu/Gln ratio in occipital cortex</li> <li>- Patients showed ↑ Glu in paracingulate cortex</li> </ul>	
Hampson et al. 2013	VVD = 24 FM = 24 HC = 13	fMRI (thumb pressure and vulvar pressure)	<u>VVD vs. HC</u> <ul style="list-style-type: none"> <li>- VVD showed ↑ activations in the INS, dorsal MCC, PCC, THAL to thumb pain</li> </ul> <u>VVD &amp; FM vs. HC</u> <ul style="list-style-type: none"> <li>- VVD &amp; FM showed ↑ activations in the INS to thumb pain</li> </ul>	Evoked pain paradigm
Jensen et al. 2013	FM = 26 HC = 13	MRI (CT, GMV); fMRI (pressure pain)	<u>FM vs. HC</u> <ul style="list-style-type: none"> <li>- Overlap was present in ↓ CT and GMV and functional regional coherence in rostral ACC</li> <li>- Morphometric changes correlated with longer exposure to pain</li> <li>- In patients, morphometric and functional changes in the mesolimbic areas correlated with depression symptoms</li> </ul>	Both evoked pain paradigm and non-evoked paradigm
Kamping et al. 2013	FM = 16 HC = 16	fMRI (visual stimuli and laser pain to left hand)	<u>FM vs. HC</u> <ul style="list-style-type: none"> <li>- Patients showed significantly ↑ power in SI, SMA, dIPFC and AMYG</li> </ul>	Evoked pain and non-pain paradigm
Kim et al. 2013	FM = 19 HC = 20	Resting fMRI	<u>FM vs. HC</u> <ul style="list-style-type: none"> <li>- Patients showed significantly ↑ frequency power in SI, SMA, dIPFC, AMYG not associated with depression or anxiety</li> </ul>	Non-evoked paradigm
Labus et al. 2013	IBS = 11 HC = 15	fMRI (CRF-R1 antagonist effects; threat of abdominal pain)	<u>IBS vs. HC</u> <ul style="list-style-type: none"> <li>- Patients had ↑ CRF-R1 antagonist suppression of pons, mPFC, HIPPO, aINS and midbrain during extinction</li> </ul>	Evoked pain paradigm
Lee et al. 2013	FM = 23 HC = 24	fMRI (Visual pictures of painful vs. non-painful stimuli)	<u>FM vs. HC</u> <ul style="list-style-type: none"> <li>- Patients showed ↓ activation to pain-related stimuli in the THAL, ACC, dIPFC, PreCG, PosCG and SMA</li> </ul>	Evoked pain paradigm

Liu et al. 2013	MIGR = 26 HC = 26	MRI (topological properties)	<u>MIGR vs. HC</u> - Patients showed longer global distance connection - Patients showed abnormal global topology in structural networks (i.e. ↑ clustering coefficients)	Non-evoked paradigm
Piche et al. 2013	IBS = 14 HC = 14	MRI (CT)	<u>IBS vs. HC</u> -Patients showed ↓ pain inhibition and ↑ pINS thickness  <u>All Subjects:</u> ↑ lateral OFC associated with less pain inhibition	Non-evoked paradigm
Qiu et al. 2013	CLUST = 12 HC = 12	Resting fMRI	<u>CLUST vs. HC</u> - During pain in attack phase, patients showed ↑ functional connectivity of HYPO with ACC, PCC, SFG, MFG, IFG, STG, IPG, AMYG, and PHG - During out of attack phase, patients showed ↑ functional connectivity of HYPO with IFG, STG, MTG, temporal pole, INS cortex, parahippocampal gyrus, and uncus	Non evoked pain paradigm
Rosenberger et al. 2013	IBS = 15 HC = 12	fMRI (rectal distension)	<u>IBS vs. HC</u> - Patients showed ↑ cerebellular activation associated with anxiety and depression	Evoked pain paradigm
Tu et al 2013	PDM = 32 HC = 32	MRI (GMV)	<u>PDM vs. HC (menstruation – periovulatory phase)</u> - Patients displayed ↑ GMV changes in the left medial OFC, PreCG, ITG and right HYPO during menstruation - Patients showed ↓ GMV changes in the left SII and ACC/dorsal PCC during menstruation	Non-evoked paradigm

