Supplement

Results of the pilot study

Hypothesis 1a: The signal detection measure d' declines with increasing n-back level.

ANOVA:

$F(2.30, 32.20) = 0.00$, $p > .999$, $\eta_p^2 = 2.16\text{e-}32$, 95% CI [0.00, 1.00], $BF10 = 0.09$

Hypothesis 1b: Reaction time increases with increasing n-back level.

ANOVA:

$F(2.14, 30.00) = 17.18$, $p < .001$, $\eta_p^2 = 0.55$, 95% CI [0.33, 1.00], $BF10 = 125.61$

Paired contrasts:

Table S.1
Paired contrasts for the rmANOVA comparing reaction time between n-back levels

Contrast	Estimate	SE	df	t	p	$BF10$	η_p^2	95%CI
1 - 2	-0.14	0.03	42.00	-4.15	0.001	249.00	0.29	[0.11, 1.00]
1 - 3	-0.24	0.03	42.00	-7.00	0.000	994.00	0.54	[0.36, 1.00]
1 - 4	-0.16	0.03	42.00	-4.86	0.000	27.90	0.36	[0.17, 1.00]
2 - 3	-0.10	0.03	42.00	-2.85	0.033	5.94	0.16	[0.03, 1.00]
2 - 4	-0.02	0.03	42.00	-0.72	0.891	0.32	0.01	[0.00, 1.00]
3 - 4	0.07	0.03	42.00	2.14	0.158	4.41	0.10	[0.00, 1.00]

Note. The column Contrast contains the n of the n-back levels. SE = standard error, df = degrees of freedom, t = t-statistic, p = p-value, CI = confidence interval.

Hypothesis 1c: Ratings on all NASA-TLX dimensions increase with increasing n-back level.

Mental subscale ANOVA:

$F(2.08, 27.03) = 69.96$, $p < .001$, $\eta_p^2 = 0.84$, 95% CI [0.74, 1.00], $BF10 =$ 240,305,851.21

Mental subscale paired contrasts:

Table S.2
Paired contrasts for the rmANOVA comparing ratings on the NASA-TLX Mental subscale between n-back levels

Contrast	Estimate	*SE*	*df*	*t*	*p*	*BF*10	η_p^2	95%*CI*
1 - 2	-4.43	0.80	39.00	-5.53	<.001	1,400.00	0.44	[0.25, 1.00]
1 - 3	-8.43	0.80	39.00	-10.50	<.001	35,700.00	0.74	[0.62, 1.00]
1 - 4	-10.80	0.80	39.00	-13.50	<.001	190,000.00	0.82	[0.74, 1.00]
2 - 3	-4.00	0.80	39.00	-5.00	<.001	373.00	0.39	[0.20, 1.00]
2 - 4	-6.36	0.80	39.00	-7.94	<.001	3,330.00	0.62	[0.45, 1.00]
3 - 4	-2.36	0.80	39.00	-2.94	0.027	38.10	0.18	[0.04, 1.00]

Note. The column Contrast contains the n of the n-back levels. *SE* = standard error, *df* = degrees of freedom, t = t-statistic, p = p-value, CI = confidence interval.

Physical subscale ANOVA:

$F(1.61, 20.96) = 7.86$, $p = .005$, $\eta_p^2 = 0.38$, 95% CI [0.10, 1.00], $BF10 = 0.34$

Physical subscale paired contrasts:

Table S.3
Paired contrasts for the rmANOVA comparing ratings on the NASA-TLX Physical subscale between n-back levels

Contrast	Estimate	SE	df	t	p	$BF10$	η_p^2	95%CI
1 - 2	-1.64	0.80	39.00	-2.06	0.185	3.51	0.10	[0.00, 1.00]
1 - 3	-3.07	0.80	39.00	-3.85	0.002	6.50	0.28	[0.10, 1.00]
1 - 4	-3.50	0.80	39.00	-4.38	<.001	7.66	0.33	[0.14, 1.00]
2 - 3	-1.43	0.80	39.00	-1.79	0.294	1.79	0.08	[0.00, 1.00]
2 - 4	-1.86	0.80	39.00	-2.33	0.110	2.00	0.12	[0.01, 1.00]
3 - 4	-0.43	0.80	39.00	-0.54	0.950	0.38	7.33e-03	[0.00, 1.00]

Note. The column Contrast contains the n of the n-back levels. SE = standard error, df = degrees of freedom, t = t-statistic, p = p-value, CI = confidence interval.

