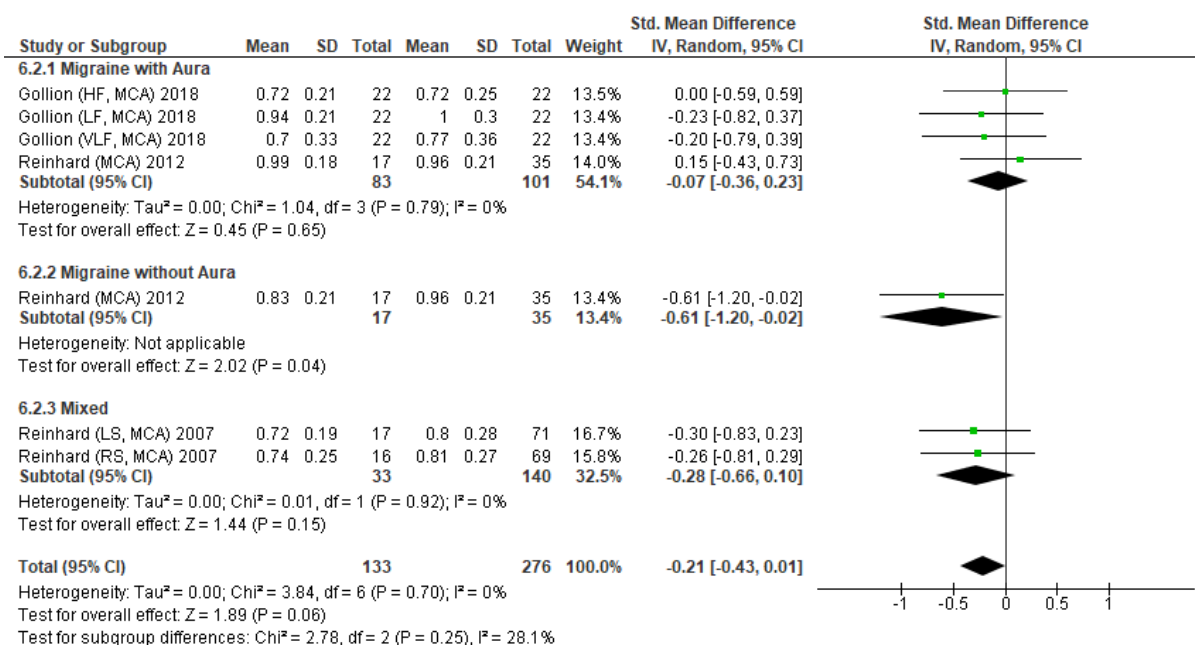


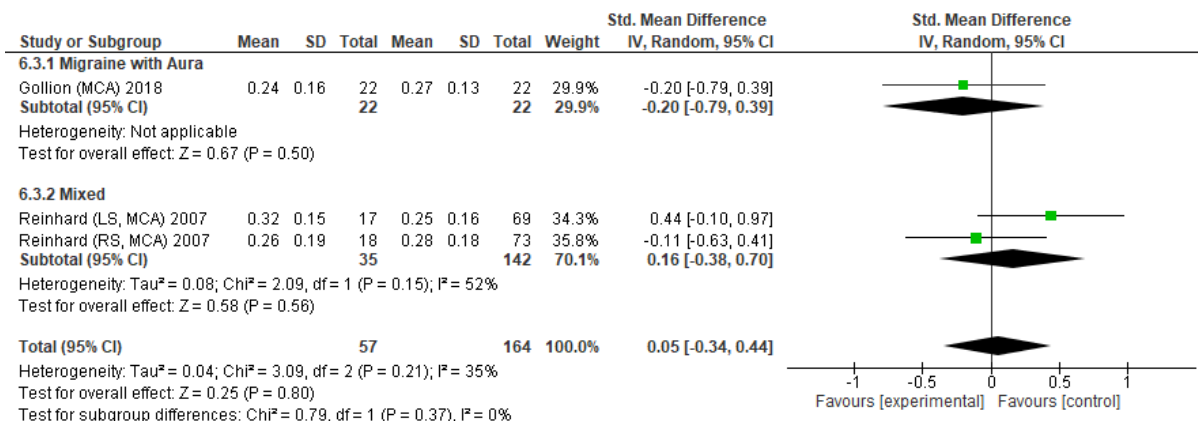
Supplemental Figure 1: Forest plot of six quantitative comparisons of phase in the anterior circulation in migraineurs versus controls taken from three studies