Arkink et al. 2012	MIGR = 29 HC = 16	MRI (perfusion)	<u>MIGR vs. HC</u> - Patients without aura had ↑ perfusion in MFG, ITG, and MTG, and ↓ perfusion in IFG - Patients with aura had ↓ perfusion in PosCG, ITG	Non-evoked paradigm
As-Sanie et al. 2012	CPP with ENDO = 17 ENDO without CPP = 15 CPP without ENDO = 6 HC = 23	MRI (GMV)	<u>CPP with ENDO vs. HC</u> - Patients showed ↓ GMV in THAL, ACC, putamen, INS <u>CPP without ENDO vs. HC</u> - Patients showed ↓ GMV in THAL <u>ENDO without CPP vs. HC</u> - No significant differences	Non-evoked paradigm
Bannbers et al. 2012	PMDD = 14 HC = 13	fMRI (Go/NoGo task)	<u>PMDD vs. HC</u> - Patients had ↓ activity in parietal areas - Patients had ↑INS activity during luteal phase and ↓ INS activity during follicular phase	Evoked non-pain paradigm
Barke et al. 2012	CLBP = 15 HC = 15	fMRI (phobia-related pictures)	<u>CLBP vs. HC</u> - No difference in fear-related activations	Evoked non-pain paradigm
Burgmer et al. 2012	FM = 17 HC = 17	fMRI (tonic pain in right volar forearm)	<u>FM vs. HC</u> - HCs displayed correlations between activity of the dIPFC and sensorimotor cortex with secondary hyperalgesia scores while patients did not. - No group differences in correlations between brain activity and primary hyperalgesia scores	Evoked pain paradigm
Duschek et al. 2012	FM = 25 HC = 25	CBF (thermal stimulation)	<u>FM vs. HC</u> - Patients showed ↑ blood flow response in anterior cerebral arteries	Evoked pain paradigm
Ellingson et al. 2012	FM = 11	fMRI (heat & cognitive distraction)	-During distraction, physical activity was positively associated with dIPFC, PCC, PAG activity and negatively associated	Evoked pain paradigm

			with aINS activity -Sedentary time was negatively associated with dIPFC, THAL, SFG, PreCG, and PosCG activity	
Foerster et al. 2012	FM = 16 HC = 17	PMRS	<u>FM vs. HC</u> - Patients had ↓ GABA levels in right aINS In patients, ↑ GABA levels in pINS positively correlated with pressure-pain thresholds	Non-evoked paradigm
Gingnell et al. 2012	PMDD = 14 HC = 15	fMRI (emotional faces)	<u>PMDD vs. HC</u> - Patients had ↑ AMYG reactivity in follicular phase correlated with progesterone	Evoked non-pain paradigm
Hassett et al. 2012	FM = 66 HC = 22	MRI (GMV)	<u>FM vs. HC</u> - Patients with shorter telomeres showed ↓ GMV in SI, MFG, precuneus	Non-evoked paradigm
Howard et al. 2012	OA = 16 HC = 17	rCBF	<u>OA vs. HC</u> Patients showed ongoing pain as represented in SI,SII, INS, cingulate cortex, THAL, AMYG, HIPPP, dorsal midbrain/pontine tegmentum, PAG/nucleus cunneiformis	Non-evoked paradigm
Jensen et al. 2012	FM = 28 HC = 14	fMRI (pressure pain)	<u>FM vs. HC</u> - Patients displayed ↑ connectivity of the rostral ACC to AMYG, HIPPP, and brainstem and ↓ connectivity of the THAL to OFC	Evoked pain paradigm
Jeong et al. 2012	PMDD = 15 HC = 15	MRI (GMD)	<u>PMDD vs. HCs</u> - Patients had ↑ GMD in HIPPP and ↓ GMD in PHG	Non-evoked paradigm
Larsson et al. 2012	IBS = 44 HC = 20	fMRI (rectal distension)	<u>Hypersensitive IBS vs. Normosensitive IBS &amp; HC</u> -Hypersensitive patients had ↑ INS activation and ↓ ACC deactivation	Evoked pain paradigm

Liu et al. 2012	MIGR = 43 HC = 43	MRI (GMV); Resting fMRI (topological properties)	<u>MIGR vs. HC</u> - Patients showed abnormal global topology with ↑ mean clustering coefficients in both structural and functional networks - Patients showed ↑ betweenness centrality in PreCG, OFG, MTG, ITG, SMA, IPL and ↓ in PHG, ACC, and THAL	Non-evoked paradigm
Mordasini et al. 2012	CP/CPPS = 20 HC = 20	MRI (GMV)	<u>CP/CPPS vs. HC</u> - Patients had ↓ GMV in the ACC of the dominant hemisphere - ↓ ACC was positively correlated with Chronic Prostatitis Symptom Index (CPSI) scores and the pain subscale	Non-evoked paradigm
Qiu et al. 2012	CLUST = 12 HC = 12	Resting fMRI	<u>CLUST vs. HC</u> - Altered regional homogeneity in ACC, PCC, PFC, INS	Non-evoked paradigm
Teepker et al. 2012	CLUST = 7 Male HC = 7	DTI	<u>CLUST vs. HC</u> - Patients showed altered white matter in brainstem, frontal lobe, temporal lobe, occipital lobe, internal capsule and on the right side of the THAL and cerebellum.	Non-evoked paradigm
Seo et al. 2012	FM = 19 HC = 22	fMRI (N-back task)	- In patients, inferior frontal cortex was correlated with mild and moderate pain ratings after controlling for anxiety and depression - In patients, left dlPFC, right vlPFC, and right inferior parietal cortex activity was associated with anxiety and depression ratings	Evoked non-pain paradigm
Szabo et al. 2012	MIGR = 17 HC = 17	DTI (FA and MD)	<u>MIGR vs. HC</u> - Patients showed ↓ FA in the right frontal white matter cluster - Patients showed ↑ MD in the right frontal white matter cluster	Non-evoked paradigm