Time subscale ANOVA:

$F(2.14, 27.86) = 31.25$, $p < .001$, $\eta_p^2 = 0.71$, 95% CI [0.53, 1.00], $BF10 = 24.80$

Time subscale paired contrasts:

Table S.4
Paired contrasts for the rmANOVA comparing ratings on the NASA-TLX Time subscale between n-back levels

Contrast	Estimate	SE	df	t	p	$BF10$	η_p^2	95%CI
1 - 2	-1.64	0.82	39.00	-2.00	0.206	11.40	0.09	[0.00, 1.00]
1 - 3	-5.14	0.82	39.00	-6.26	<.001	278.00	0.50	[0.31, 1.00]
1 - 4	-7.14	0.82	39.00	-8.69	<.001	3,710.00	0.66	[0.51, 1.00]
2 - 3	-3.50	0.82	39.00	-4.26	0.001	38.80	0.32	[0.13, 1.00]
2 - 4	-5.50	0.82	39.00	-6.69	<.001	1,060.00	0.53	[0.35, 1.00]
3 - 4	-2.00	0.82	39.00	-2.43	0.087	3.09	0.13	[0.01, 1.00]

Note. The column Contrast contains the n of the n-back levels. SE = standard error, df = degrees of freedom, t = t-statistic, p = p-value, CI = confidence interval.

Performance subscale ANOVA:

$F(2.12, 27.59) = 6.78$, $p = .004$, $\eta_p^2 = 0.34$, 95% CI [0.09, 1.00], $BF10 = 1.82$

Performance subscale paired contrasts:

Table S.5
Paired contrasts for the rmANOVA comparing ratings on the NASA-TLX Performance subscale between n-back levels

Contrast	Estimate	SE	df	t	p	$BF10$	η_p^2	95%CI
1 - 2	1.50	1.10	39.00	1.37	0.526	1.00	0.05	[0.00, 1.00]
1 - 3	3.93	1.10	39.00	3.59	0.005	33.70	0.25	[0.08, 1.00]
1 - 4	4.21	1.10	39.00	3.85	0.002	5.32	0.28	[0.10, 1.00]
2 - 3	2.43	1.10	39.00	2.22	0.136	11.00	0.11	[0.01, 1.00]
2 - 4	2.71	1.10	39.00	2.48	0.079	1.83	0.14	[0.01, 1.00]
3 - 4	0.29	1.10	39.00	0.26	0.994	0.28	1.74e-03	[0.00, 1.00]

Note. The column Contrast contains the n of the n-back levels. SE = standard error, df = degrees of freedom, t = t-statistic, p = p-value, CI = confidence interval.

Effort subscale ANOVA:

$F(1.57, 20.43) = 28.65$, $p < .001$, $\eta_p^2 = 0.69$, 95% CI [0.47, 1.00], $BF10 = 10{,}733.57$

Effort subscale paired contrasts:

Table S.6
Paired contrasts for the rmANOVA comparing ratings on the NASA-TLX Effort subscale between n-back levels

Contrast	Estimate	SE	df	t	p	$BF10$	η_p^2	95%CI
1 - 2	-2.71	0.96	39.00	-2.84	0.035	1,020.00	0.17	[0.03, 1.00]
1 - 3	-6.79	0.96	39.00	-7.09	<.001	774.00	0.56	[0.39, 1.00]
1 - 4	-7.79	0.96	39.00	-8.14	<.001	1,380.00	0.63	[0.47, 1.00]
2 - 3	-4.07	0.96	39.00	-4.26	0.001	55.60	0.32	[0.13, 1.00]
2 - 4	-5.07	0.96	39.00	-5.30	<.001	44.60	0.42	[0.22, 1.00]
3 - 4	-1.00	0.96	39.00	-1.05	0.724	0.62	0.03	[0.00, 1.00]

Note. The column Contrast contains the n of the n-back levels. SE = standard error, df = degrees of freedom, t = t-statistic, p = p-value, CI = confidence interval.

Frustration subscale ANOVA:

$F(2.53, 32.94) = 35.31$, $p < .001$, $\eta_p^2 = 0.73$, 95% CI [0.58, 1.00], $BF10 = 17{,}679.16$

Frustration subscale paired contrasts:

Table S.7
Paired contrasts for the rmANOVA comparing ratings on the NASA-TLX Frustration subscale between n-back levels

Contrast	Estimate	SE	df	t	p	$BF10$	η_p^2	95%CI
1 - 2	-1.57	0.91	39.00	-1.73	0.323	3.52	0.07	[0.00, 1.00]
1 - 3	-5.71	0.91	39.00	-6.28	<.001	590.00	0.50	[0.32, 1.00]
1 - 4	-8.36	0.91	39.00	-9.19	<.001	27,000.00	0.68	[0.54, 1.00]
2 - 3	-4.14	0.91	39.00	-4.56	<.001	71.10	0.35	[0.16, 1.00]
2 - 4	-6.79	0.91	39.00	-7.46	<.001	2,660.00	0.59	[0.42, 1.00]
3 - 4	-2.64	0.91	39.00	-2.91	0.029	2.54	0.18	[0.03, 1.00]

Note. The column Contrast contains the n of the n-back levels. SE = standard error, df = degrees of freedom, t = t-statistic, p = p-value, CI = confidence interval.

