

SUPPLEMENTARY MATERIAL

Mindfulness-training Affects Attention – Or is it Attentional Effort?

Christian Gaden Jensen^{1,a}, Signe Vangkilde², Vibe Frokjaer¹, Steen G. Hasselbalch¹.

Byline / Author note

¹Neurobiology Research Unit and Cimbi, Rigshospitalet, University of Copenhagen, Copenhagen, Denmark.

²Center for Visual Cognition, University of Copenhagen, Copenhagen, Denmark.

^aCorresponding author at: Neurobiology Research Unit, Rigshospitalet, N9201, 9 Blegdamsvej, Copenhagen, DK-2100, Denmark.

Tel.: +45 35456742; fax: + 45 35456713. Email: cgjensen@nru.dk.

Supplementary Table I. Descriptives and pre-post effect sizes (*ds*) from the DART, the Stroop Color-Word task, the D2 test, and the TVA-test (main results in bold).

Test paradigm Outcome	Test time	No incentive (<i>n</i> = 8)			Incentive (<i>n</i> = 8)			Non-mindfulness course (<i>n</i> = 15)			Mindfulness course (<i>n</i> = 16)		
		<i>M</i>	<i>SD</i>	<i>d</i>	<i>M</i>	<i>SD</i>	<i>d</i>	<i>M</i>	<i>SD</i>	<i>d</i>	<i>M</i>	<i>SD</i>	<i>d</i>
<i>Dual Attention to Response Task</i>													
White digit RT (ms)	1	172	(44)		252	(78)		227	(57)		208	(65)	
	2	139	(38)	1.42**	174	(38)	1.30**	194	(44)	.97**	170	(50)	.81**
Commission Error RT (ms)	1	214	(102)		253	(84)		300	(156)		253	(100)	
	2	206	(79)	.18	196	(83)	.49	233	(142)	.42	218	(95)	.33
Grey digit RT (ms)	1	376	(65)		419	(60)		413	(63)		383	(77)	
	2	341	(63)	.61*	331	(51)	1.44**	375	(69)	.59*	395	(86)	-.21
Coefficient of Variation (see text)	1	0.53	(.09)		0.42	(.12)		0.49	(.09)		0.48	(.13)	
	2	0.56	(.07)	-.26	0.45	(.14)	-.26	0.45	(.05)	.86	0.46	(.12)	.21
<i>Stroop Color-Word Task</i>													
Congruent Block time (s)	1	48	(10)		52	(8)		57	(11)		51	(6)	
	2	46	(8)	.40	46	(8)	.92*	52	(6)	.51	48	(5)	.62*
Incongruent block time (s)	1	93	(19)		87	(10)		100	(15)		97	(13)	
	2	88	(18)	.77	82	(8)	1.21*	95	(12)	.47	90	(12)	1.18***
Incongruent block error rate	1	3.8	(3.0)		2.3	(1.8)		2.7	(2.7)		2.8	(2.5)	
	2	3.6	(1.7)	.06	1.9	(1.6)	.17	2.3	(1.8)	.13	2.1	(1.5)	.21
<i>D2 test of attention</i>													
Total score, <i>TN</i>	1	552	(44)		525	(52)		505	(49)		538	(63)	
	2	588	(45)	1.34**	563	(57)	1.92***	558	(45)	1.78***	574	(62)	1.45***
Total score – errors, <i>TN-E</i>	1	524	(58)		500	(43)		480	(52)		517	(61)	
	2	562	(60)	2.09**	543	(54)	2.10***	536	(43)	2.12***	559	(59)	1.81***
Spread, <i>S</i>	1	13	(3)		14	(2)		13	(4)		12	(3)	
	2	10	(4)	1.15*	10	(4)	.84 (*)	11	(4)	.54 (*)	10	(5)	.66*
Total error rate, <i>E</i>	1	28	(21)		26	(28)		25	(22)		21	(14)	
	2	26	(21)	.20	21	(17)	.63	22	(22)	.28	15	(22)	.93**
Error percentage, <i>E%</i>	1	5.3	(4.2)		4.7	(4.9)		4.9	(4.4)		3.9	(2.5)	
	2	4.7	(3.7)	.38	3.6	(2.8)	.69	3.9	(3.9)	.62*	2.5	(1.9)	1.14***
<i>Theory of Visual Attention Test</i>													
Perceptual Threshold, <i>t₀</i> (ms)	1	10	(6)		14	(8)		11	(7)		15	(11)	
	2	9	(5)	.42	12	(5)	.27	8	(6)	.45	9	(9)	1.14**
Processing Speed, <i>C</i> (letters / s)	1	35	(12)		38	(10)		36	(12)		39	(13)	
	2	40	(14)	.86*	40	(10)	.37	40	(14)	.70*	41	(11)	.35
Capacity of Visual STM, <i>K</i> (letters)	1	3.54	(.90)		3.59	(.45)		3.35	(.78)		3.46	(.78)	
	2	3.46	(.64)	-.16	3.56	(.55)	-.21	3.56	(.82)	.42	3.74	(.68)	.64*
Attentional selectivity, <i>α</i> (see text)	1	0.53	(.15)		0.61	(.26)		0.64	(.31)		0.69	(.29)	
	2	0.48	(.33)	.29	0.48	(.18)	.93	0.52	(.27)	.47	0.61	(.32)	.30