			- Patients showed ↑ connectivity of the right frontal white matter cluster to the pain network (OFC, INS, THAL, dorsal midbrain)	
Van der Schueren et al. 2012	MIGR = 20 HC = 18	PET (CBR1 imaging)	<u>MIGR vs. HC</u> - Patients showed ↑ CBR1 binding in ACC mesial temporal, PFC, superior frontal cortices	Non-evoked paradigm
<b>2011</b>				
Burgmer et al. 2011	FM = 14 HC = 11	fMRI (anticipation of pain)	<u>FM vs. HC</u> - Patients had ↑ activation of dIPFC, PAG, and posterior parietal cortex during anticipation of pain	Evoked pain paradigm
Chen et al. 2011	IBS = 10 HC = 16	DTI (FA)	<u>IBS vs. HC</u> -Patients showed ↑ FA in fornix and external capsule adjacent to the right posterior insula. - Pain severity correlated with FA of bilateral aINS and lateral THAL. - Pain unpleasantness correlated with FA of Left aINS. -Pain catastrophizing correlated negatively with FA of cingulum.	Non-evoked paradigm
Demarquay et al. 2011	MIGR = 10 HC = 10	PET ([ <sup>18</sup> F]MPPF tracer- 5-HT antagonist)	<u>MIGR vs. HC</u> - Patients who developed an odor-triggered MIGRaine attack showed ↑ [ <sup>18</sup> F]MPPF binding potential in the pontine raphe when compared to headache-free MIGR and HCs - Patients who developed a MIGRaine attack showed ↑ [ <sup>18</sup> F]MPPF binding potential in left OFC, PreCG, and temporal pole when compared to headache-free MIGR	Non-evoked paradigm

			- No significant differences were observed between headache-free MIGR and HCs	
Diers et al. 2011	FM = 6 HC = 6	fMRI (Intramuscular proton and prostaglandin injection)	<u>FM vs. HC</u> - Patients had ↑ activation of left aINS	Evoked pain paradigm
Farmer et al. 2011	CP/CPPS = 16 HC = 16	MRI (GMV) and fMRI (spontaneous pain)	<u>CP/CPPS vs. HC</u> - No group differences were found in GMV - GMV of aINS and ACC were positively correlated with pain intensity and pain chronicity - Spontaneous pelvic pain correlated with right aINS activity	Non-evoked paradigm
Glass et al. 2011	FM = 18 HC = 14	fMRI (go/no-go task)	<u>FM vs. HC</u> - Patients had ↓ activity in right pre-motor cortex, SMA, MCC, putamen Patients had ↓ activity in right INS cortex and right IFG after controlling for anxiety	Evoked non-pain paradigm
Kilpatrick et al. 2011	IBS = 26 HC = 19	fMRI (emotional and neutral faces; HTR3A genotype)	- C/C genotype was associated with ↑ generalized AMYG responsiveness regardless of diagnosis	Evoked non-pain paradigm
Kim et al. 2011	FM = 19 HC = 22	fMRI (pressure pain)	<u>FM vs. HC</u> - Patients had ↑ bilateral INS activation when exposed to high pressure stimuli	Evoked pain paradigm
McLoughlin et al. 2011	FM = 16 HC = 18	fMRI (thermal pain)	- In patients, physical activity positively correlated with activity in dIPFC, PCC, and pINS - In patients, physical activity negatively correlated with activity in SI and superior parietal cortex	Evoked pain paradigm
Rapkin et al. 2011	PMDD = 12 HC = 12	PET	<u>PMDD vs. HCs</u> - Patients had ↑ cerebellular activity	Non-evoked paradigm
Robinson et al. 2011	FM = 12 HC = 14	MRI (GMV)	<u>FM vs. HC</u> - Patients had ↓ GMV in ACC, MCC and	Non-evoked paradigm