Abbreviations: HF, high frequency; LF, low frequency; LS, left side of cerebral artery; MCA, middle cerebral artery; RS, right side of cerebral artery; VLF, very low frequency



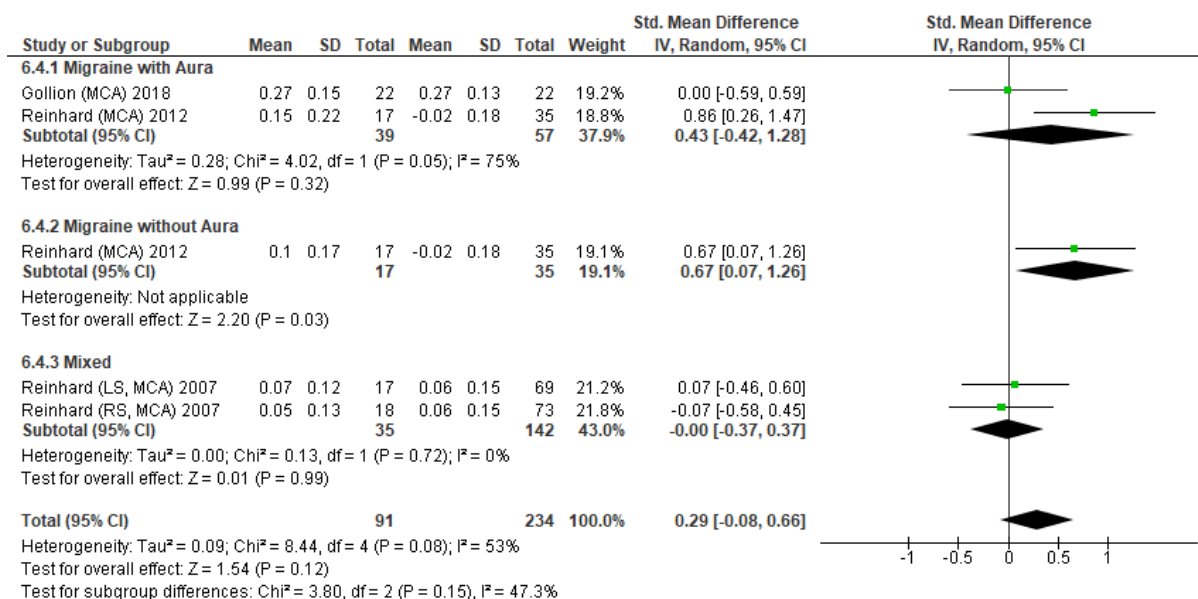
Supplemental Figure 2: Forest plot of six quantitative comparisons of gain in the anterior circulation in migraineurs versus controls taken from three studies

Abbreviations: HF, high frequency; LF, low frequency; LS, left side of cerebral artery; MCA, middle cerebral artery; RS, right side of cerebral artery; VLF, very low frequency



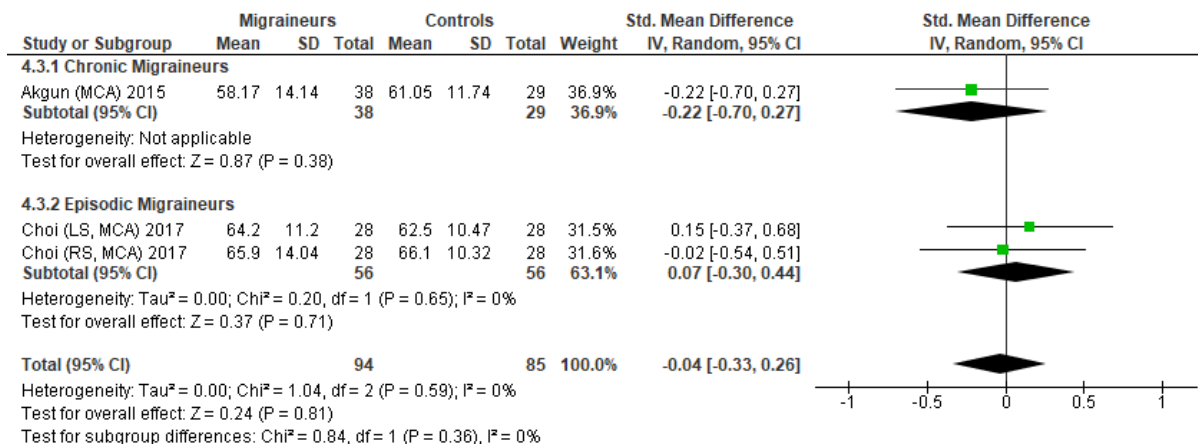
Supplemental Figure 3: Forest plot of three quantitative comparisons of Mx in the anterior circulation in migraineurs versus controls taken from two studies