* / ** / ***. Pre-post change significant at the 0.05 level / 0.01 level / 0.001 level (2-tailed, uncorrected for multiple tests).

Supplementary Table II. Mean reaction times (ms) per trial type in the Spatial & Temporal Attention Network task (STAN).

Cue Type	Field / CTI	Session	No incentive ^a		Incentive ^a		Non-mindfulness course ^b		Mindfulness course ^c	
			<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
<i>Temporal cues</i>										
Temporal invalid	750	1	276	(26)	282	(49)	300	(38)	288	(32)
Temporal invalid	750	2	274	(41)	262	(44)	274	(44)	271	(39)
Temporal valid	750	1	259	(22)	257	(14)	275	(35)	281	(37)
Temporal valid	750	2	252	(32)	239	(30)	256	(30)	260	(33)
<i>Neutral cues</i>										
Neutral	750	1	285	(45)	286	(29)	293	(33)	291	(32)
Neutral	750	2	275	(51)	251	(24)	282	(39)	273	(33)
Neutral mean	–	1	269	(43)	277	(22)	282	(36)	277	(30)
Neutral mean	–	2	265	(55)	243	(22)	269	(35)	263	(35)
Neutral	Left	1	268	(44)	283	(25)	287	(34)	279	(31)
Neutral	Left	2	266	(58)	248	(25)	270	(37)	263	(32)
Neutral	Right	1	271	(45)	279	(26)	277	(39)	276	(32)
Neutral	Right	2	264	(52)	238	(20)	266	(39)	263	(39)
<i>Spatial cues</i>										
Spatial valid	Left	1	266	(49)	273	(21)	280	(40)	269	(35)
Spatial valid	Left	2	240	(28)	235	(40)	262	(32)	252	(34)
Spatial valid	Right	1	254	(47)	267	(27)	271	(41)	262	(29)
Spatial valid	Right	2	247	(43)	240	(26)	259	(32)	249	(31)
Spatial invalid	Left	1	296	(49)	284	(55)	315	(54)	299	(36)
Spatial invalid	Left	2	284	(32)	272	(39)	301	(51)	274	(31)
Spatial invalid	Right	1	302	(53)	289	(57)	308	(60)	295	(41)
Spatial invalid	Right	2	286	(55)	270	(44)	296	(36)	282	(36)

^a*n* = 8. ^b*n* = 15. ^c*n* = 16.

Note. CTI = Cue-Target Interval (ms; see Figure 2).

Supplementary Table III. Significant Time × Group interactions.