			mINS	
Seifert et al 2011	CLUST = 7 HC = 7	PET (FDG)	<u>CLUST vs. HC</u> - A positive correlation between depression scores and glucose metabolism in INS cortex A positive correlation between disability scores and glucose metabolism in AMYG	Non-evoked paradigm
Vincent et al. 2011	DYS = 12 HC = 12	fMRI (thermal stimulation of arm and abdomen)	<u>DYS vs. HC</u> - During menstruation, patients failed to deactivate precuneus, fusiform, entorhinal cortex	Evoked pain paradigm
<b>2010</b>				
Blankstein et al. 2010	IBS = 11 HC = 16	MRI (VBM and CT)	<u>IBS vs. HC</u> - Patients had ↑ HYPO volume - Patients had ↓ thinning of the aMCC - Negative correlation between dIPFC CT and pain catastrophizing - Positive correlation between aINS CT and pain duration - Short-term IBS had INS thinning, BUT long-term IBS had normal INS thickness	Non-evoked paradigm
Bouloche et al 2010	MIGR = 7 HC = 7	PET- H <sub>2</sub> O <sup>15</sup> (Visual stimulation with/out concomitant trigeminal painful stimulation)	<u>MIGR vs. HC</u> Patients showed ↑ activation in cuneus, lingual gyrus and PCC when pain was applied	Evoked pain paradigm
Elsenbruch et al. 2010	IBS = 15 HC = 12	fMRI (rectal distension)	<u>IBS vs. HC</u> - During nonpainful distensions, patients had ↑ activation in the vIPFC, INS and aMCC - During painful distensions, patients had ↑ activation in the vIPFC and INS while controls had ↑ activation in the dIPFC and	Evoked pain paradigm

			sgACC	
Elsenbruch et al. 2010	IBS = 15 HC = 12	fMRI (rectal distension)	<u>IBS vs. HC</u> - Patients had ↑ activation in the PFC and aINS - Anxiety symptoms were associated with activation of the aMCC and pgACC in patients	Evoked pain paradigm
Hall et al. 2010	IBS = 7 HC = 6	fMRI (rectal distension)	<u>IBS vs. HC</u> - Patients had ↑ activation of ACC, INS, vmPFC - Patients failed to downregulate activity in the vmPFC and PCC/precuneus within the DMN - Controls had ↑ activation of THAL, striatal regions and dlPFC	Evoked pain paradigm
Jensen et al. 2010	FM = 83	fMRI (pressure pain)	- Brain activity during pain not modulated by depression, anxiety, or catastrophizing	Evoked pain paradigm
Napadow et al. 2010	FM = 18 HC = 18	Resting fMRI	<u>FM vs. HC</u> - Patients had ↑ connectivity between DMN and INS cortex Spontaneous pain at the time of the scan was correlated with greater intrinsic connectivity between the INS and both the DMN and the EAN	Non-evoked paradigm
Puri et al. 2010	FM = 5 HC = 5	MRI (GMD)	<u>FM vs. HC</u> - Patients showed ↓ GMD in SMA	Non-evoked paradigm
Tu et al. 2010	PDM = 32 HC = 32	MRI (GMV)	<u>PDM vs. HC</u> - Female patients had ↓ GMV in the right MFG, mPFC, precuneus, SII, pINS, STG/mINS, right culmen, and left cerebellar tonsil - Female patients showed ↑ GMV in the right posterior PHG/HIPP, ACC/dorsal ACC, PAG, HYPO, precuneus, MTG/STG, and right cerebral tonsil	Non-evoked paradigm

<b>2009</b>				
Burgmer et al. 2009	FM = 18 HC = 19	fMRI (tonic pain vs. phasic pain)	<u>FM vs. HC</u> - Patients showed differences in activity in fronto-cingulate cortex, SMA, and THAL which changed over the time course of pain stimulation and during anticipation of pain	Evoked pain paradigm
Burgmer et al. 2009	FM = 14 HC = 14	MRI (GMV)	<u>FM vs. HC</u> - Patients showed ↓ GMV in PFC, AMYG, and ACC	Non-evoked paradigm
Harris et al. 2009	FM = 19 HC = 14	PMRS	<u>FM vs. HC</u> - Patients showed ↑ Glu and combined Glu+Gln within right pINS For both groups, higher levels of Glu+Gln within right pINS were associated with lower pressure pain thresholds	Non-evoked paradigm
Hsu et al. 2009	FM with affective disorders = 29 FM without affective disorders = 29 HC = 29	MRI (GMV)	<u>FM with affective disorders vs. FM without affective disorders vs. HC</u> - Patients with affective disorders had ↓ left aINS GMV - No difference in left aINS GMV between patients without affective disorders and HCs Negative correlation was found between left aINS cluster and trait anxiety	Non-evoked paradigm
Jensen et al. 2009	FM = 16 HC = 16	fMRI (pressure pain)	<u>FM vs. HC</u> - Patients showed ↓ reactivity in rostral ACC	Evoked pain paradigm
Pujol et al. 2009	FM = 9 HC = 18	fMRI (pressure pain)	<u>FM vs. HC</u> - Patients showed ↑ aINS, BG, ACC activation	Evoked pain paradigm
Tu et al. 2009	PDM = 17 HC = 16	PET (glucose metabolism)	<u>PDM vs. HC</u> - Patients had ↑ regional metabolism in	Non-evoked paradigm

