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Do "central sensitisation" questionnaires reflect measures of nociceptive sensitisation or psychological constructs? A systematic review and meta-analyses

Article

Supplemental Material

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Supplementary Table 1a

Table shows correlations extracted from studies that correlate the CSI total score with psychological constructs

Study	N	Subject Population	Age (SD)	Sex (Female)	Psychological Construct								Questionnaires
					Dep	Anx	Cat	Stress	Sleep	Kin	Other		
					r	r	r	r	R	r	Measure	r	
Coronado et al (2018)	78	Shoulder Pain Patients	39.0 (14.5)	46%	0.64	0.66		0.67			Brief Resilience Scale Positive Affect Negative Affect	-0.29 -0.11 0.67	BRS, PANAS, DASS-21
Hendriks et al (2020)	125	Chronic Whiplash Patients	40.24 (11.26)	57%	0.56	0.54		0.66			4DSQsomatization	0.68	4DSQ
Kregel et al (2020)	116	Chronic Spinal Pain Patients	39.92 (12.52)	62%			0.46						PCS
van Wilgen et al (2018)	114	Chronic Pain Patients	46.73 (15.95)	56%			0.27						PCS
Wolmeister et al (2020)	150	Patients Undergoing Surgery	58.2 (12.1)	58%				0.51					B-MEPS
De Groef et al (2018)	146	Breast Cancer Survivors	56.8 (9.9)	100%			0.48						PCS
Gervais-Hupe (2018)	133	Knee Osteoarthritis Patients	63.5 (10.7)	56%			0.30				Somatization Anxio-depressive Symptoms	0.76 0.58	HADS (a+d), PCS, PHQ-15
Miki et al (2020)	238	Pre-surgical Low Back Pain Patients	63.50 (16.0)	43%	0.49	0.50	0.54						HADS (a+d), PCS
van der Noord et al (2018)	198	Chronic Pain Patients	46.8 (15.5)	58%	0.67	0.65	0.39						SCL-90, PCS
Andias et al (2020)	1,435	Adolescents with Pain	16.30 ± 1.17	64%	0.60	0.59	0.49	0.65	0.46	0.46			PCS, DASS-21, TSK, BaSIQs

Bilika et al (2020)	250	200 Chronic Pain Patients + 50 Healthy Controls	49.35 (14.70) 27.90 (8.71)	62% 50%			0.68						PCS
Chiarotto et al (2018)	220	Chronic Pain Patients	54.5 (15.5)	79%	0.55	0.71							HADS (a+d), PCS
Shigetoh et al (2019)	20	Musculoskeletal Pain Patients	67.5 (15.6)	60%	0.58	0.66	0.54			0.83			HADS (a+d), PCS, TSK
Clark et al (2018)	21	Chronic Low Back Pain Patients	43	76%		0.63					Sensory Sensitivity (SSv) Sensation Seeking (SSk)	0.57 -0.53	AASP
Clark et al (2019)	165	Chronic Low Back Pain Patients	45 (12)	76%		0.46					Sensory Sensitivity Sensation Avoiding Low Registration Sensation Seeking Profile	0.63 0.48 0.54 -0.23	AASP, STAI (t)
Sharma et al (2020)	100	Musculoskeletal Pain Patients	42.01 (14.61)	67%			0.50						PCS
Walankar et al (2020)	80	Chronic Shoulder Pain Patients	NA	48%			0.71			0.66			PCS, TSK
Verbrugghe et al (2020)	101	Chronic Low Back Pain Patients	44.2 (9.6)	61%				0.36		0.26			PSS, TSK
Neblett et al (2017)	763	Chronic Spinal Pain	46.8 (10.6)	35%	0.60				0.23		Abuse History PASS	0.11 0.34	BDI, ISI, PASS and abuse history
Mansiz-Kaplan et al (2020)	64	Adolescents with Chest Pain	15.0 (1.8)	84%	0.64	0.75					Childhood Trauma	0.57	HADS (a+d), CTQ

Knezevic et al (2020)	399	Chronic Pain Patients	52.76 (12.58)	67%			0.37	0.50					MOS, PCS
Caumo et al (2017)	285	Chronic Pain + Healthy Controls	NA	87%			0.68						PCS
Imai et al (2020)	201	Chronic and Non-Chronic Pain Patients	71.8 (8.8)	NA	0.50		0.33						GDS15, PCS
Polli et al (2020)	26	Healthy Controls	52.0(10.90)	100%		0.14	0.52						PCS, BAI
Polli et al (2020)	28	Pain Patients	48.0(9.44)	100%		0.78	0.26						PCS, BAI
Nguy et al (2020)	52	Parkinson's Disease Patients	67.8(7.80)	31%	0.46	0.42		0.41					HADS (a+d), PSQI
Midenfjord et al (2021)	401	All Participants Healthy, Chronic Pain and Irritable Bowell Syndrome Patients	31.0	73%	0.55	0.66							HADS (a+d)
Midenfjord et al (2021)	111	Healthy Volunteers	25.0	59%	0.32	0.43							HADS (a+d)
Midenfjord et al (2021)	36	Chronic Pain Patients	44.0	92%	0.56	0.75							HADS (a+d)
Serrano Ibanez et al (2021)	398	Chronic Pain Patients	53.03(8.76)	92%						DASS		0.44	DASS-21
Mikkonen et al (2021)	229	Musculoskeletal Pain Patients	NA	73%	0.62				0.46				TSK, DEPS

Shigetoh et al (2020)	43	Musculoskeletal and Central Pain Patients	72.2(12.9)	77%	-0.02	0.48	0.37			PCS, HADS (a+d)
Johnson et al (2020)	181	Chronic Pain Patients	44.62(14.06)	80%	0.60	0.61		Childhood Sexual Abuse	0.32	HADS(a+d), CATS
								Childhood Punishment	0.44	
								Childhood Neglect	0.50	
McKernan et al (2019)	175	Chronic Pain Patients	44.89(14.23)	80%				Trauma History Questionnaire	0.28	CTQ
								PCL (PTSD checklist)	0.65	

Anx = Anxiety, Cat = Pain Catastrophising, Dep = Depression, Kin = Kinesiophobia. n = number of participants, r = extracted correlation

*Questionnaire Key: **4DSQ** = Four-Dimensional Symptom Questionnaire, **AASP** = Adolescent/Adult Sensory Profile, **BAI** = Beck Anxiety Inventory, **BaSIQs** = Basic scale of Insomnia Complaints and Quality of Sleep, **BD** = Becks Depression Inventory, **B-MEPS** = Brief Measure of Emotional Pre-operative Stress, **BRS** = Brief Resilience Scale, CTQ = Childhood Trauma Questionnaire, DASS-21 = Depression Anxiety Stress Scale, DEPS = Depression Scale, GDS15 = Geriatric Depression Scale, **HADS (a+d)** Hopsitial Anxiety and Depression Scale, **ISI** = Insomnia Sleep Index, **MOS** = Medical Outcomes Study Sleep Scale, **PANAS** = Positive and Negative Affect Schedule, **PASS** = Pain Anxiety Sensitivity Scale, **PCS** = Pain Catastrophising Scale, **PSS** = Perceived Stress Scale, **PHQ-15** = Patient Health Questionnaire, **PSQI** = Pittsburgh Sleep Quality Index, **SCL-90** = Sympton Checklist 90, **STAI (t+s)** State and Trait Anxiety Inventory, **TSK** = Tampa Scale of Kinesophobia.*

Supplementary Table 1b

Table shows correlations extracted from studies that correlate the CSI total score with nociceptive measures

Study	**N**	**Subject Population**	**Age (SD)**	**Sex (Female)**	**Nociceptive Measure**										
					PPT		HPT		CPM		TS		WP	Other	
					r	avg r	r	avg r	R	avg r	r	avg r	r	Measure	r
Coronado et al (2018)	78	Shoulder Pain Patients	39.0 (14.5)	46%	-0.13 -0.09 -0.13	-0.12	-0.08 0.13	0.03						Suprathreshold	-0.03
Shulman et al (2020)	30	Chronic Pain Patients	15.2 (1.9)	75%										Offset Analgesia	-0.05
Shulman et al (2020)	32	Healthy Partcipants	15.3 (2.1)	72%										Offset Analgesia	-0.24
Hendriks et al (2020)	125	Chronic Whiplash Patients	40.24 (11.26)	57%	-0.11 -0.20	-0.17					0.03 -0.01	0.01			
Kregel et al (2020)	116	Chronic Spinal Pain Patients	39.92 (12.52)	62%	-.26 -.24 -.28 -.26	-0.26			0.02	0.02					
van Wilgen et al (2018)	114	Chronic Pain Patients	46.73 (15.95)	56%									0.58		
Wolmeister et al (2020)	150	Patients Undergoing Surgery	58.2 (12.1)	58%	-0.29	-0.29			0.01	0.01				Pressure Pain Tolerance	-0.20

