

Additional file 2: characteristics of studies examining the effects of tDCS on activities, arm function and acceptability

Study-ID	Design and sample size	EXP mean age (SD), years	CTL mean age (SD), years	EXP mean time post-stroke (SD)	CTL mean time post-stroke (SD)	Stimulation variables	Control Intervention	Base treatment	Outcomes
Allman et al., 2016 [44]	RCT; Anodal: 11 Sham: 13	67 (10)	60 (12)	57 (40) months	51 (33) months	20 min with 1 mA of anodal tDCS with the anode placed over the M1 of the affected hemisphere Reference electrode position: over the contralateral supraorbital forehead Treatment was delivered on 9 consecutive working days	Sham tDCS (1 mA for 10 s)	Graded Repetitive Arm Supplementary Program (GRASP) for 60 min on 9 consecutive working days	ARAT, WMFT, UE-FM, fMRI
Ang et al., 2012 [60]	RCT; Dual: 10 Sham: 9	52 (12)	56 (10)	3 (2) years	3 (1) years	20 min with 1 mA of dual tDCS with the anode placed over the M1 of the affected hemisphere and the cathode placed over the M1 of the unaffected hemisphere (size not stated) Stimulation was delivered 5 times a week for 2 weeks	Sham tDCS (1 mA for 30 s)	60 min of therapy with the MIT-Manus arm robot 5 times a week for 2 weeks	UE-FM
Au-Yeung et al., 2014 [61]	Randomised cross-over trial; Anodal: 10 Cathodal: 10 Sham: 10	63 (6)		8 (3) years		Anodal: 20 min with 1 mA with 35 cm ² anodal electrode over the M1 of the lesioned hemisphere Cathodal: 20 min with 1 mA with 35 cm ² cathodal electrode over the M1 of the non-lesioned hemisphere Reference electrode position: over the contralateral supraorbital forehead Stimulation was delivered once with at least 5 days of resting period	Sham tDCS (1 mA for 10 s)	None	PPT, Pinch grip strength
Boggio et al., 2007 [50]	Randomised cross-over trial; Anodal: 2 Cathodal: 1 Sham: 1	56 (11)	75 (NA)	33 (34) months	39 (NA) months	Anodal: 20 min with 1 mA with 35 cm ² anodal electrode over the M1 of the lesioned hemisphere Cathodal: 20 min with 1 mA with 35 cm ² cathodal electrode over the M1 of the non-lesioned hemisphere Reference electrode position: over the contralateral supraorbital forehead Stimulation was delivered once a day for 4 days	Sham tDCS (1 mA for 30 s)	None	JTT
Bolognini et al., 2011 [27]	RCT; Anodal: 10 Sham: 11	43 (13)	51 (15)	44 (31) months	26 (18) months	20 min with 1 mA with 35 cm ² anodal electrode over the M1 of the lesioned hemisphere Stimulation was delivered 5 days a week for 2 consecutive weeks	Sham tDCS (2 mA for 30 s)	CIMT up to 4 hours/day for 5 days a week for 2 consecutive weeks	JTT, handgrip strength, MAL, UE-FM, questionnai

									re for adverse effects
Cha et al., 2014 [39]	RCT; Anodal: 10 Active Control: 10	60 (11)	58 (10)	14 (5) months	15 (4) months	20 min with 1 mA with 35 cm ² anodal electrode over the M1 of the lesioned hemisphere Reference electrode position: over the contralateral supraorbital forehead Stimulation was delivered 5 days a week for 4 weeks	Basic training for improving function of upper and lower extremities for 30 min a day, 5 times a week for 4 weeks		UE-FM, grip strength
DiLazzaro et al., 2014a [28]	RCT; Dual: 7 Sham: 7	66 (16)	71 (14)	3 (1) days	3 (1) days	40 min with 2 mA with 35 cm ² with the anode over the M1 of the lesioned hemisphere and cathode over the M1 of the non-lesioned hemisphere Stimulation was delivered 5 on consecutive days	Sham tDCS (2 mA for 30 s)	None	ARAT, 9HPT, handgrip strength, MAL, NIHSS, mRS, adverse events