			<p>the PCC and ↓ metabolism in the SII and dIPFC</p> <p>In patients, the offset of menstrual pain was related to:</p> <ul style="list-style-type: none"> <li>- ↑ activity of the PFC/OFC and left ventral posterior THAL</li> <li>↓ activity of the left sensorimotor regions</li> </ul>	
Wood et al. 2009	FM = 30 HC = 20	MRI (GMD); PET ([18F]fluoro-L-DOPA)	<p><u>FM vs. HC</u></p> <ul style="list-style-type: none"> <li>- Patients showed ↓ GMD in PHG, PCC, ACC</li> <li>- ↓ GMD in PHG associated with dopamine metabolism from VTA</li> </ul>	Non-evoked paradigm
Wood et al. 2009	FM = 16 HC = 8	SPECT	<p><u>FM vs. HC</u></p> <ul style="list-style-type: none"> <li>- Patients showed ↓ ratio of N-acetylaspartate to creatine in HIP</li> </ul>	Non-evoked paradigm
<b>2008</b>				
Batra et al. 2008	PMDD = 12 HC = 13	PMRS	<p><u>PMDD vs. HC</u></p> <ul style="list-style-type: none"> <li>- Glu/cr plus phosphocreatine levels were significantly ↓ in the mPFC during the luteal phase compared to the follicular phase for both PMDD and HC</li> <li>- No diagnosis x phase effects were found</li> </ul>	Non-evoked paradigm
Berman et al. 2008	IBS = 14 HC = 12	fMRI (rectal distension)	<p><u>IBS vs. HC</u></p> <ul style="list-style-type: none"> <li>- During cued anticipation, patients had ↑ activation in the pINS and dorsal brainstem</li> <li>- During distensions, patients had ↑ activation in the dorsal brainstem, dorsal ACC and pINS</li> </ul>	Evoked pain paradigm
Demarquay et al. 2008	MIGR = 11 HC = 12	PET- H <sub>2</sub> O <sup>15</sup> (olfactory stimuli)	<p><u>MIGR vs. HC</u></p> <p>During both olfactory and non-olfactory conditions, patients showed ↑ activation in left temporal pole and ↓ activation in</p>	Non-evoked paradigm

			frontal and temporal parietal regions, PCC, and right locus coeruleus	
Guedj et al. 2008	FM = 20 HC = 10	SPECT	<u>FM vs. HC</u> - Patients showed ↑ perfusion of parietal, SI cortex associated positively with fibromyalgia impact questionnaire (FIQ) scores - Patients showed ↓ perfusion of anterior temporal cortex, which was negatively associated with FIQ.	Non-evoked paradigm
Lothe et al. 2008	MIGR = 10 HC = 24	PET (5-HT1A imaging)	<u>MIGR vs. HC</u> - Patients showed ↑ 5-HT1A binding potential in HIPPP, IPL, PosCG, precuneus, STG, MTG	Non-evoked paradigm
Lutz et al. 2008	FM = 30 HC = 30	DTI	<u>FM vs. HC</u> - Patients showed ↓ FA in both thalami, thalamocortical tracts and insular regions - Patients showed ↑ GMV in the PosCG, AMYG, HIPPP, SFG, and ACC.	Non-evoked paradigm
Ringel et al. 2008	IBS = 10 HC = 10	fMRI (rectal distension)	<u>IBS vs. HC</u> - Patients had ↑ pain, ↑ activity in the left MCC and PCC, and ↓ activity in the left supragenual ACC - Distension-elicited pain correlated with anxiety and anterior PCC activation - Subjects with abuse history showed ↑ activation of left MCC and PCC	Evoked pain paradigm
Schmitz et al. 2008	MIGR = 24 HC = 24	MRI (VBM); Maudsley Attention and Response Suppression Battery	<u>MIGR vs. HC</u> - Patients showed ↓ frontal and parietal lobe GMD and ↓ time to task set shifting - In patients, delayed response time correlated with ↓ GMD of the frontal lobes	Both evoked non-pain paradigm and non-evoked paradigm
Schweinhardt et al. 2008	PVD = 14 HC = 14	MRI (GMD)	<u>PVD vs. HC</u> - Patients showed ↑ GMD in PHG, HIPPP, BG related to lower pain threshold and	Non-evoked paradigm