De Groef et al (2018)	146	Breast Cancer Survivors	56.8 (9.9)	100%	-0.30	-0.30						Index of Widespread Hyperalgesia	-0.14
Gervais-Hupe (2018)	133	Knee Osteoarthritis Patients	63.5 (10.7)	56%	-0.24 -0.26	-0.25	0.19	0.19	0.07 0.09	0.08	0.40		
Mibu et al (2019)	104	Chronic Low Back Pain Patients	58.4(14.2)	74%	-0.09	-0.09			0.09	0.09	0.25		
Mibu et al (2019)	50	Knee Osteoarthritis Patients	66.7 (7.7)	90%	-0.16	-0.16			-0.13	-0.13	0.27		
French et al (2019)	36	18 Greater Trochanteric Pain Syndrome Patients + 18 Healthy controls	54.5 (23)	83%	-0.55 -0.57 -0.52 -0.52 -0.54 -0.36 -0.27 -0.44	-0.47							
Lluch Girbes et al (2016)	53	Knee Osteoarthritis Patients	70.2 (7.4)	64%								Area of pain	0.46
Moore et al (2020)	134	Knee Osteoarthritis Patients	64.63 (7.80)	61%	-0.39 -0.40 -0.37	-0.39	0.28	0.28	0.18 0.21	0.19		Manual Tender Point Count Number of Painful Sites	0.45 0.43

Polli et al (2020)	26	Pain Patients	52.0(10.90)	100%	0.02	0.02	0.11 -0.66 0.73	0.06			0.10	0.10	0.25	Cold Pain Neck Cold Pain Hand Cold Pain Leg	-0.15 0.07 -0.07
Polli et al (2020)	28	Healthy Participants	48.0(9.44)	100%	-0.33	-0.33	-.36 -.39 .15	-0.20			0.32	0.32	0.47	Cold Pain Neck Cold Pain Hand Cold Pain Leg	0.38 0.37 0.35
Proença et al (2021)	31	Healthy Participants	33.0	71%	-0.05 -0.10 -0.02	-0.06			0.08 0.24 0.17	0.16					
Proença et al (2021)	115	Temporomandibular Disorder	37.0	83%	-0.10 -0.08 -0.09	-0.09			-0.04 -0.06 0.03	-0.02					
Johnson et al (2020)	181	Chronic Pain Patients	44.62(14.06)	80%									0.52		
McKernan et al (2019)	175	Chronic Pain Patients	44.89(14.23)	80%									0.55		

CPM = Conditoned Pain Modulation, HPT – Heat Pain Threshold, PPT = Pressure Pain Threshold, TS – Temporal Summation, WP = Widespread Pain. n = number of participants, r = extracted correlation, avg r = average of extracted r correlations (multiple body sites per study).

Supplementary Table 1c

Table shows correlations extracted from studies that correlate the PSQ total score with psychological constructs.

Study	N	Subject Population	Age (SD)	Sex (female)	Psychological Construct						Questionnaires
					Dep	Anx	Cat	Stress	Other		
					r	avg r	r	r	Measure	r	
Coronado et al (2018)	78	Shoulder Pain Patients	39.0 (14.5)	46%	0.14	0.31		0.14	BRS Positive Affect Negative Affect	-0.39 -0.16 0.31	BRS, PANAS, DASS-21
Kuperman et al (2020)	130	Mild Traumatic Brain Injury Patients	37.0 (12.0)	44%	0.23	0.16	0.48	0.23			PCS, HADS (a+d), PSS
Ruscheweyh et al (2009)	47	Healthy Participants	25 (4)	61%	0.24	0.17	0.45				PCS, BDI, STAI (t+s)
Ruscheweyh et al (2017)	65	Chronic Pain Patients	49.3 (12.3)	74%	0.25	0.27					BDI, STAI (t+s), PCS
Honigman et al (2013)	29	Healthy Participants	27.6 (3.4)	48%		0.51	0.46				PCS, STAI (t+s)
Quan et al (2018)	182	Healthy Participants	39.9 (14.6)	74%	0.00	0.10	0.27				PCS, STAI (t+s), BDI
Bar-Shalita et al (2015)	250	Healthy Participants	27.3 (3.77)	50%			0.24		SRQ	0.31	PCS, SRQ
Azimi et al (2016)	101	Lumbar Disc Herniation Patients	52.4 (9.1)	54%			0.81				PCS
Hermesdorf et al (2016)	735	Depression Patients	49.72 (7.30)	59%	0.11	0.16					Ham (a+d)
Catchart et al (2012)	53	Chronic Tension	45.5 (13.4)	66%				0.34			DASS-21

Gacs et al (2020)	226	Headache Sufferers Healthy Participants	30.5 (10.3)	64%				Past Negativity Past-Positivity Present-Fatalism Present Hedonism Future-Orientation	0.20 0.02 0.16 -0.15 -0.14	ZTRI
Kim et al (2014)	72	Degenerative Spinal Disease patients	65.87 (8.14)	63%			0.38			PCS
Bar-Shalita et al (2020)	204	Healthy Participants	27.4 (3.71)	49%				Aversive Hedonic Extraversion Neuroticism Agreeableness Conscientiousness Openness to Experience	0.29 0.04 0.05 0.29 -0.13 -0.07 -0.15	SRQ
Grundstrom et al (2019)	37	Persistent Pelvic Pain	26.4 (5.9)	100%	0.27	0.19				HADS (a+d)
Grundstrom et al (2019)	55	Healthy Participants	30.2 (5.6)	100%	0.34	0.18				HADS (a+d)
Rehberg et al (2017)	198	Breast Cancer Patients	57.5 (12.5)	NA	0.12	0.13				BDI, STAI (t+s)
Kuperman et al (2018)	100	Mild Traumatic Brain Injury Patients	36 (12.5)	42%	0.17	0.11	0.31			PCS, HADS (a+d)

Kuperman et al (2018)	80	Healthy Participants	43 (14.3)	53%	0.08	0.03	0.23			PCS, HADS (a+d)
Ye et al (2020)	64	Healthy Participants	NA	52%		0.14	0.19			PCS, STAI (t+s)
Schemer et al (2020)	112	Healthy Participants	23.36(4.0)	100%	-0.10		0.15			BDI, PCS
Meeker et al (2021)	64	Healthy Participants	NA	NA	-0.01	0.11	0.50			CES-D, PCS, STAI-T
Forstenpointner et al (2021)	555	Pain, Painless and Healthy Participants	NA	NA	0.11	0.16	0.30			PCS, HADS (a+d)
Forstenpointner et al (2021)	332	Pain Patients	59.0 (15.5)	51%	0.01	0.10	0.25			PCS, HADS (a+d)
Forstenpointner et al (2021)	112	Healthy Controls	43.3 (13.0)	62%	0.12	0.11	0.14			PCS, HADS (a+d)
Kopera et al (2021)	110	Non-Alcohol Use Disorder Patients	40.6 (8.1)	NA	0.09			DERS	-0.17	BDI, DERS
Kopera et al (2021)	144	Alcohol Use Disorder Patients	44 (11.2)	NA	0.14			DERS	0.21	BDI, DERS
Huang et al (2019)	136	Pain Patients	44	36%	0.13		0.25	PANAS	0.07	PANAS, BDI, PCS
Huang et al (2019)	157	Healthy Controls	44	36%	0.11			PANAS	0.15	PANAS, BDI
Koo et al (2015)	58	Pain Patients	41.3 (14.5)	64%			0.26	PASS	0.11	PCS, PASS
Jakubczyk et al (2021)	165	Alcohol Use Disorder Patients	44(11.2)	12%		0.19				BSI
Jakubczyk et al (2021)	110	Non-Alcohol Use Disorder Patients	40.6(8.1)	26%		0.16				BSI

Zaorska et al (2020)	165	Alcohol Use Disorder Patients	25.7(9.6)	12%	0.19	CTQ	0.139	BSI, CTQ	

Anx = Anxiety, Cat = Pain Catasrophising, Dep = Depression, Kin = Kinesiophobia. n = number of participants, r = extracted correlation, avg r = average of STAI (trait and state)

*Questionnaire Key: **BD** = Becks Depression Inventory **BRS** = Brief Resilience Scale, **BSI** = Brief Symptom Inventory, **CES-D** = Centre for Epidemiologic Studies Depression Scale, **CTQ** = Childhood Trauma Questionnaire, **DASS-21** = Depression Anxiety Stress Scale, **DERS** = Difficulties in Emotion Regulation Scale, **HADS (a+d)** = Hopsitial Anxiety and Depression Scale, **PANAS** = Positive and Negative Affect Schedule, **PCS** = Pain Catastrophising Scale, **PSS** = Perceived Stress Scale, **SRQ** = Sensory Responsiveness Questionnaire, **STAI (t+s)** State and Trait Anxiety Inventory*

Supplementary Table 1d

Table shows correlations extracted from studies that correlate the PSQ total score with nociceptive measures.