Abbreviations: LS, left side of cerebral artery; MCA, middle cerebral artery; RS, right side of cerebral artery

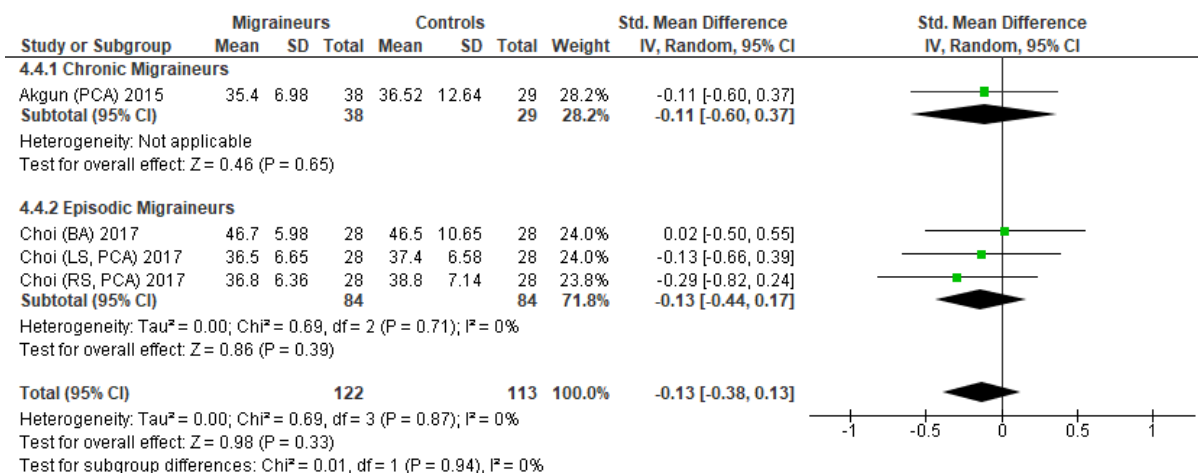


Supplemental Figure 4: Forest plot of five quantitative comparisons of Dx in the anterior circulation in migraineurs versus controls taken from three studies

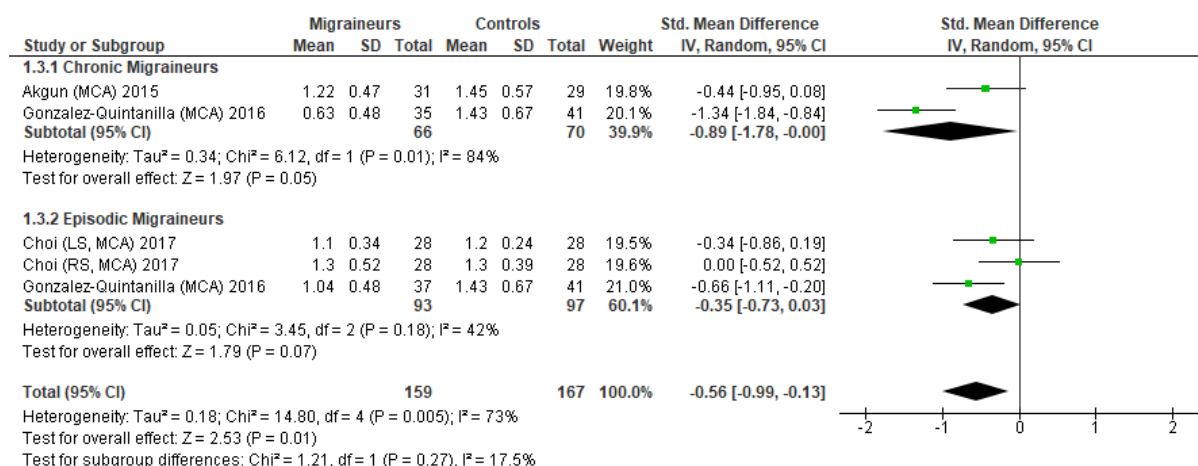
Abbreviations: LS, left side of cerebral artery; MCA, middle cerebral artery; RS, right side of cerebral artery