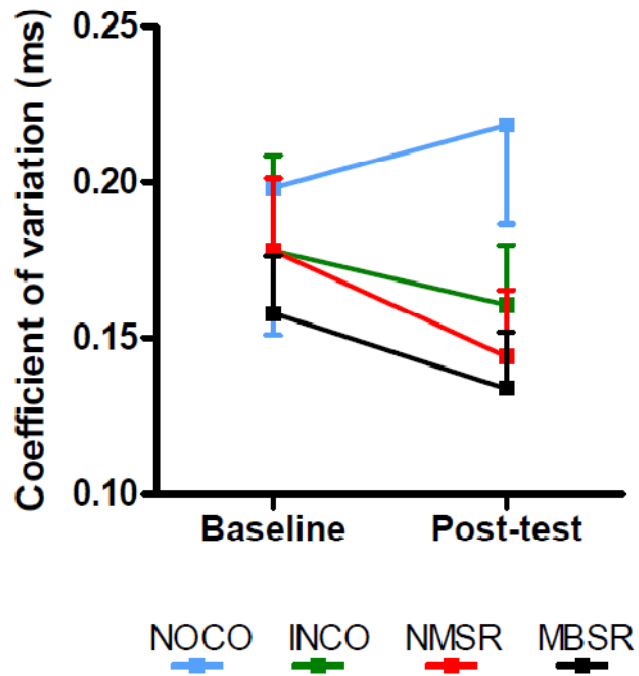
Paradigm	Test	Comparison	<i>F</i>	<i>df</i>	<i>p</i>	ω^2	Interpretation
<i>Dual Attention to Response Task (DART)</i>							
Grey digit RT	ANCOVA	MBSR vs. NOCO vs. INCO vs. NMSR	4.77	46	.006	.14	Group changes differed overall
Grey digit RT	ANCOVA	MBSR vs. INCO	12.70	24	.002	.24	INCO improved more than MBSR.
<i>Spatial and Temporal Attention Network task (STAN)</i>							
Neutral trials RT	ANCOVA	MBSR vs. (NMSR + MBSR)	5.94	39	.016	.05	INCO improved more than the stress reduction groups combined.
Temporal invalid trials	ANOVA	NMSR vs. NOCO	5.28	23	.032	.13	NMSR improved more than NOCO
<i>D2-test of attention</i>							
Error distribution ^a	ANOVA	MBSR vs. NOCO vs. INCO vs. NMSR	2.73	92	.028	-	Group changes differed overall
Error distribution ^a	ANOVA	MBSR vs. NOCO	3.21	46	.050	-	MBSR improved Section 2 more than NOCO.
Error distribution ^a	ANOVA	MBSR vs. CICO	3.13	62	.051	-	MBSR improved Section 2 more than CICO.
Error distribution ^a	ANOVA	MBSR vs. NMSR	7.03	62	.004	-	MBSR improved Section 2 more than NMSR.
<i>Theory of Visual Attention test (TVA)</i>							
Perceptual threshold	ANCOVA	MBSR vs. NOCO	4.95	24	.037	.04	MBSR improved more than NOCO.
Perceptual threshold	ANCOVA	MBSR vs. CICO	6.21	32	.019	.04	MBSR improved more than CICO.
Working memory capacity	ANCOVA	MBSR vs. CICO	5.11	32	.032	.05	MBSR improved more than CICO.
<i>Cortisol secretion</i>							
AUC – Ground	ANCOVA	MBSR vs. CICO	7.50	26	.012	.14	MBSR decreased more than CICO.
<i>Mindfulness Attention and Awareness Scale (MAAS)</i>							
Overall mindfulness	ANCOVA	MBSR vs. CICO	6.81	29	.015	.09	MBSR increased more than CICO.
<i>Cohen's Perceived Stress Scale (PSS)</i>							
Overall stress score	ANCOVA	MBSR vs. CICO	5.64	29	.025	.11	MBSR decreased more than CICO.

^a. Time × Group × Section interaction. No effect size is provided due to the complexity of interpreting such an effect (see “Data Analyses”).

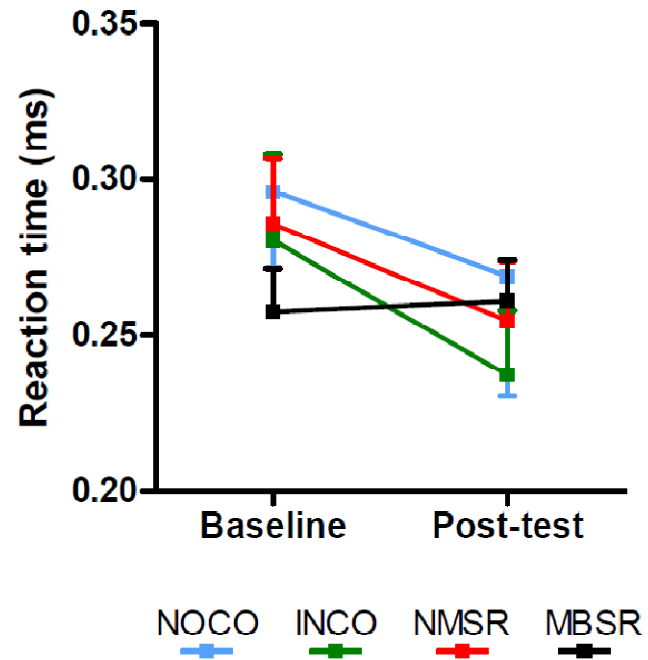
Note. *p*-values are two-tailed and uncorrected for multiple comparisons (see text for Bonferroni-corrected *p*-values).

SUPPLEMENTARY FIGURES

S1. Set shifting RT stability



S2. Readiness RT stability



Supplementary Figures. *S1.* Pre-post group changes on the grey digit CV in DART. No groups improved significantly, and no Time × Group interactions were significant. *S2.* Pre-post group changes on the CV for neutrally cued trials in STAN. No groups improved significantly, and no Time × Group interactions were significant. Error bars represent one standard error of the mean.