Study	**n**	**Subject Population**	**Age (SD)**	**Sex (Fem)**	**Nociceptive Measure**									
					PPT		HPT		CPM		TS		Other	
					r	avg r	r	avg r	R	avg r	r	avg r	Measure	r
Coronado et al (2018)	78	Shoulder Pain Patients	39.0 (14.5)	46%	-0.14 -0.27 -0.25	-0.22	-0.17 0.17	0.00					Suprathreshold	0.15
Kuperman et al (2020)	130	Mild Traumatic Brain Injury Patients	37.0 (12.0)	44%	-0.25	-0.25	-0.30	-0.30	-0.13 0.31	0.09	0.15 0.16	0.16	Mean Area of Injured Pain Number of Painful Body Areas	0.26 0.28
Ruscheweyh et al (2009)	47	Healthy Participants	25.0 (4.0)	61%									Experimental Pain Threshold	.03

									Score	
									Experimental Pain Intensity Rating Score	0.56
									PinPrick	0.39
									Phasic Heat47	0.51
									Phasic Heat48	0.54
									Tonic Heat	0.43
									Tonic Cold	0.47
									Cold Pressor	0.42
Ruscheweyh et al (2015)	65	Chronic Pain Patients	49.3 (12.3)	74%	-0.29	-0.29	-0.45	-0.46	Tonic Cold	0.68
									Pinprick (512 mN)	0.38
									Phasic Heat	0.63
									47°C	0.67
									Phasic Heat 48°C	
Quan et al (2018)	182	Healthy Participants	39.9 (14.6)	74%					Electrical Pain Threshold	0.30
									Pain Tolerance	0.23
									Fixed Pain Stimulation	0.50
Hermesdorf et al (2016)	735	Depression Patients	49.7 (7.3)	59%	-0.21	-0.21				
Grundstrom et al (2019)	37	Persistent Pelvic Pain	26.4 (5.9)	100%	-0.43	-0.43	-0.63	-0.63	Cold Pain Threshold	0.56
Grundstrom et al (2019)	55	Healthy Participants	30.2 (5.6)	100%	-0.15	-0.15	-0.09	-0.09	Cold Pain Threshold	0.08
Van Boekel et al (2020)	262	Healthy Participants		57%	-0.05	-0.05			Pressure Pain Threshold- NRS	0.40
									Electrical Pain Tolerance (n=132)	-0.17

													Electrical Pain Tolerance NRS (n=132)	0.24
Ruscheweyh et al (2012)	46	Mixed Chronic Pain Patients	50 (13)	74%	-0.29	-0.30	-0.51	-0.51					Phasic Heat (47°C)	0.72
													Phasic Heat (48°C)	0.76
													Pinprick (512 mN)	0.40
													Tonic Cold	0.76
Valeberg et al (2017)	48	Healthy Participants		44%			−0.15	−0.15					Cold Pressor Pain Intensity rating	0.36
													Cold Pressor Pain Tolerance	-0.30
Rehberg et al (2017)	198	Breast Cancer Patients	57.5 (12.5)						-0.18	-0.18			Electrical Pain Threshold	-0.29
													Pain Intensity Heat (hot water bath)	0.33
Ruscheweyh et al (2018)	501	Population-Based Participants	52.9 (8.2)	52%	-0.17	-0.17								
Kohl et al (2014)	60	Fibromyalgia Patients	51.4 (9.4)	100%									Heat Pain Tolerance	-0.52
Kuperman et al (2018)	100	Mild Traumatic Brain Injury Patients	36 (12.5)	42%					-0.21 0.33	0.06	0.12	0.12	Electrical Pain tolerance	-0.27
Kuperman et al (2018)	80	Healthy Participants	43 (14.3)	53%					0.03 -0.11	-0.04	0.30	0.30	Electrical Pain Tolerance	-0.01
Meeker et al (2021)	64	Healthy Participants					-0.29	-0.29					Warm Detection Threshold	-0.08

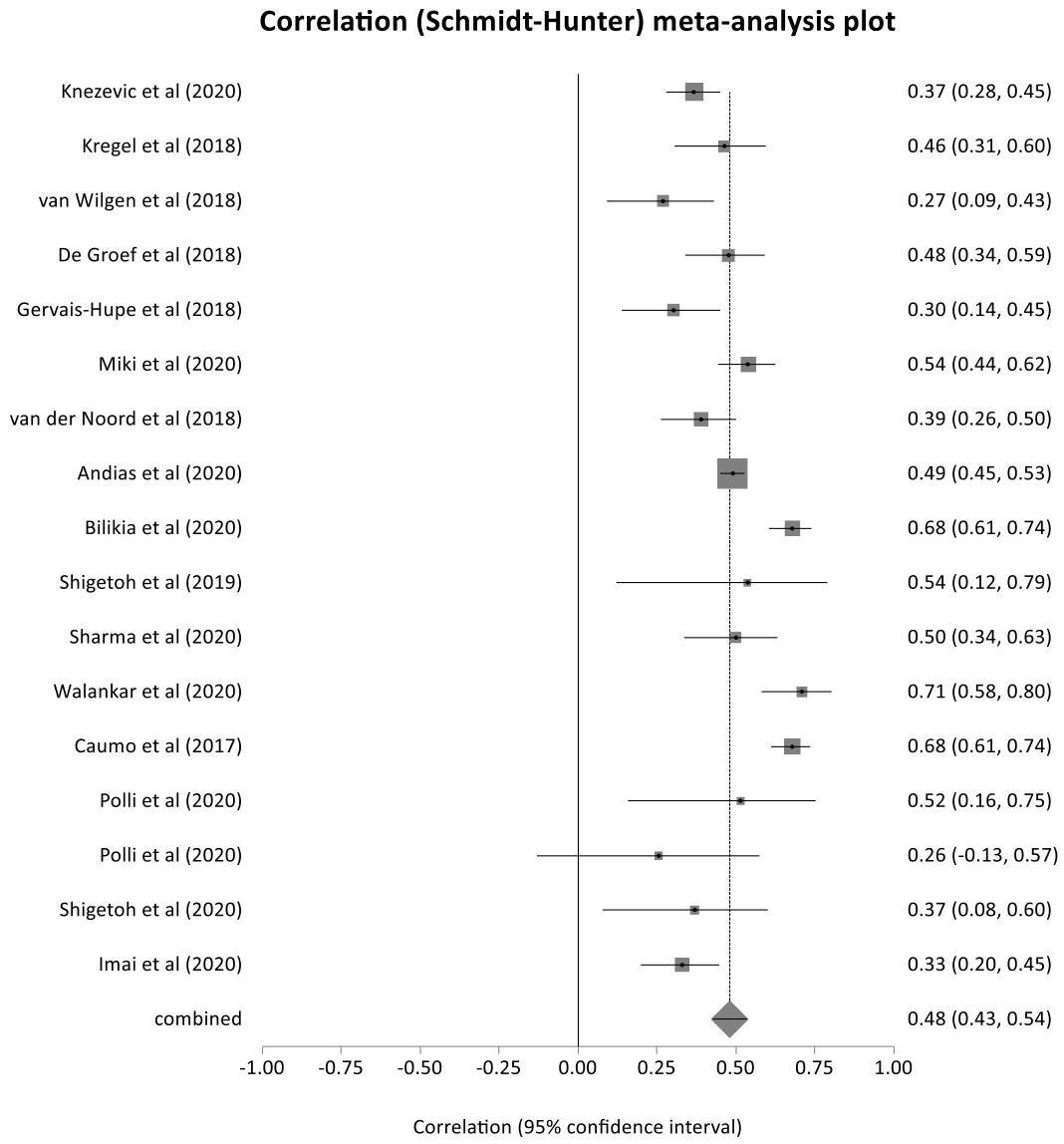
Forstenpointner et al (2021)	555	Pain, Painless and Healthy Participants			-0.09	-0.09	0.04	0.04		0.03	0.03	Cold Detection Threshold	-0.10
												Warm Detection Threshold	0.12
												Temperature Sensory Limen	0.11
												Cold Pain Threshold	0.01
												Mechanical Pain Threshold	0.04
												Mechanical Pain Sensitivity	0.07
												Mechanical Detection Threshold	0.10
												Vibration Detection Threshold	-0.08
Forstenpointner et al (2021)	332	Pain Patients	59.0 (15.5)	51%	-0.07	-0.07	-0.01	-0.01		0.03	0.03	Cold Detection Threshold	-0.04
												Warm Detection Threshold	0.06
												Temperature Sensory Limen	0.05
												Cold Pain Threshold	0.07
												Mechanical Pain threshold	-0.05
												Mechanical Pain Sensitivity	0.04
												Mechanical Detection Threshold	0.02