Supplemental Figure 5: Forest plot of three quantitative comparisons of mean blood flow velocity in the anterior circulation in migraineurs versus controls taken from two studies
Abbreviations: LS, left side of cerebral artery; MCA, middle cerebral artery; RS, right side of cerebral artery

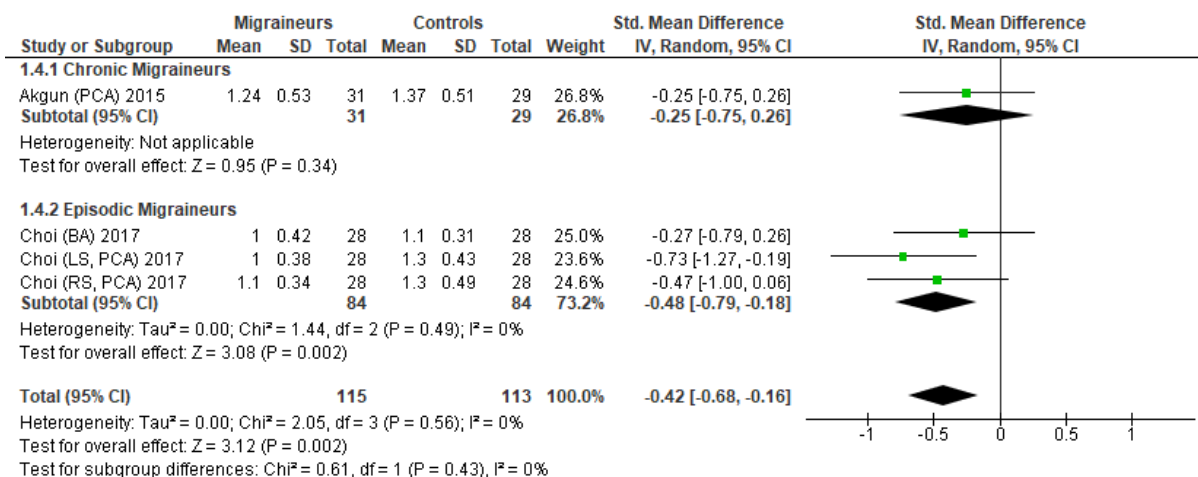


Supplemental Figure 6: Forest plot of four quantitative comparisons of mean blood flow velocity in the posterior circulation in migraineurs versus controls taken from two studies
Abbreviations: BA, basilar artery; LS, left side of cerebral artery; PCA, posterior cerebral artery; RS, right side of cerebral artery;



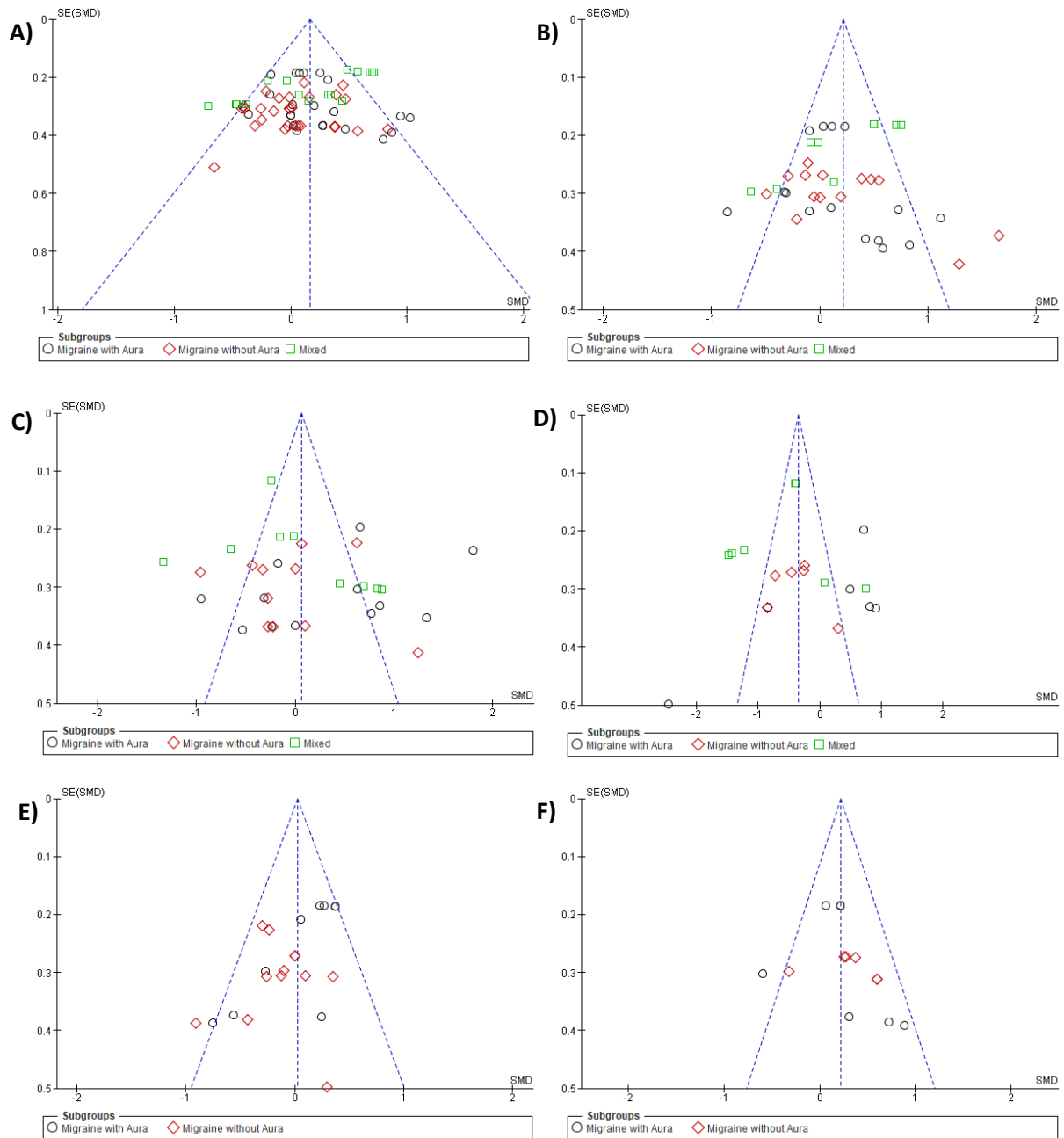
Supplemental Figure 7: Forest plot of five quantitative comparisons of cerebrovascular responsiveness to hypercapnia in the anterior circulation in migraineurs versus controls taken from three studies