			increased pain catastrophizing	
<b>2007</b>				
Chen et al. 2007	FM = 71 HC = 14	SPECT	<u>FM vs. HC</u> - Patients showed ↓ rCBF in THAL, BG and temporoparietal areas	Non-evoked paradigm
Guedj et al. 2007	FM = 18 HC = 10	SPECT	<u>FM vs. HC</u> - Patients showed ↑ somatosensory perfusion and ↓ frontal, cingulate, medial temporal and cerebellar perfusion	Non-evoked paradigm
Harris et al. 2007	FM = 17 HC = 17	PET (μ-opioid receptor)	<u>FM vs. HC</u> - Patients showed ↓ binding potential in the NAcc, AMYG, dorsal ACC - Binding potential in the NAcc was negatively correlated with affective pain ratings - Binding potential in the cingulate and striatum was negatively correlated with amount of affective pain	Non-evoked paradigm
Kuchinad et al. 2007	FM = 10 HC = 10	MRI (GMV)	<u>FM vs. HC</u> - Patients showed ↓ GMV in ACC, INS, medial frontal cortex and ↑ age-associated gray matter loss	Non-evoked paradigm
Sprenger et al. 2007	CLUST = 11 HC = 11	PET (FDG)	<u>CLUST vs. HC</u> - When “in bout” was compared to “out of bout”, patients showed ↑ metabolism in pgACC, PCC, PFC, INS, THAL and temporal cortex - When “in bout” was compared to “out of bout”, patients showed ↓ metabolism in cerebellopontine area - Compared to HCs, hypometabolism was observed in pgACC, PFC, and OFC in patients	Non-evoked paradigm

Wood et al. 2007	FM = 6 HC = 8	PET ([ <sup>18</sup> F]fluoro-L-DOPA)	<u>FM vs. HC</u> - Patients showed ↓ dopamine uptake in THAL, BG, ACC, HIP	Non-evoked paradigm
<b>2006</b>				
Albuquerque et al. 2006	BMS = 8 HC = 8	fMRI (thermal stimulation to trigeminal nerve)	<u>BMS vs. HC:</u> - Patients showed ↑ activation in right ACC and bilateral precuneus and ↓ activation in THAL, right MFG, right PreCG, left lingual gyrus and cerebellum	Evoked pain paradigm
Lawal et al. 2006	IBS = 10 HC = 10	fMRI (rectal distension)	<u>IBS vs. HC</u> - Patients had ↑ fMRI activity volume but similar % signal change as controls	Evoked pain paradigm
Song et al. 2006	IBS = 12 HC = 12	fMRI (rectal distension with and without ice water immersion of foot)	<u>IBS vs. HC</u> - Patients had ↓ activation in aINS, SII, and putamen during rectal stimulation alone - Patients had ↓ activation in SI and right STG and ↑ activation in right inferior lobule and bilateral STG during rectal plus heterotopic stimulation	Evoked pain paradigm
Sprenger et al. 2006	CLUST = 7 HC = 8	PET (Opioid Receptor)	<u>CLUST vs. HC</u> - ↓ receptor binding in pineal gland	Non-evoked paradigm
Tanaka et al. 2006	CFS = 7 HC = 7	fMRI (auditory stimuli during fatiguing visual task)	<u>CFS vs. HC</u> - Patients showed ↓ responsiveness to auditory stimuli	Evoked non-pain paradigm
<b>2005</b>				
De Lange et al. 2005	CFS = 28 HC = 28	MRI (GMV)	<u>CFS vs. HC</u> - Patients showed ↓ in global GMV This decline in GMV was linked to physical activity	Non-evoked paradigm
Mayer et al. 2005	IBS = 7 UC = 8	rCBF (rectal distension)	<u>IBS vs. HC</u> - Patients showed ↑ activation of the	Evoked pain paradigm