											Vibration Detection Threshold	0.01
Forstenpointner et al (2021)	112	Healthy Controls	43.3 (13.0)	62%	-0.07	-0.07	0.07	0.07		-0.04	-0.04	Cold Detection Threshold	-0.09
												Warm Detection Threshold	-0.08
												Temperature Sensory Limen	0.06
												Cold Pain Threshold	-0.04
												Mechanical Pain Threshold	-0.01
												Mechanical Pain Sensitivity	0.18
												Mechanical Detection Threshold	0.06
												Vibration Detection Threshold	0.08

CPM = Conditoned Pain Modulation, HPT – Heat Pain Threshold, PPT = Pressure Pain Threshold, TS – Temporal Summation. n = number of participants, r = extracted correlation, avg r = average of extracted r correlations (multiple body sites per study).

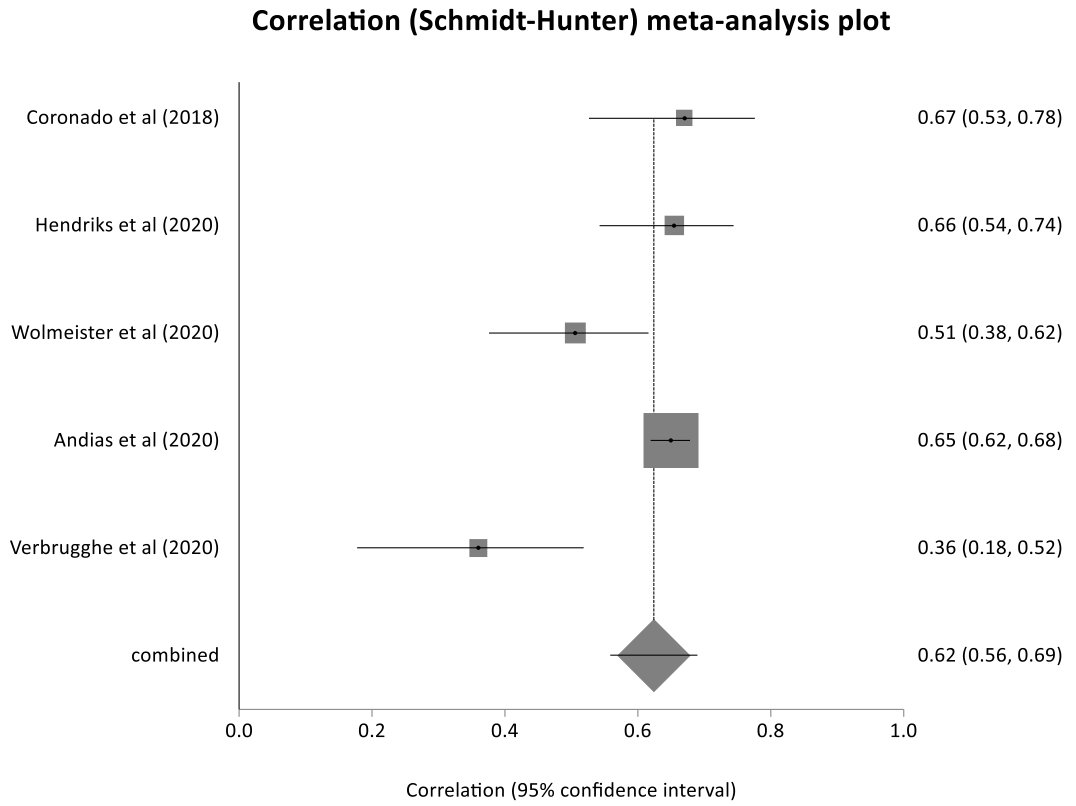
Supplementary Figure 1a

Forrest Plot to Show Meta-analytic Correlation Between Pain Catastrophising Scores and CSI Total Scores



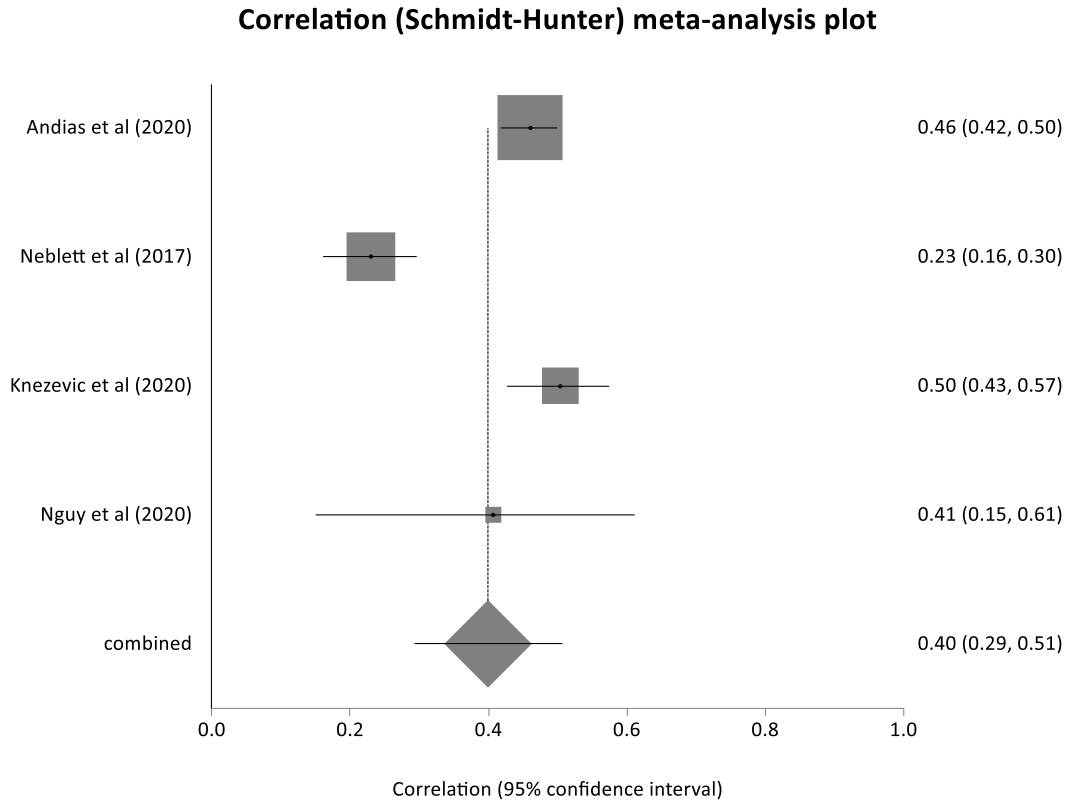
Supplementary Figure 1b

Forrest Plot to Show Meta-analytic Correlation Between Stress Scores and CSI Total Scores