DiLazzaro et al., 2014b [29]	RCT; Dual: 10 Sham: 10	61 (16)	69 (12)	3 (2) days	3 (1) days	40 min with 2 mA with 35 cm ² with the anode over the M1 of the lesioned hemisphere and cathode over the M1 of the non-lesioned hemisphere Stimulation was delivered 5 on consecutive days	Sham tDCS (2 mA for 30 s)	CIMT for at least 90% of waking hours, including 1.5 hours a day arm training	ARAT, 9HPT, handgrip strength, MAL, NIHSS, mRS, adverse events, functional imaging data
Fregni et al., 2005 [62]	Randomised cross-over trial; Anodal: 6 Cathodal: 6 Sham: 6	54 (17) years		27 (24) months		Anodal: 20 min with 1 mA with 35 cm ² anodal electrode over the M1 of the lesioned hemisphere Cathodal: 20 min with 1 mA with 35 cm ² cathodal electrode over the M1 of the non-lesioned hemisphere Stimulation was delivered once with at least 48 h resting period	Sham tDCS (1 mA for 30 s)	None	JTT
Fusco et al., 2013 [51]	Randomised cross-over trial; Anodal: 9 Cathodal: 9 Dual: 9 Sham: 9	44 (16)	65 (22)	31 (13) days	25 (5) days	Anodal: 15 min with 1.5 mA with 35 cm ² anodal electrode over the M1 of the lesioned hemisphere Cathodal: 15 min with 1.5 mA with 35 cm ² cathodal electrode over the M1 of the non-lesioned hemisphere Dual: 15 min with 1.5 mA with 35 cm ² with the anode over the M1 of the lesioned hemisphere and cathode over the M1 of the	Sham tDCS (not described by the authors)	None	9HPT-index, maximum pinch and grasp force, patient satisfaction

						non-lesioned hemisphere Reference electrode position: over the contralateral supraorbital forehead Active stimulation and sham stimulation were delivered alternately on 2 consecutive days			
Fusco et al., 2014 [40]	RCT; Cathodal: 5 Sham: 6	56 (15)	60 (12)	19 (8) days		10 min with 1.5 mA with 35 cm ² cathodal electrode over the M1 of the non-lesioned hemisphere Reference electrode position: above the right shoulder Stimulation was delivered 5 times a week for 2 weeks	Sham tDCS (not described by the authors)	45 min of individualised motor rehabilitation focusing on recovery of upper limb twice a day	Canadian Neurological Scale, BI, 9HPT, grasp and pinch force, UE-FM, RMI
Hesse et al., 2011 [30]	RCT; Anodal: 32 Cathodal: 32 Sham: 32	65 (10)	66 (10)	4 (2) weeks	4 (2) weeks	Anodal: 20 min with 2 mA with 35 cm ² anodal electrode over the M1 of the lesioned hemisphere Cathodal: 20 min with 2 mA with 35 cm ² cathodal electrode over the M1 of the non-lesioned hemisphere Reference electrode position: over the contralateral supraorbital forehead Stimulation was delivered 5 days a week for 6 consecutive weeks	Sham tDCS (0 mA for 20 s)	20 min of robot-assisted arm training with the Bi-Manu-Track system 5 days a week for 6 consecutive weeks	UE-FM, BI, muscle strength, muscle tone, BBT
Khedr et al., 2013 [31]	RCT; Anodal: 14 Cathodal: 13 Sham: 13	59 (9)	57 (8)	13 (5) days	13 (5) days	Anodal: 25 min with 2 mA with 35 cm ² anodal electrode over the M1 of the lesioned hemisphere Cathodal: 25 min with 2 mA with 35 cm ² cathodal electrode over the M1 of the non-lesioned hemisphere Reference electrode position: over the contralateral supraorbital forehead Stimulation was delivered for 6 consecutive days	Sham tDCS (2 mA for 2 min)	Passive movement and range of motion exercise up to active resistive exercise within 1 hour after tDCS	NIHSS, OMCASS, BI, muscle strength, cortical excitability