Abbreviations: LS, left side of cerebral artery; MCA, middle cerebral artery; RS, right side of cerebral artery; VA, vertebral artery



Supplemental Figure 8: Forest plot of four quantitative comparisons of cerebrovascular responsiveness to hypercapnia in the posterior circulation in migraineurs versus controls taken from two studies

Abbreviations: LS, left side of cerebral artery; PCA, posterior cerebral artery; RS, right side of cerebral artery



Supplemental Figure 9: Funnel plot with pseudo 95% confidence intervals for A) MBFV in the anterior circulation, B) MBFV in the posterior circulation, C) CVR to hypercapnia in the anterior circulation, D) CVR to hypercapnia in the posterior circulation E) PI in the anterior circulation and F) PI in the posterior circulation to evaluate publication bias

Supplemental Table 1: Subgroup Analysis Summary

Supplemental Table 1A: Subgroup Analysis Summary					
			Overall Effect	Heterogeneity	
	Subgroup	SMD (95%CI)	P-Value	Chi² P-Value	I² (%)
Anterior MBFV	MA	0.19 (0.06, 0.32)	<0.01*	0.15	23
	MO	0.04 (-0.08, 0.15)	0.55	0.38	5
	Mixed	0.17 (-0.05, 0.39)	0.12	<0.01*	74
	<i>Test for subgroup differences</i>			0.20	38
Posterior MBFV	MA	0.16 (-0.06, 0.38)	0.15	<0.01*	58
	MO	0.20 (-0.07, 0.46)	0.16	<0.01*	67
	Mixed	0.23 (-0.02, 0.49)	0.07	<0.01*	76
	<i>Test for subgroup differences</i>			0.92	0
Anterior PI	MA	0.10 (-0.11, 0.31)	0.35	0.06	46
	MO	-0.14 (-0.31, 0.03)	0.10	0.55	0
	<i>Test for subgroup differences</i>			0.08	67
Posterior PI	MA	0.20 (-0.08, 0.48)	0.16	0.05	51
	MO	0.29 (0.03, 0.55)	0.03*	0.28	21
	<i>Test for subgroup differences</i>			0.66	0
Anterior CVRH	MA	0.33 (-0.15, 0.81)	0.17	<0.01*	87
	MO	-0.06 (-0.39, 0.26)	0.70	<0.01*	71
	Mixed	0.02 (-0.39, 0.44)	0.92	<0.01*	87
	<i>Test for subgroup differences</i>			0.40	0
Posterior CVRH	MA	0.00 (-0.80, 0.81)	1.00	<0.01*	90
	MO	-0.40 (-0.68, -0.11)	<0.01*	0.19	33
	Mixed	-0.60 (-1.07, -0.14)	0.01*	<0.01*	91
	<i>Test for subgroup differences</i>			0.44	0
Hypocapnia	MA	-0.21 (-1.15, 0.73)	0.66	<0.01*	85
	MO	0.17 (-0.25, 0.59)	0.43	0.08	52
	<i>Test for subgroup differences</i>			0.47	0
NVC	MA	0.23 (-0.37, 0.83)	0.45	<0.01*	80
	MO	0.10 (-0.61, 0.80)	0.78	0.18	45
	Mixed	0.33 (-0.22, 0.88)	0.24	Not estimable	Not estimable
	<i>Test for subgroup differences</i>			0.88	0
Phase	MA	-0.13 (0.42, 0.17)	0.40	0.90	0