Hypothesis 2a: Subjective values decline with increasing n-back level.

ANOVA:

$F(1.80, 25.26) = 7.80$, $p = .003$, $\eta_p^2 = 0.36$, 95% CI [0.10, 1.00]

Contrasts:

Table S.8
Different contrasts for the rmANOVA comparing subjective values between n-back levels

Contrast	Estimate	SE	df	t	p	η_p^2	95%CI
Declining Linear	1.06	0.22	42.00	4.78	<.001	0.35	[0.17, 1.00]
Ascending Quadratic	0.07	0.10	42.00	0.72	0.475	0.01	[0.00, 1.00]
Declining Logistic	1.16	0.25	42.00	4.56	<.001	0.33	[0.15, 1.00]
Positively Skewed Normal	0.66	0.16	42.00	4.21	<.001	0.30	[0.12, 1.00]

Note. SE = standard error, df = degrees of freedom, t = t-statistic, p = p-value, CI = confidence interval.

Hypothesis 2b: Subjective values decline with increasing n-back level, even after controlling for declining task performance measured by signal detection d' and reaction time.

Multi level model:

Table S.9
Effects of n-back load level on subjective value controlled for task performance (d' and reaction time).

Parameter	Beta	*SE*	*p*-value	Random Effects (SD)
Intercept	0.81	0.03	<.001***	0.09
N-back level	-0.12	0.04	0.003**	0.12
d'	0.02	0.02	0.238	
median RT	0.25	0.19	0.21	

Note: NFC = Need for Cognition, SE = standard error.
***$p < .001$, **$p < .01$, *$p < 0.5$.

The intraclass correlation equals 0.015.

The Bayes Factor $BF10$ of the multi level model approached infinity.

The conditional R^2 of the model describes the proportion of variance explained by both fixed and random effects, and is $R^2 = 0.74$.

The effect size is f^2 = -0.075.

Hypothesis 3a: Participants with high NFC scores have higher subjective values for 2- and 3-back but lower subjective values for 1-back than participants with low NFC scores.

ANOVA:

Table S.10
Main effects and interaction of NFC group and n-back level on subjective values

	Sum Sq	*df*	error Sum Sq	error *df*	F	p	η_p^2	95%CI
Intercept	0.52	1.00	0.71	13.00	9.41	0.009	0.42	[0.09, 1.00]
NFC group	0.00	1.00	0.71	13.00	0.01	0.931	5.96e-04	[0.00, 1.00]
n-back level	0.04	2.00	1.66	26.00	0.32	0.726	0.02	[0.00, 1.00]
NFC group x n-back level	0.02	2.00	1.66	26.00	0.19	0.829	0.01	[0.00, 1.00]

Note. NFC = Need for Cognition, Sum Sq = sum of squares, *df* = degrees of freedom, F = F-statistic, p = p-value, CI = confidence interval.

Hypothesis 3b: Participants with high NFC scores have lower NASA-TLX scores in every n-back level than participants with low NFC scores.

ANOVA:

Main effect of the NFC group:

$F(1, 12) = 7.57$, $p = .018$, $\hat{\eta}^2_G = .348$, 90% CI [.030, .610], $BF10 = 88$

Main effect of the n-back level:

$F(1.56, 18.71) = 68.33$, $p < .001$, $\hat{\eta}^2_G = .466$, 90% CI [.239, .603], $BF10 = 1000$

Interaction effect of NFC group and n-back level:

$F(1.56, 18.71) = 0.84$, $p = .422$, $\hat{\eta}^2_G = .011$, 90% CI [.000, .008], $BF10 = 3398060$

Paired contrasts for the main effect of n-back level:

Table S.11
Main effects and interaction of NFC group and n-back level on NASA-TLX scores

	Sum Sq	*df*	error Sum Sq	error *df*	*F*	*p*	η^2_p	95%*CI*
Intercept	5,770.00	1.00	241.00	12.00	287.00	<.001	0.96	[0.91, 1.00]
NFC group	152.00	1.00	241.00	12.00	7.57	0.018	0.39	[0.05, 1.00]
n-back level	249.00	3.00	43.70	36.00	68.30	<.001	0.85	[0.77, 1.00]
NFC group x n-back level	3.04	3.00	43.70	36.00	0.84	0.483	0.07	[0.00, 1.00]

Note. NFC = Need for Cognition, Sum Sq = sum of squares, *df* = degrees of freedom, F = F-statistic, p = p-value, CI = confidence interval.