Distress and Retaliatory Aggression in Response to Witnessing Intergroup Exclusion are Greater on Higher Levels of Collective Narcissism

Online Supplementary Material

Supplementary Material S1: Mindfulness Manipulation Verbatim Transcript

The mindfulness condition audio recording contained the following spoken instructions:

> In a moment, the game will begin and thoughts, emotions, assessments, various comments will appear. Observe them all as passing creations of the mind. Only observe thoughts, comments, and emotions. How does your mind react to what the participants do, to whom they serve, how fast the ball flies? Maybe there are emotions, assessments: “I like it”, “I don’t like it”, “It’s weird”. All the time, just observe your thoughts and emotions as passing products of the mind that appear and flow away, as another thought comes with the next move. Focus all the time only on the thoughts and reactions of your mind; as if you were standing by the river and watching the flowing leaves. All the time, return to observing your thoughts and treating these thoughts as passing creations.

Supplementary Material S2: Table

Descriptive Statistics for Toronto Mindfulness Scale Scores in Intergroup Exclusion

	Control			Mindfulness				95% CI (*d*)	
	N	*M*	*SD*	*N*	*M*	*SD*	*p*	*d*	LB	UB
Low Collective Narcissism	35	5.47	0.70	31	5.80	0.83	.07	0.42	-0.06	0.91
High Collective Narcissism	37	5.40	0.58	35	5.27[a]	0.72	.46	-0.19	-0.65	0.27
Total	72	5.43	0.64	66	5.52	0.81	.41	0.12	-0.22	0.45

[a] Significantly lower than low collective narcissism/mindfulness group; $p < .01$, $d = 0.68$, 95% CI(d): (0.18, 1.18).

Supplementary Material S3: Table

Mixed-Model ANOVA Results for Emotional Distress

Effect	*F*	*p*	η_p^2
Observed Intergroup Exclusion	127.95	< .001	.46
Observed Intergroup Exclusion * Mindfulness Condition	1.72	.19	.01
Observed Intergroup Exclusion * Collective Narcissism Group	4.49	.04	.03
Observed Intergroup Exclusion * Mindfulness Condition * Collective Narcissism Group	0.97	.33	< .01

Note. $N = 153$. This ANOVA table corresponds to Figure 2 in the main text of the article.

Supplementary Material S4: Table

Mixed-Model ANOVA Results for HF HRV

Effect	*F*	*p*	η_p^2
Observed Intergroup Exclusion	0.42	.52	< .01
Observed Intergroup Exclusion * Mindfulness Condition	3.17	.08	.02
Observed Intergroup Exclusion * Collective Narcissism Group	3.38	.07	.02
Observed Intergroup Exclusion * Mindfulness Condition * Collective Narcissism Group	7.84	< .01	.05

Note. $N = 143$. This ANOVA table corresponds to Figure 3 in the main text of the article.

Supplementary Material S5: Table

Mixed-Model ANOVA Results for Aggression

Effect	*F*	*p*	η_p^2
Observed Intergroup Exclusion	31.05	< .001	.17
Observed Intergroup Exclusion * Mindfulness Condition	1.09	.30	< .01
Observed Intergroup Exclusion * Collective Narcissism Group	4.03	.05	.03
Observed Intergroup Exclusion * Mindfulness Condition * Collective Narcissism Group	4.27	.04	.03

Note. $N = 153$. This ANOVA table corresponds to Figure 4 in the main text of the article.

Supplementary Material S6: Description of Measurements Indexing Cognitive Effort

We recorded pupil diameter and eye blinks using an Aurora eye tracker (Smart Eye, Gothenburg, Sweden) mounted to the computer monitor that presented the study for recording pupil size at 60 Hz. The Aurora eye tracker consists of a video camera and an infrared light source focused on the participant's eyes, allowing the device to track the location and size of the pupil and corneal reflection (allowing up to 50*40 cm head movement). Testing occurred in a moderately lit room. The pupil diameter resolution was 0.5 mm. Participants sat 70 ± 10 cm from the monitor. The distance of 70 cm was recommended by the software provider and is consistent with that of previous research (e.g., Silk et al., 2012). A standard calibration trial recorded participants' gaze fixations in all corners and the center of the screen. The eye tracker provided pupil diameter values for both eyes (later averaged to yield an average pupil diameter score) and for both Cyberball conditions (including the respective baseline and game periods). Pupil diameter and dilation data are commonly used in psychophysiology, for example, as indicators of cognitive processes or emotional arousal (Bradley et al., 2008; Ferrari et al., 2017; Mathot, 2018).