Kim et al., 2009 [63]	Randomised cross-over trial; Anodal: 10 Sham: 10	63 (13)		6 (3) weeks		20 min with 1 mA with 35 cm ² anodal electrode over the M1 of the lesioned hemisphere Reference electrode position: over the contralateral supraorbital forehead Stimulation was delivered once, separated by at least 24 h of resting period	Sham tDCS (1 mA for 30 s)	None	BBT, VAS for fatigue
Kim et al., 2010 [32]	RCT; Anodal: 7 Cathodal: 6 Sham: 7	54 (15)	63 (9)	27 (21) days	23 (8) days	Anodal: 20 min with 2 mA with 35 cm ² anodal electrode over the M1 of the lesioned hemisphere Cathodal: 20 min with 2 mA with 35 cm ² cathodal electrode over the M1 of the non-lesioned hemisphere Reference electrode position: over the contralateral supraorbital forehead	Sham tDCS (2 mA for 1 min)	30 min of standardised occupational therapy to improve paretic hand function for 5 days a week for 2 consecutive weeks	UE-FM

						Stimulation was delivered 5 days a week for 2 consecutive weeks			
Lee et al., 2014 [33]	RCT; Cathodal: 21 Active control: 22 Cathodal + active control: 21	62 (11)	61 (14)	18 (8) days	17 (6) days	20 min with 2 mA with 25 cm ² cathodal electrode over the M1 of the non-lesioned hemisphere Reference electrode position: over the contralateral supraorbital forehead Stimulation was delivered 5 days a week for 3 weeks	Virtual reality solely for 30 minutes a day, 5 times a week for 3 weeks	Cathodal: occupational therapy for 30 min a day, 5 times a week for 3 weeks Cathodal + active control and virtual reality only groups: virtual reality therapy for 30 min a day, 5 times a week for 3 weeks	MAS, MMT, UE-FM, K-MBI
Lindenberg et al., 2010 [41]	RCT; Dual: 10 Sham: 10	62 (15)	56 (13)	31 (21)	40 (23)	30 min with 1.5 mA with 16.3 cm ² anode over the M1 of the lesioned hemisphere and cathode over the M1 of the non-lesioned hemisphere Stimulation was delivered on 5 consecutive days	Sham tDCS (1.5 mA for 30 s)	60 min of physical and occupational therapy on 5 consecutive days, including functional motor tasks	UE-FM, WMFT
Mahmoudi et al., 2011 [64]	Randomised cross-over trial; Anodal A: 10 Anodal B: 10 Cathodal: 10 Dual: 10 Sham: 10	61 (14)		8 (5) months		Anodal A: 20 min with 1 mA with 35 cm ² anodal electrode over the M1 of the lesioned hemisphere and the reference electrode over the contralateral orbit Anodal B: 20 min with 1 mA with 35 cm ² anodal electrode over the M1 of the lesioned hemisphere and the reference electrode on the contralateral deltoid muscle Cathodal: 20 min with 1 mA with 35 cm ² cathodal electrode over the M1 of the non-lesioned hemisphere and the reference electrode on the contralateral deltoid muscle Dual: 20 min with 1 mA with 35 cm ² with the anode over the M1 of the lesioned hemisphere and cathode over the M1 of the non-lesioned hemisphere Each stimulation type was delivered once with at least 96 h resting period.	Sham tDCS (1 mA for 30 s)	None	JTT