	HC = 7		AMYG, rostroventral ACC and dorsomedial frontal cortex	
Pukall et al. 2005	VVS = 14 Female HC = 14	fMRI (pressure to the posterior portion of the vulvar vestibule)	<u>VVS vs. HC</u> - Female VVS showed ↑ activations in the INS and frontal cortex	Evoked pain paradigm
<b>2004</b>				
Cook et al. 2004	FM = 9 HC = 9	fMRI (thermal stimulation)	<u>FM vs. HC</u> - Patients showed ↑ activity in INS during pain - Patients showed ↑ activity in PFC, SMA, INS, ACC during warm stimuli	Evoked pain paradigm
De Lange et al. 2004	CFS = 16 HC = 16	fMRI (motor imagery task and a control visual imagery task)	<u>CFS vs. HC</u> - During the motor imagery task, patients showed ↑ activity in visual structures - In both groups, dorsal ACC was activated during error trials - There was activity in the ventral ACC when HCs made errors, but there was no activity in the ventral ACC when patients made errors	Evoked non-pain paradigm
Sidhu et al. 2004	IBS = 8 HC = 8	fMRI (rectal distension)	<u>IBS vs. HC</u> - HC showed differences in cortical volume activated by increasing distension pressure - Patients failed to show differences in cortical volume activated by increasing distension pressure	Evoked pain paradigm
Wilder-Smith et al. 2004	IBS = 10 HC = 10	fMRI (rectal distension with and without DNIC)	<u>IBS-D vs. IBS-C vs. HC during distension alone</u> - IBS-D and IBS-C showed ↑ deactivation of AMYG/HIPP and ↓ activation of ACC - IBS-D showed ↓ activation of PFC	Evoked pain paradigm

			<u>IBS-D vs. IBS-C vs. HC during distension with DNIC</u> - IBS-D and IBS-C showed ↓ deactivation of aINS - IBS-D showed ↓ activation of ACC, PCC, and PFC - IBS-C showed ↑ activation of THAL, OFC, and AMYG/HIPP	
Yunus et al. 2004	FM = 12 HC = 7	PET (FDG)	<u>FM vs. HC</u> - There were no differences between patients and HCs in all brain structures	Non-evoked paradigm
<b>2003</b>				
Chang et al. 2003	IBS = 10 IBS+FM = 10	rCBF (rectal distension)	<u>IBS vs. IBS+FM</u> - ↑ rCBF to MCC with noxious visceral stimuli in IBS, but with somatic stimuli in IBS+FM	Evoked pain paradigm
Hagelberg et al. 2003	AFP = 8 HC = 11	PET [ <sup>18</sup> F]DOPA and D1 and D2 receptors with [ <sup>11</sup> C]NNC 756 and [ <sup>11</sup> C]raclopride	<u>AFP vs. HC</u> - Patients showed ↑ D2 receptor availability in left putamen - Patients showed ↓ D1/D2 ratio in the bilateral putamen - Patients ↑ uptake of [ <sup>11</sup> C]raclopride in the left putamen	Non-evoked paradigm
Hagelberg et al. 2003	BMS = 10 HC = 11	PET [ <sup>18</sup> F]DOPA and D1 and D2 receptors with [ <sup>11</sup> C]NNC 756 and [ <sup>11</sup> C]raclopride	<u>BMS vs. HC</u> - Patients showed ↑ [ <sup>11</sup> C]raclopride uptake in the left putamen Patients showed ↓ D1/D2 ratio in the left putamen	Non-evoked paradigm
Ringel et al. 2003	IBS = 6 HC = 6	PET (rectal distension)	<u>IBS vs. HC</u> - Patients had ↓ ACC and ↑ thalamic activation	Evoked pain paradigm
Vincent et al. 2003	MIGR = 5 HC = 5	fMRI (Visual stimuli)	<u>MIGR vs. HC</u> -Patients had activation in extrastriate	Evoked non-pain paradigm

			cortex -Controls had activation in the medial and anterior OFC	
Wik et al. 2003	FM = 8 HC = 8	PET (rCBF)	<u>FM vs. HC</u> - Patients showed ↑ rCBF in the bilateral retrosplenial cortex - Patients showed ↓ rCBF in the left frontal, temporal, parietal, and occipital cortices	Non-evoked paradigm
<b>2002</b>				
Epperson et al. 2002	PMDD = 9 HC = 14	SPECT	<u>PMDD vs. HCs</u> - Patients had ↑ cortical GABA levels during luteal phase	Non-evoked paradigm
<b>2001</b>				
Hadjikhani et al. 2001	MIGR = 3	fMRI (Visual stimuli)	-Patients had focal ↑ in BOLD signal within extrastriate cortex, progressing continuously and slowly over occipital cortex - BOLD signal ↓ following retinotopic progression	Evoked non-pain paradigm
Jaaskelainen et al. 2001	BMS = 10 HC = 14	PET [ <sup>18</sup> F]DOPA	<u>BMS vs. HC</u> Patients showed ↓ presynaptic dopaminergic function in the right putamen	Non-evoked paradigm
<b>2000</b>				
Kwiatek et al. 2000	FM = 17 HC = 22	SPECT	<u>FM vs. HC</u> - Patients showed ↓ rCBF in THAL, inferior pontine tegmentum, lentiform nucleus	Non-evoked paradigm
Lekander et al. 2000	FM = 5	PET (rCBF); [ <sup>15</sup> O]butanol to study immune function	- Negative correlation between natural killer cell activity and activity in secondary somatosensory and motor cortices and	Non-evoked paradigm