The eye tracker also allowed for the computation of eye blink data during the Cyberball games via the eyelid opening parameter. We used eye blinks because they are used as an indicator of distress in psychophysiological research (Giannakakis et al., 2017). We used the blink detection R-Notebook algorithm in iMotions software to compute the number of blinks from the eyelid opening data. We used the default settings (minimum blink duration: 20 ms, maximum blink duration: 500 ms, maximum duration between two blinks: 70 ms). For 22 participants, the software provided no blink data. Visual inspection of these participants' raw data revealed that this was likely due to a software error, as legible raw data were present. For these missing cases, one author (KW) manually counted the number of blinks in the periods of interest. To validate this approach, the author also counted blinks for the remaining sample. The manually counted blinks were highly correlated with the automatically counted blinks provided by iMotions (inclusion: $r[120] = .90$, $p < .001$; exclusion: $r[118] = .91$, $p < .001$), permitting the inclusion of the 22 cases of manually counted blink data in the analyses.

Supplementary Material S7: Table

Comparison of Mindfulness and Control Condition on Pupil Dilation and Eye Blink Rate as Markers of Cognitive Effort

		Control		Mindfulness						95% CI (*d*)	
		M	*SD*	*M*	*SD*	*t*	*df*	*p*	*d*	LB	UB
Pupil Diameter	Cyberball Inclusion	4.94	0.77	4.91	0.80	0.23	148	.82	0.04	-0.28	0.36
	Cyberball Exclusion	4.98	0.81	4.93	0.82	0.36	148	.72	0.06	-0.26	0.38
Eye Blink Rate	Cyberball Inclusion	48.92	31.05	60.65	33.44	-2.24	150	.03	-0.36	-0.68	-0.04
	Cyberball Exclusion	57.59	34.56	65.93	36.03	-1.44	146	.15	-0.24	-0.56	0.09

Note. The eye tracking data reflective of cognitive effort presented here were collected for another research question within the same project. We thus highlight that we intend to publish these data elsewhere for their intended purpose, whereas they are only provided as a supplementary source of information here. Both variables are based on winsorized data (as per the other physiological variables reported in this article).

Supplementary Material S8: Table

Verbatim Suspicions of Five Participants Doubting the Study Paradigm

Participant ID	Suspicion translation
23	I suspect that it was related to prejudices against immigrants and deliberately evoking an emotional reaction to the set outcome of the game. A little 'soft Milgram'.
37	It's hard to put into words. How does he react to "relations" with people from abroad, from a different culture. Does their behavior influence us as we see them as a society. I also suspect that the cyberball and red square clicking was set.
48	I don't think anyone played cyberball, all participants were observers. I do not know what the main goal was, it is possible that it was whether I would increase the length / noise level of the opponent in response to his increase in these values.
59	I guess we were all observers and it wasn't like someone was setting up this horrible hype. It was to annoy us. Maybe it is about a national feeling of harm.
67	The players were bots and the goal was something emotional in terms of belonging to a particular group. Sensors were to verify participants 'responses with their organisms' reactions.

Supplementary Material S9: Table

Descriptive Statistics for Emotional Distress Excluding Five Participants

		Cyberball Inclusion			Cyberball Exclusion			95% CI (*d*)	
		N	*M*	*SD*	*N*	*M*	*SD*	*d*	LB	UB
Control	Low Collective Narcissism	37	2.44	0.65	37	3.47	1.23	0.84	0.37	1.32
	High Collective Narcissism	38	2.39	0.76	38	4.14	1.25	1.40	0.90	1.91
	Total	75	2.42	0.71	75	3.81	1.27	1.10	0.75	1.44
Mindfulness	Low Collective Narcissism	35	2.70	1.05	35	3.71	1.43	0.71	0.23	1.19
	High Collective Narcissism	38	2.82	0.91	38	4.03	1.39	0.87	0.40	1.34
	Total	73	2.76	0.97	73	3.88	1.41	0.79	0.46	1.13
Total	Low Collective Narcissism	72	2.56	0.87	72	3.59	1.32	0.77	0.43	1.11
	High Collective Narcissism	76	2.61	0.86	76	4.09	1.31	1.13	0.79	1.47
	Total	148	2.59	0.86	148	3.84	1.34	0.94	0.70	1.18