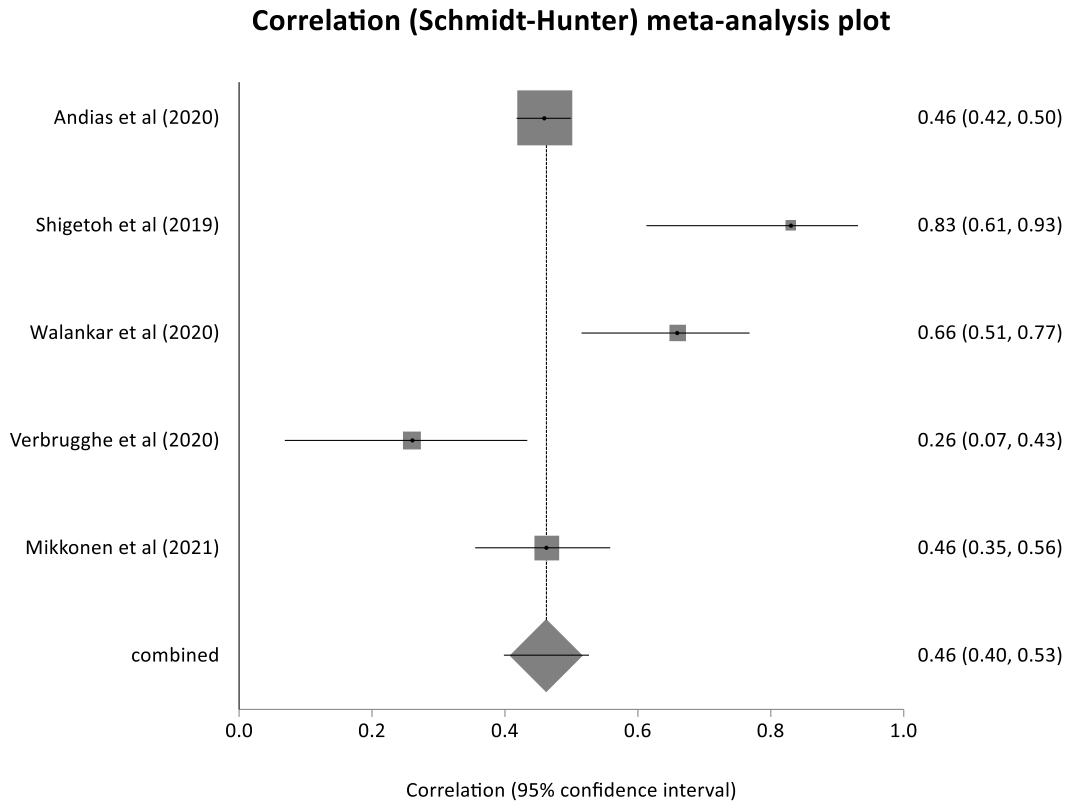
Supplementary Figure 1c

Forrest Plot to Show Meta-analytic Correlation Between Sleep Scores and CSI Total Scores



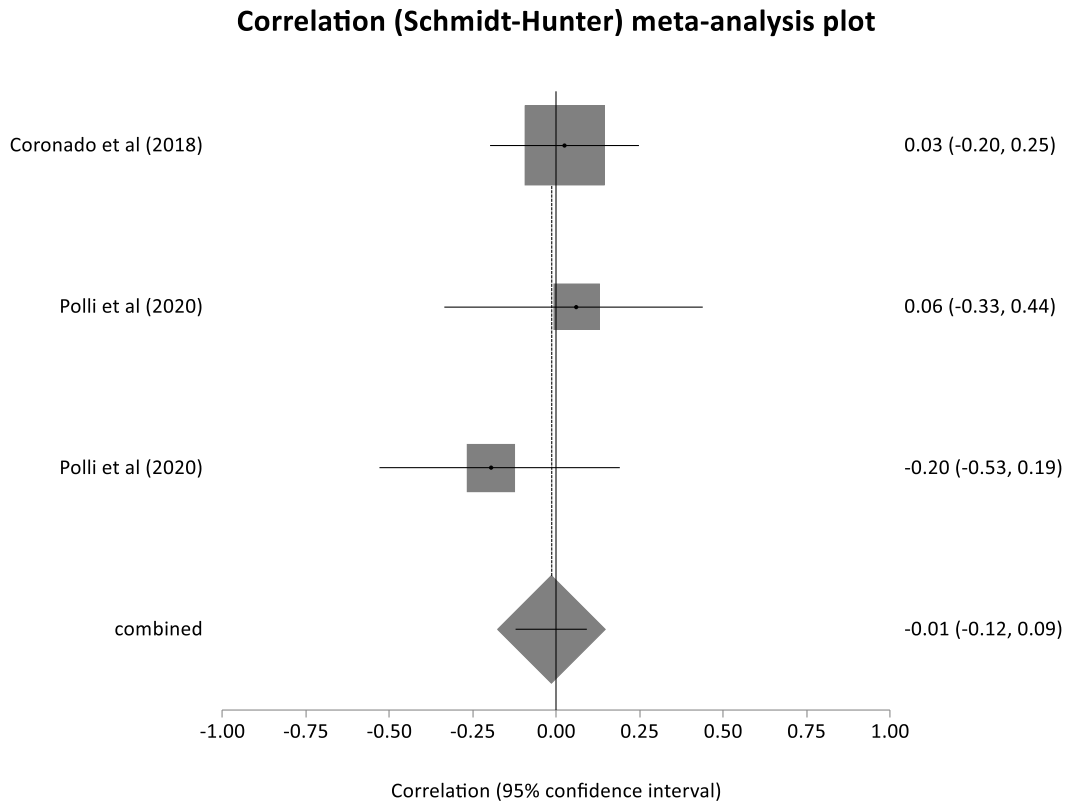
Supplementary Figure 1d

Forrest Plot to Show Meta-analytic Correlation Between Kinesophobia Scores and CSI Total Scores



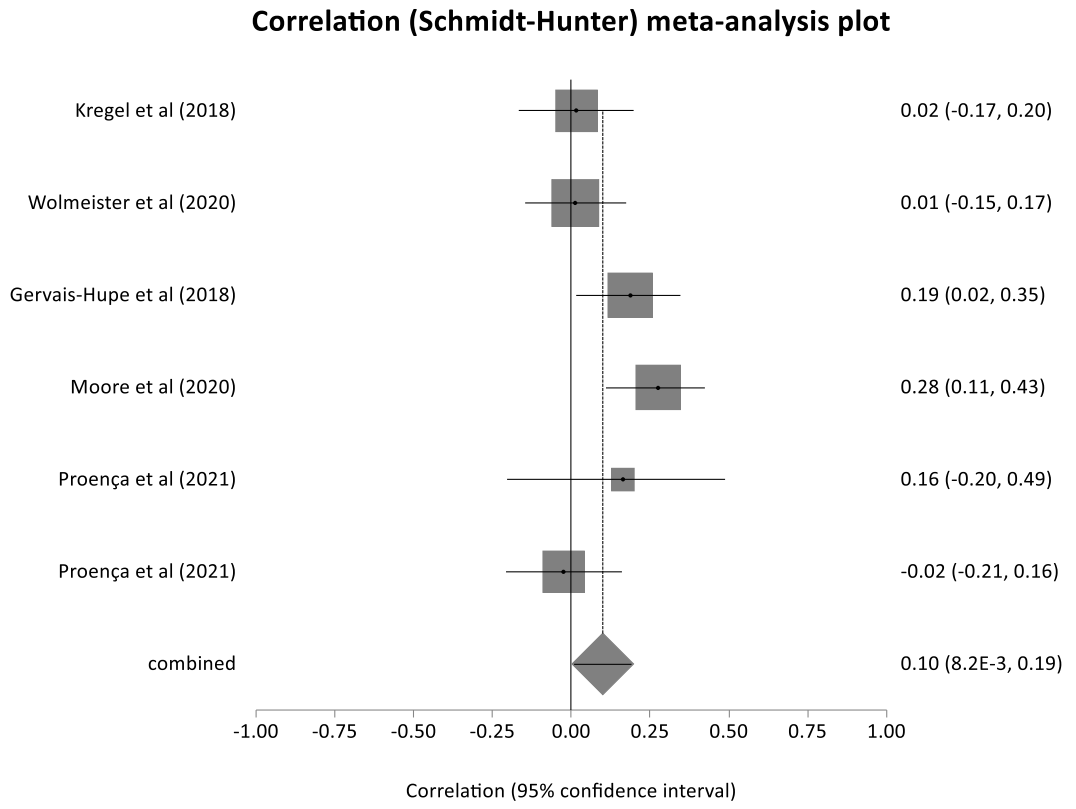
Supplementary Figure 1e

Forrest Plot to Show Meta-analytic Correlation Between Heat Pain Threshold Scores and CSI Total Scores