Mortensen et al., 2016 [53]	RCT; Anodal: 8 Sham: 7	66 (11)	61 (10)	32 (16) months	29 (15) months	20 min with 1 mA with 35 cm ² anodal electrode over the M1 of the lesioned hemisphere and the reference electrode over the contralateral orbit Treatment was delivered on 5 consecutive days	Sham tDCS (30 s with 1 mA max.)	30 min of home-based occupational therapy	JTT, grip strength, SIS
Nair et al., 2011 [47]	RCT; Cathodal: 7 Sham: 7	61 (12)	56 (15)	33 (20) months	28 (28) months	30 min with 1 mA with cathodal electrode over the M1 of the non-lesioned hemisphere and the reference electrode on the contralateral deltoid muscle Stimulation was delivered on 5 consecutive days	Sham tDCS (not described by the authors)	60 min of occupational therapy for 5 consecutive days	3J-ROM, change in UE-FM
Qu et al., 2009 [34]	RCT; Cathodal: 25	45 (11)	45 (14)	6 (range 3 to 36) months	4 (range 3 to 12) months	20 min with 0.5 mA with cathodal electrode over the M1 of the non-lesioned hemisphere Reference electrode position: unclear	Physical therapy according to the Bobath, Brunnstrom and Rood approaches for 40 min twice a day for 5 consecutive days for 4 weeks		BI, MAS, UE-FM

	Sham: 25					Stimulation was delivered 5 days a week for 4 weeks			
Rocha et al., 2016 [45]	RCT; Anodal: 7 Cathodal: 7 Sham: 7	58 (range 41-71)	59 (range 46-70)	31 months (range 9-67)	27 months (6-46)	Anodal: 13 min with 1 mA with 35 cm ² anodal electrode over the M1 of the lesioned hemisphere Cathodal: 9 min with 1 mA with 35 cm ² cathodal electrode over the M1 of the non-lesioned hemisphere Reference electrode position: over the contralateral supraorbital forehead Stimulation was delivered 5 days a week for 2 consecutive weeks	Sham tDCS (1 mA for 30 s)	Modified CIMT for 6 consecutive hours each day for 4 weeks plus 1 h gross and fine motor activities training per day	UE-FM, MAL, handgrip strength
Rossi et al., 2013 [42]	RCT; Anodal: 25 Sham: 25	66 (14)	70 (14)	2 days	2 days	20 min with 2 mA with anodal electrode over the M1 of the lesioned hemisphere Reference electrode position: over the contralateral supraorbital forehead Stimulation was delivered on 5 consecutive days	Sham tDCS (2 mA for 30 s)	Not described by the authors	NIHSS, UE-FM
Sattler et al., 2015 [46]	RCT; Anodal: 10 Sham: 10	68 (10)	63 (12)	5 (3) days	6 (4) days	13 min with 1.2 mA with anodal electrode over the M1 of the lesioned hemisphere Reference electrode position: over the contralateral supraorbital forehead Stimulation was delivered on 5 consecutive days	1.2 mA for 60 s	rPNS for 13 min on 5 consecutive days + occupational therapy 3 to 5 times a week for 30 min	JTT, handgrip strength, 9HPT, hand tapping test, UE-FM
Sik et al., 2015 [54]	RCT; Anodal: 10 Dual: 10 Sham: 11	Median (25th-75th percentile): Anodal: 62 (55-70) Dual: 59 (54-66)	Median (25th-75th percentile): 60 (55-67)	Median (25th-75th percentile): Anodal: 21 (8-44) months Dual: 25 (9-38) months	Median (25th-75th percentile): 18 (12-33) months	Anodal: 20 min with 2 mA with 16 cm ² anodal electrode over the M1 of the lesioned hemisphere Dual: anodal + 20 min with 2 mA with 16 cm ² cathodal electrode over the M1 of the non-lesioned hemisphere Reference electrode position: over the contralateral supraorbital forehead Treatment was delivered in 15 sessions during 3 weeks	2 mA for 1 min	15 sessions of physiotherapy and occupational therapy for 120 min during 3 weeks	JTT, WMFT, Kocaeli Functional Evaluation Test