Supplementary Material S10: Table

Mixed-Model ANOVA Results for Emotional Distress Excluding Five Participants

Effect	*F*	*p*	η_p^2
Observed Intergroup Exclusion	122.11	< .001	.46
Observed Intergroup Exclusion * Mindfulness Condition	1.53	.22	.01
Observed Intergroup Exclusion * Collective Narcissism Group	4.11	.04	.03
Observed Intergroup Exclusion * Mindfulness Condition * Collective Narcissism Group	1.26	.26	< .01

Note. $N = 148$.

Supplementary Material S11: Table

Descriptive Statistics for Aggression Volume Excluding Five Participants

		Cyberball Inclusion			Cyberball Exclusion				95% CI (*d*)	
		N	*M*	*SD*	*N*	*M*	*SD*	*d*	LB	UB
Control	Low Collective Narcissism	37	2.91	2.12	37	3.27	2.32	0.16	-0.30	0.61
	High Collective Narcissism	38	3.80	2.41	38	4.20	2.57	0.16	-0.29	0.61
	Total	75	3.36	2.30	75	3.74	2.48	0.16	-0.17	0.48
Mindfulness	Low Collective Narcissism	35	2.81	1.98	35	3.04	1.95	0.12	-0.35	0.59
	High Collective Narcissism	38	3.71	2.13	38	4.71	2.68	0.37	-0.08	0.83
	Total	73	3.28	2.10	73	3.91	2.48	0.25	-0.07	0.58
Total	Low Collective Narcissism	72	2.86	2.04	72	3.16	2.13	0.14	-0.19	0.47
	High Collective Narcissism	76	3.75	2.26	76	4.45	2.62	0.27	-0.05	0.59
	Total	148	3.32	2.20	148	3.83	2.47	0.20	-0.02	0.43

Supplementary Material S12: Table

Mixed-Model ANOVA Results for Aggression Volume Excluding Five Participants

Effect	*F*	*p*	η_p^2
Observed Intergroup Exclusion	29.81	< .001	.17
Observed Intergroup Exclusion * Mindfulness Condition	1.61	.21	.01
Observed Intergroup Exclusion * Collective Narcissism Group	4.83	.03	.03
Observed Intergroup Exclusion * Mindfulness Condition * Collective Narcissism Group	3.94	.05	.03

Note. $N = 148$.

Supplementary Material S13: Table

Descriptive Statistics for HF HRV Excluding Five Participants

		Cyberball Inclusion			Cyberball Exclusion			95% CI (*d*)	
		N	*M*	*SD*	*N*	*M*	*SD*	*d*	LB	UB
Control	Low Collective Narcissism	35	-163.12	363.83	35	-134.66	462.00	0.06	-0.41	0.53
	High Collective Narcissism	36	-235.38	501.07	36	-82.23	1030.71	0.15	-0.31	0.61
	Total	71	-199.76	437.21	71	-108.08	797.21	0.12	-0.21	0.44
Mindfulness	Low Collective Narcissism	33	-163.55	395.04	33	-4.48	278.01	0.57	0.08	1.06
	High Collective Narcissism	35	208.33	851.57	35	-311.21	918.65	-0.57	-1.04	-0.09
	Total	68	27.86	691.08	68	-162.36	699.30	-0.27	-0.61	0.07
Total	Low Collective Narcissism	68	-163.33	376.44	68	-71.49	386.69	0.24	-0.10	0.57
	High Collective Narcissism	71	-16.65	726.41	71	-195.11	976.92	-0.18	-0.51	0.15
	Total	139	-88.41	584.70	139	-134.63	748.69	-0.06	-0.30	0.17

Supplementary Material S14: Table

Mixed-Model ANOVA Results for HF HRV Excluding Five Participants

Effect	*F*	*p*	η_p^2
Observed Intergroup Exclusion	0.35	.55	< .01
Observed Intergroup Exclusion * Mindfulness Condition	3.25	.07	.02
Observed Intergroup Exclusion * Collective Narcissism Group	3.39	.07	.02
Observed Intergroup Exclusion * Mindfulness Condition * Collective Narcissism Group	7.13	< .01	.05

Note. $N = 139$.