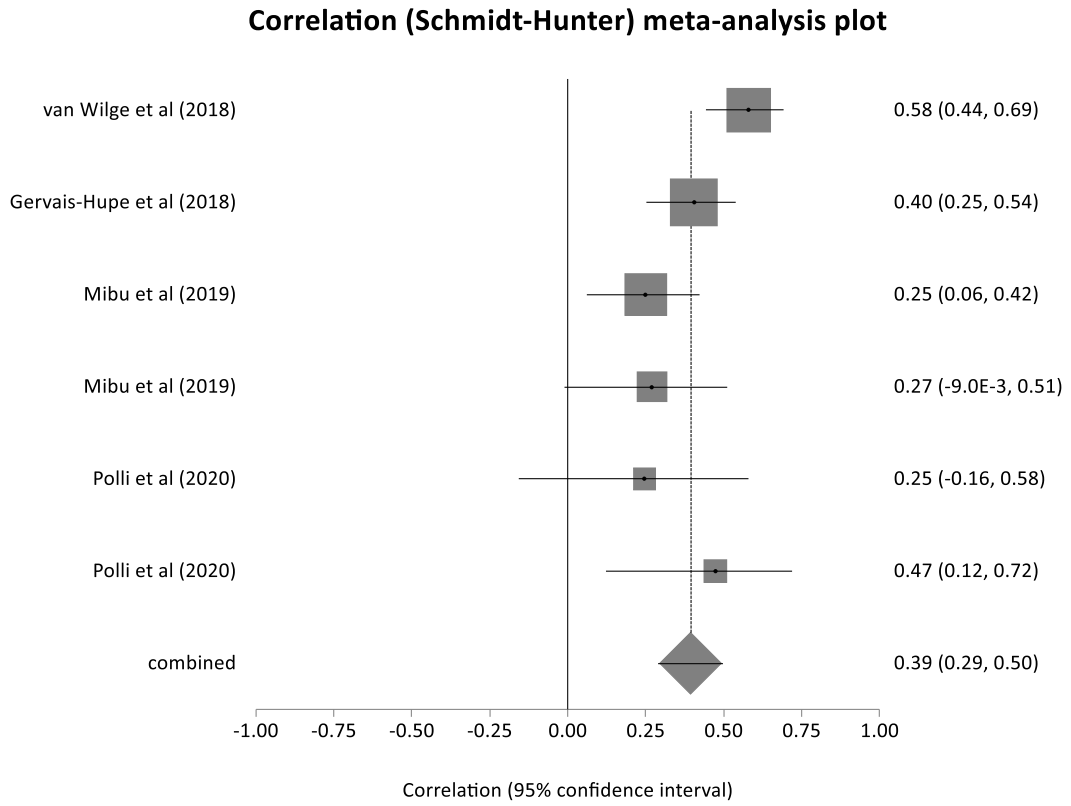
Supplementary Figure 1f

Forrest Plot to Show Meta-analytic Correlation Between Conditioned Pain Modulation Scores and CSI Total Scores



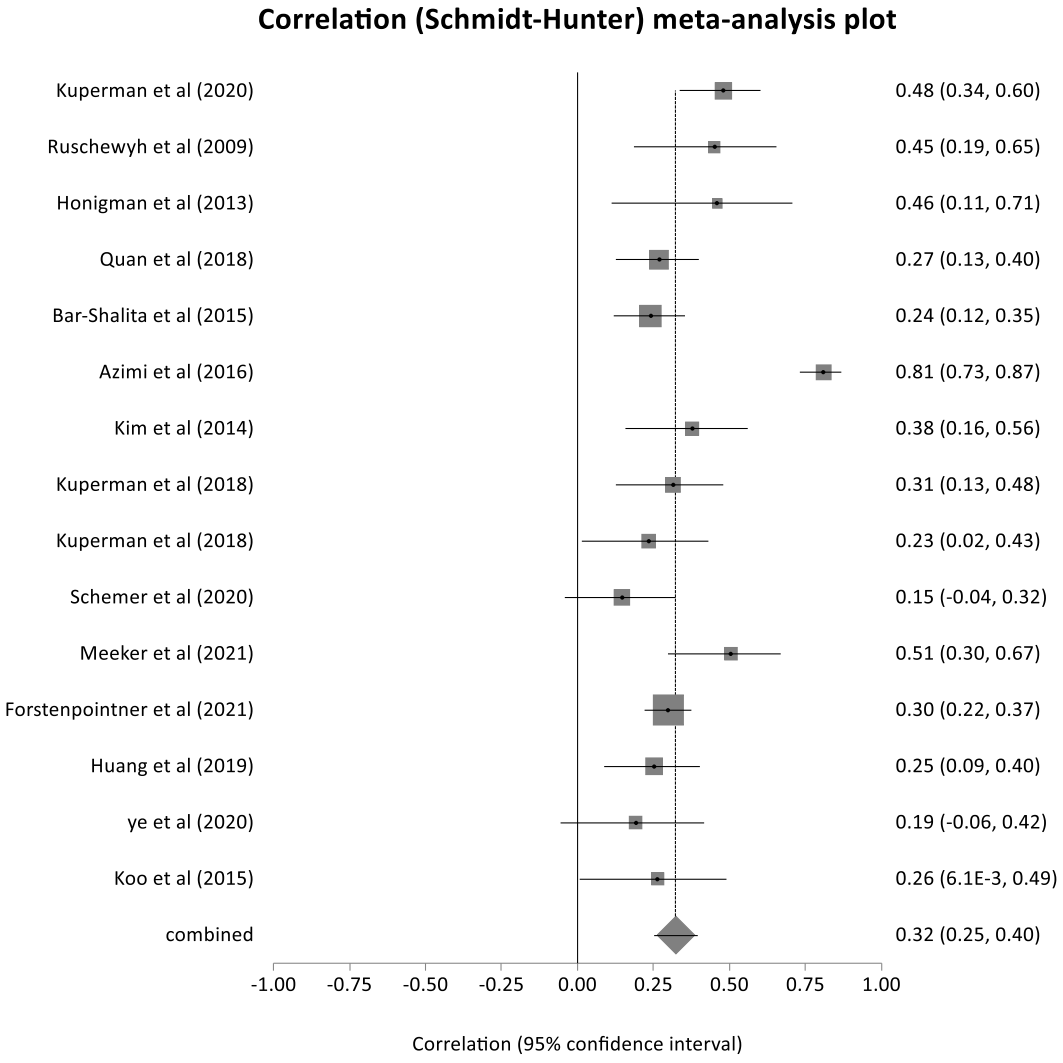
Supplementary Figure 1g

Forrest Plot to Show Meta-analytic Correlation Between Widespread Pain Scores and CSI Total Scores