			THAL - Negative correlation between natural killer cell activity and bilateral activity in PCC	
<b>1999</b>				
Chugani et al. 1999	MIGR = 11 HC = 8	PET (5-HT synthesis)	<u>MIGR vs. HC</u> - Patients showed ↑ capacity for serotonin synthesis	Non-evoked paradigm
<b>1998</b>				
May et al. 1998	CLUST = 17	rCBF	<u>Acute Pain State vs. Non-pain State</u> - ↑ activation in HYPO, ACC, INS	Non-evoked paradigm
<b>1997</b>				
DiPiero et al. 1997	CLUST = 7 HC = 12	CBF (Cold water pressor test)	<u>CLUST vs. HC</u> - Patients had ↓ sensorimotor and THAL activation	Evoked pain paradigm
<b>1995</b>				
Mountz et al. 1995	FM = 10 HC = 7	SPECT	<u>FM vs. HC</u> - Patients showed ↓ rCBF in THAL and caudate	Non-evoked paradigm

**Abbreviations - Groups:** IC/PBS, interstitial cystitis/painful bladder syndrome; HC, healthy controls; LPVD, localized provoked vulvodynia; IBS, irritable bowel syndrome; MIGR, migraine; CP/CPSP, chronic prostatitis/ chronic pelvic pain syndrome; MIGR, migraine; UCPPS, urological chronic pelvic pain; FM, fibromyalgia; PVD, provoked vestibulodynia; PMDD, premenstrual dysphoric disorder; BMS, burning mouth syndrome; RA, rheumatoid arthritis; VVD, vulvodynia; CLUST, cluster headache; PDM, primary dysmenorrhea; CPP, chronic pelvic pain; CLBP, chronic lower back pain; OA, osteoarthritis; DYS, dysmenorrhea; CFS, chronic fatigue syndrome; VVS, vulvar vestibulitis syndrome

**Abbreviations – Methods:** DTI, diffusion tensor imaging; FA, fractional anisotropy; fMRI, functional magnetic resonance imaging; CT, cortical thickness; GMD, grey matter density; GMV, grey matter volume; MRI, magnetic resonance imaging;

WMV, white matter volume; VBM, voxel based morphometry; PMRS, Proton Magnetic Resonance Spectroscopy; MD, mean diffusivity; PET, positron emission tomography; CBF, cerebral blood flow; SPECT, Single-photon emission computed tomography;

**Abbreviations – Brain Regions:** SMA, supplementary motor area; aMCC, anterior mid cingulate cortex; mPFC, medial prefrontal cortex; DMN, default mode network; PCC, posterior cingulate cortex; INS, insula; pINS, posterior insula; S1, primary somatosensory cortex; HIPPO, hippocampus; OFC, orbital frontal cortex; PreCG, precentral gyrus; PosCG, postcentral gyrus; ACC, anterior cingulate cortex; AMYG, amygdala; MFG, middle frontal gyrus; IFG, inferior frontal gyrus; IPG, inferior parietal gyrus; MCC, mid cingulate cortex; dlPFC, dorsal lateral prefrontal cortex; THAL, thalamus; GP, globus pallidus; PFC, prefrontal cortex; aINS, anterior insula; vmPFC, ventral medial prefrontal cortex; mINS, mid insula; STG, superior temporal gyrus; SFG, superior frontal gyrus; mPFC, medial prefrontal cortex; mOFG, medial orbital frontal gyrus; SII, secondary somatosensory cortex; PAG, periaqueductal gray; BG, basal ganglia; HYPO, hypothalamus; PHG, parahippocampal gyrus; MTG, middle temporal gyrus; ITG, inferior temporal gyrus; PHG, parahippocampal gyrus; OFG, orbital frontal gyrus; vlPFC, ventrolateral prefrontal cortex; NAcc, nucleus accumbens; pgACC, pregenual anterior cingulate cortex; sgACC, subgenual anterior cingulate cortex; VTA, ventral tegmental area;

**Abbreviations – Other:** COMT, catechol-O-methyltransferase; HTTLPR, serotonin transporter polymorphism; BDNF, Brain-derived neurotrophic factor; FDG, F-fluorodeoxy glucose; RIII, nociceptive flexion reflex; Glu, glutamate, Gln, glutamine; CRF-R1, corticotropin-releasing factor receptor 1; GABA, gamma-Aminobutyric acid; CPSI, Chronic Prostatitis Symptom Index; CBR1, MOR,  $\mu$ - opioid receptor, Type 1 cannabinoid receptor; SCWT, Stroop Color Word Task; HTR3A, 5-hydroxytryptamine (serotonin) receptor 3A; EAN, executive attention network; FIQ, fibromyalgia impact questionnaire;