	MO	0.53 (-0.06, 1.12)	0.08	Not estimable	Not estimable
	Mixed	0.39 (0.01, 0.77)	0.05	0.96	0
	<i>Test for subgroup differences</i>			0.04	69
Gain	MA	-0.07 (-0.36, 0.23)	0.65	0.79	0
	MO	-0.61 (-1.20, -0.02)	0.04	Not estimable	Not estimable
	Mixed	-0.28 (-0.66, 0.10)	0.15	0.92	0
	<i>Test for subgroup differences</i>			0.25	28
Mx	MA	-0.20 (-0.79, 0.39)	0.67	Not estimable	Not estimable
	Mixed	0.16 (-0.38, 0.70)	0.56	0.15	52
	<i>Test for subgroup differences</i>			0.37	0
Dx	MA	0.43 (-0.42, 1.28)	0.32	0.05	75
	MO	0.67 (0.07, 1.26)	0.03	Not estimable	Not estimable
	Mixed	-0.00 (-0.37, 0.37)	0.99	0.72	0
	<i>Test for subgroup differences</i>			0.15	47

Abbreviations: CVRH, cerebrovascular responsiveness to hypercapnia; MA, migraine with aura; MBFV, mean blood flow velocity; MO, migraine without aura; NVC, neurovascular coupling *P-Value <0.05

Supplemental Table 1B: Subgroup Analysis Summary					
			Overall Effect	Heterogeneity	
	Subgroup	SMD (95%CI)	P-Value	Chi ² P-Value	I ² (%)
Anterior MBFV	CM	-0.22 (-0.70, 0.27)	0.38	Not estimable	Not estimable
	EM	-0.07 (-0.30, 0.44)	0.71	0.65	0
	<i>Test for subgroup differences</i>			0.36	0
Posterior MBFV	CM	-0.11 (-0.60, -0.37)	0.65	Not estimable	Not estimable
	EM	-0.13 (-0.44, 0.17)	0.39	0.71	0
	<i>Test for subgroup differences</i>			0.94	0
Anterior CVRH	CM	-0.89 (-1.78, -0.00)	0.05	0.01*	84
	EM	-0.35 (-0.73, 0.03)	0.07	0.18	42
	<i>Test for subgroup differences</i>			0.27	18
Posterior CVRH	CM	-0.25 (-0.75, 0.26)	0.34	Not estimable	Not estimable
	EM	-0.48 (-0.79, -0.18)	<0.01*	0.49	0
	<i>Test for subgroup differences</i>			0.43	0

Abbreviations: CM, chronic migraine; CVRH, cerebrovascular responsiveness to hypercapnia; EM, episodic migraine; MA, migraine with aura; MBFV, mean blood flow velocity; *P-Value <0.05

Supplemental Table 2: Egger's Test

Supplemental Table 2: Egger's Test			
Comparison	Intercept	95% CI	P-value
MBFV			
Anterior Circulation	-1.201	-2.480 to 0.077	0.065
Posterior Circulation	-0.826	-2.870 to 1.218	0.418
CVR to Hypercapnia			
Anterior Circulation	1.407	-1.857 to 4.672	0.386
Posterior Circulation	0.228	-3.764 to 4.221	0.905
PI			
Anterior Circulation	-2.652	-4.427 to -0.878	0.006
Posterior Circulation	1.472	-1.526 to 4.471	0.303

Abbreviations: CVR, cerebrovascular reactivity; MBFV, mean blood flow velocity; PI, pulsatility index