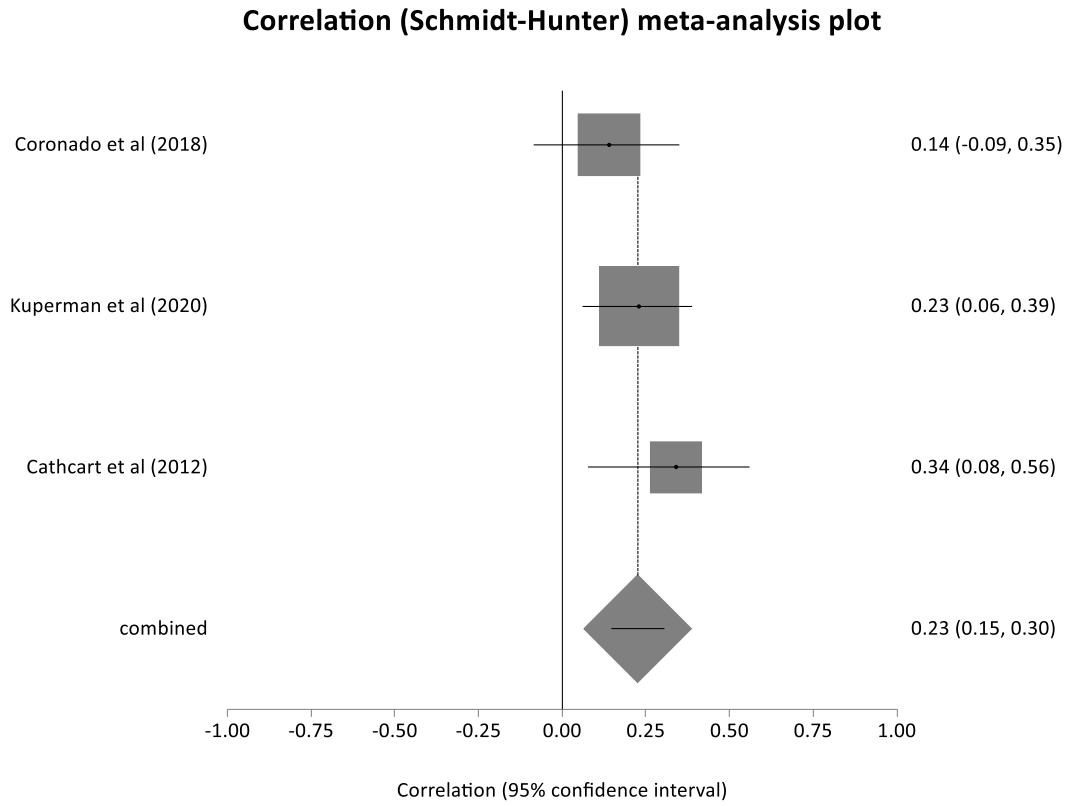
Supplementary Figure 1h

Forrest Plot to Show Meta-analytic Correlation Between Pain Catastrophising Scores and PSQ Total Scores



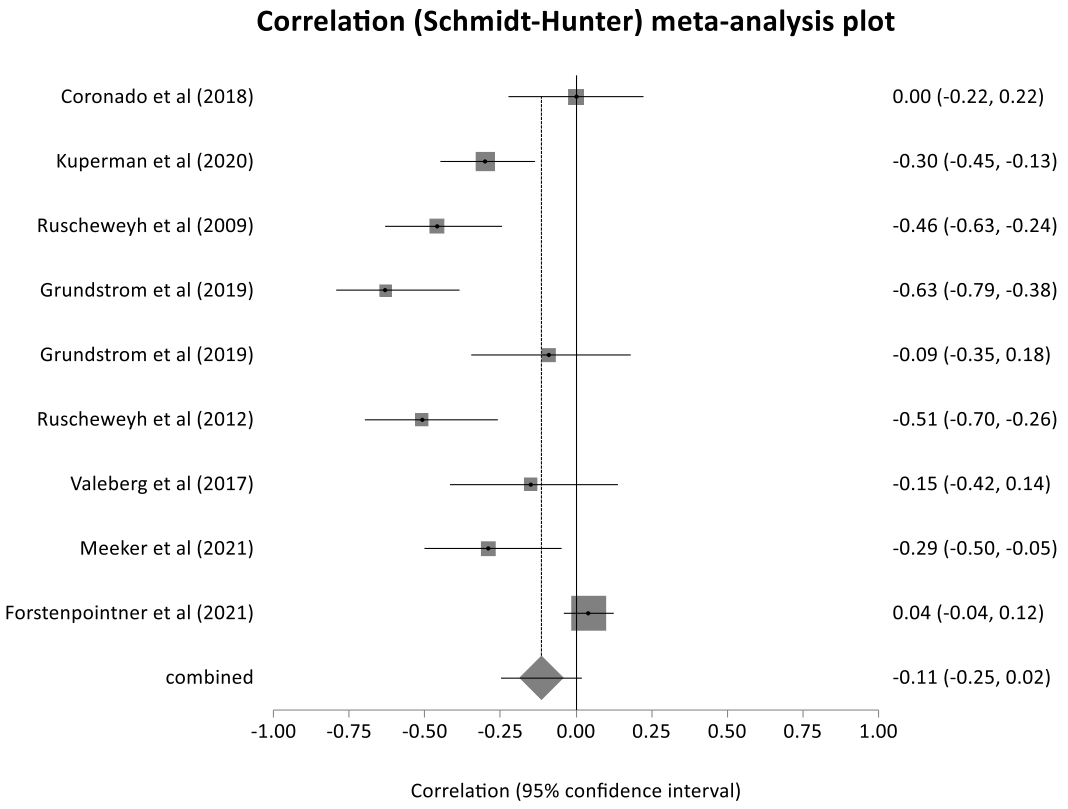
Supplementary Figure 1i

Forrest Plot to Show Meta-analytic Correlation Between Stress Scores and PSQ Total Scores



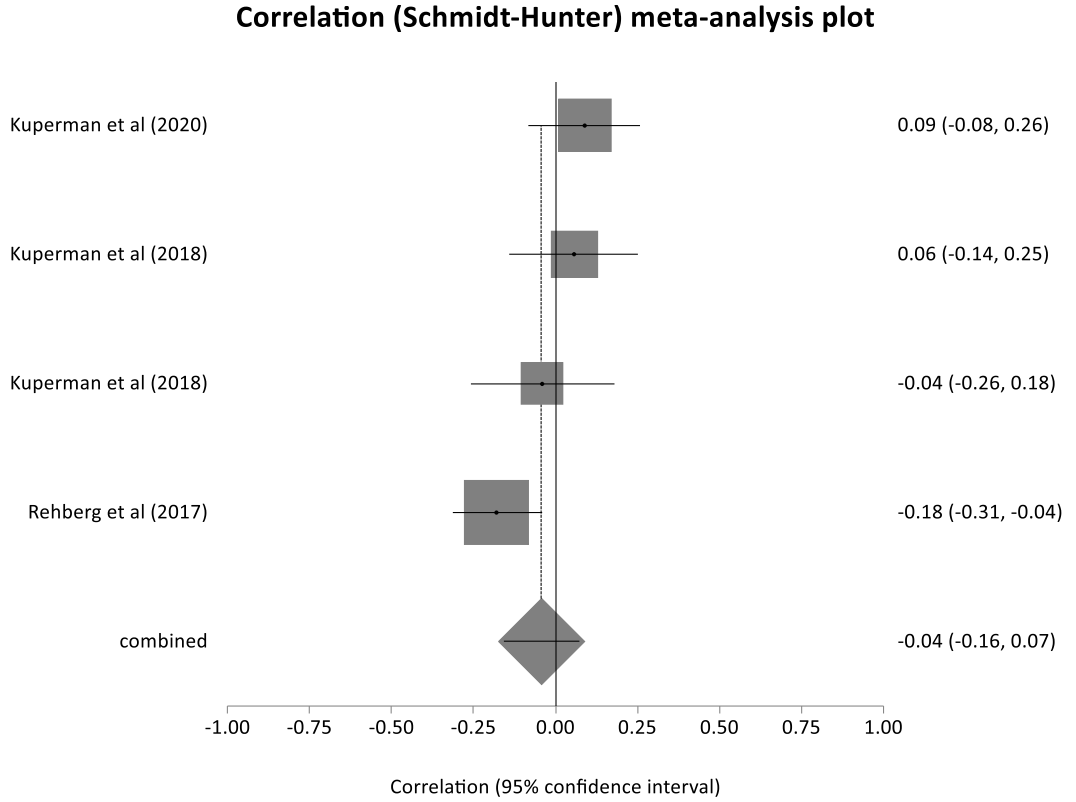
Supplementary Figure 1j

Forrest Plot to Show Meta-analytic Correlation Between Heat Pain Threshold Scores and PSQ Total Scores