Straudi et al., 2016 [37]	RCT; Dual: 12 Sham: 11	53 (16)	64 (10)	41 (35) weeks	78 (62) weeks	30 min with 1 mA with 35 cm ² anodal electrode over the M1 of the lesioned hemisphere and cathodal electrode over the M1 of the non-lesioned hemisphere	Sham tDCS (1 mA for 30 s)	30 min of robotic arm training with the REO device	UE-FM, BBT, MAL, adverse-effects questionnaire
Tedesco-Triccas et al., 2015 [35]	RCT; Anodal: 12 Sham: 11	64 (10)	63 (14)	25 (31) months	13 (16) months	20 min with 1 mA with anodal electrode over the M1 of the lesioned hemisphere Reference electrode position: over the contralateral supraorbital forehead Stimulation was delivered on 18 sessions	Sham tDCS (1 mA for 20 s)	Robotic arm training with the ArmeoSpring device (60 min per session) for 18 sessions during 8 weeks (2 to 3 sessions a week)	UE-FM, ARAT, MAL, SIS 3.0

						during 8 weeks (between 2 and 3 sessions per week)			
Viana et al., 2014 [43]	RCT; Anodal: 10 Sham: 10	56 (10)	55 (12)	32 (18) months	35 (20) months	13 min with 1 mA with anodal electrode over the M1 of the lesioned hemisphere Reference electrode position: over the contralateral supraorbital forehead Stimulation was delivered 3 times a week for 5 weeks	Sham tDCS (2 mA for 30 s)	Virtual reality training using Nintendo Wii aiming at arm movements, for 60 min	UE-FM, WMFT, MAS, hand-held dynamometry
Wang et al., 2014 [52]	RCT; Anodal tDCS + Placebo methylphenidate: 3 Sham tDCS + methylphenidate: 3 Anodal + methylphenidate: 3	54 (14)	52 (9)	Not explicitly stated, but all participants were enrolled between 1 and 4 weeks post stroke		Dual: 20 min with 1 mA with 35 cm ² with the anode over the M1 of the lesioned hemisphere and cathode over the M1 of the non-lesioned hemisphere Reference electrode position: over contralateral M1 Stimulation was delivered once	Sham tDCS (1 mA for 10 s) and placebo methylphenidate	Placebo methylphenidate 1 hour prior to stimulation, active 20 mg methylphenidate 1 hour prior to stimulation	PPT, cortical excitability
Wu et al., 2013 [36]	RCT; Cathodal: 45 Sham: 45	46 (11)	49 (13)	5 (3) months	5 (3) months	20 min with 1.2 mA with 24.75 cm ² cathodal electrode over the M1 of the non-lesioned hemisphere Reference electrode position: over the shoulder on the unaffected side Stimulation was delivered 5 days a week for 4 weeks	Sham tDCS (1.2 mA for 30 s)	conventional physical therapy program for 30 min twice daily 5 days a week for 4 weeks	MAS, UE-FM, MBI

ARAT: Action Research Arm Test, BBT: Box and Block Test, BI: Barthel Index, CIMT: constraint-induced movement therapy, CTL: Control group, EXP: Experimental group, JTT: Jebsen Taylor Hand Function Test, M1: primary motor cortex, mA: milliampere, MAL: Motor Activity Log Rating Scale, MAS: Modified Ashworth Scale, MBI: Modified Barthel Index, MI: Motricity Index, MIT: Massachusetts Institute of Technology, MRC: Medical Research Council, NIHSS: National Institute of Health Stroke Scale, OMCASS: Orgogozo MCA scale, PPT: Purdue Pegboard Test, RCT: randomised controlled trial, ROM: range of motion, RMI: Rivermead Mobility Index, SD: standard deviation, SIS: Stroke Impact Scale, tDCS: transcranial direct current stimulation, TUG: Timed Up and Go Test, UE-FM: Upper Extremity Fugl-Meyer Score, WMFT: Wolf Motor Function Test