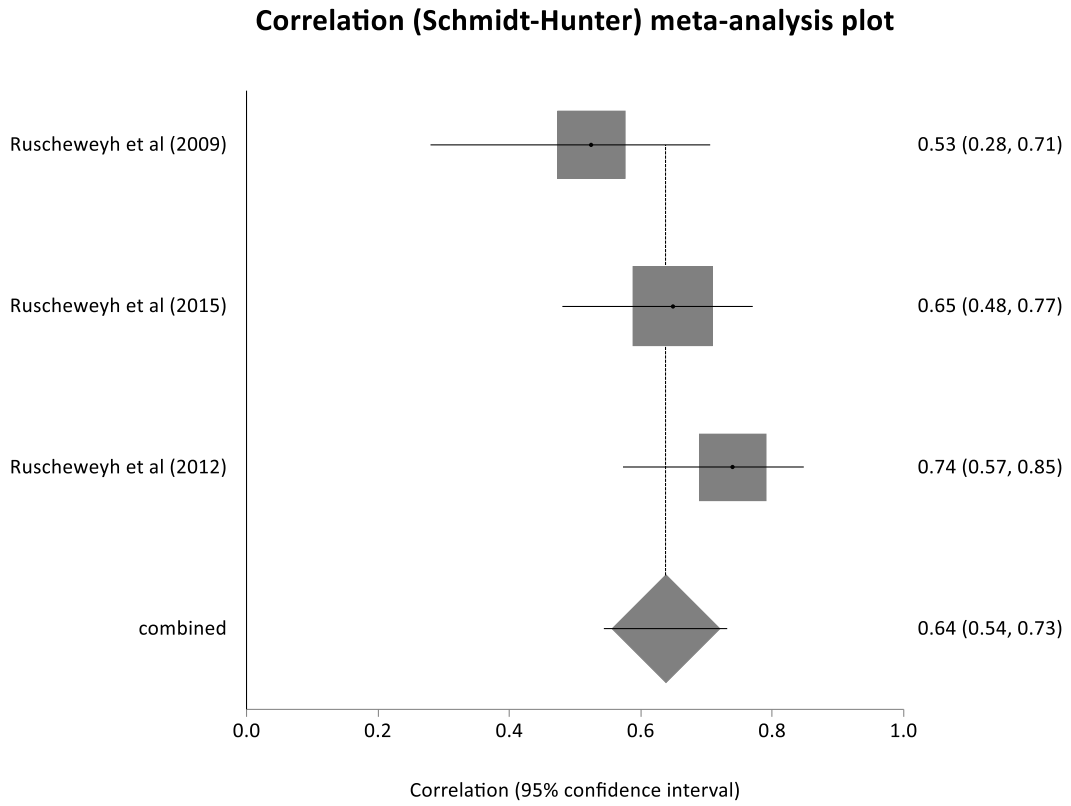
Supplementary Figure 1k

Forrest Plot to Show Meta-analytic Correlation Between Conditioned Pain Modulation Scores and PSQ Total Scores



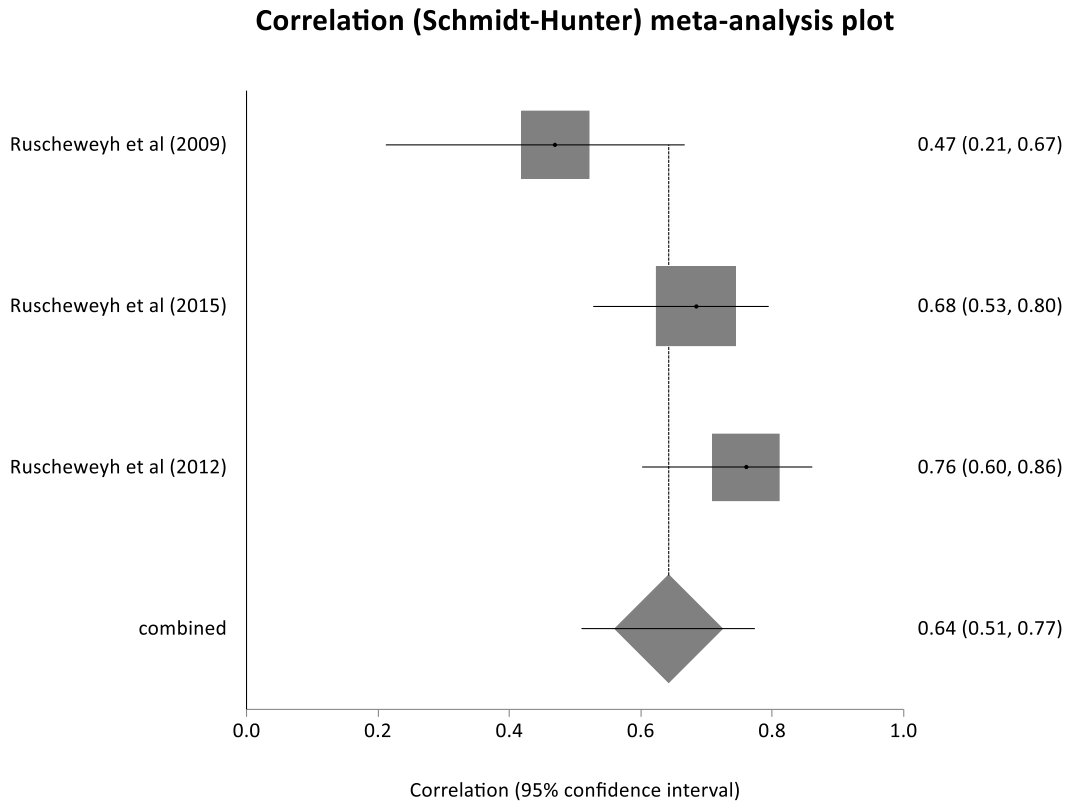
Supplementary Figure 1l

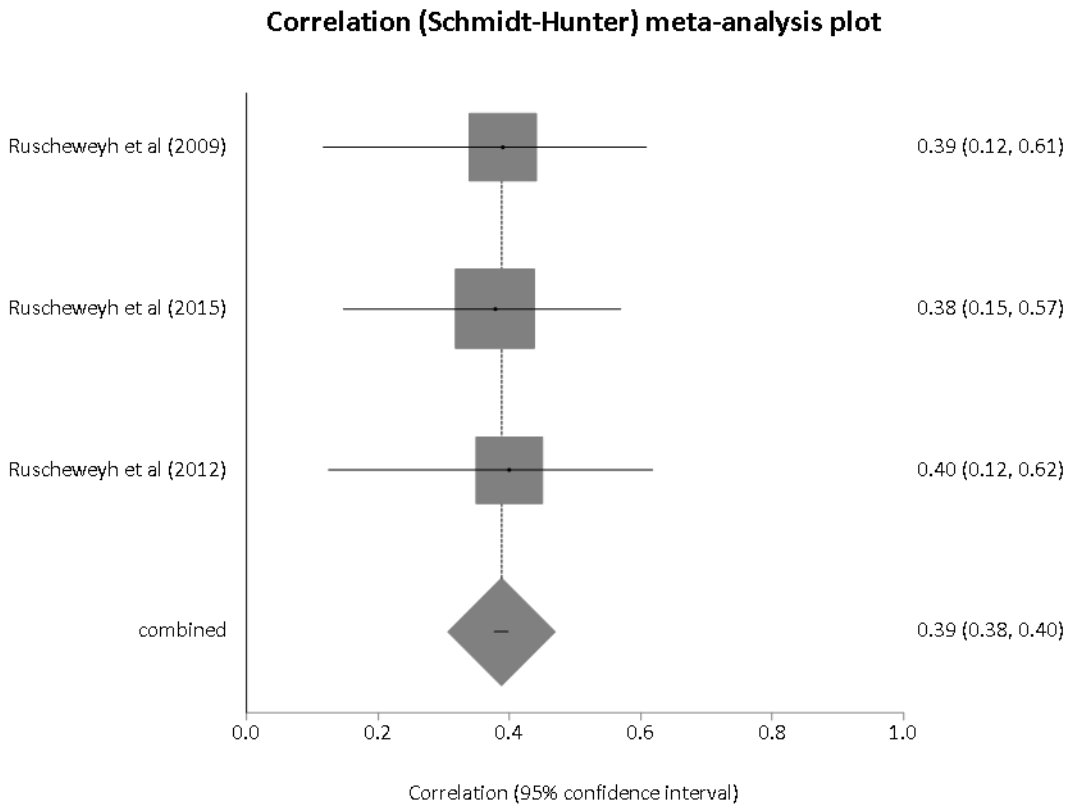
Forrest Plot to Show Meta-analytic Correlation Between Phasic Heat Scores and PSQ Total Scores



Supplementary Figure 1m

Forrest Plot to Show Meta-analytic Correlation Between Tonic Cold Scores and PSQ Total Scores



Supplementary Figure 1n

Forrest Plot to Show Meta-analytic Correlation Between Pin Prick Stimulation Scores and PSQ Total Scores