|  |  |  |
| --- | --- | --- |
| **Variable name** | **Abbreviationa** | **Description** |
| Delayed Matching-to-Sample Percent Correct All Delays | DMSPCAD | The percentage of assessment trials containing a delay during which the subject chose the correct box on their first box choice. Calculated across all assessed trials containing a delay. |
| One Touch Stockings Median Latency to First Choice | OTSMDLFC | The median latency in seconds between the appearance of the stocking balls and the first box choice. Calculated across all assessed trials where the first response was correct. |
| One Touch Stockings Problems Solved on First Choice | OTSPSFC | The total number of assessed trials where the subject chose the correct answer on their first attempt. Calculated across all assessed trials. |
| Paired Associates Learning First Attempt Memory Score | PALFAMS28 | The number of times a subject chose the correct box on their first attempt when recalling the pattern locations. Calculated across assessed trials, omitting 12 box level to provide a direct comparison to Recommended Standard. |
| Paired Associates Learning Total Errors (Adjusted) | PALTEA28 | The number of times the subject chose the incorrect box for a stimulus on assessment problems, plus an adjustment for the estimated number of errors they would have made on any problems, attempts and recalls they did not reach. Box level 12 is not included to provide a direct comparison to Recommended Standard. |
| Rapid Visual information Processing A-Prime | RVPA | Signal detection measure of a subject's sensitivity to the target sequence (string of three numbers), regardless of response tendency (the expected range is 0.00 to 1.00; bad to good). In essence, this metric is a measure of how good the subject is at detecting target sequences. |
| Rapid Visual information Processing Median Delay Latency | RVPMDL | The median response latency in milliseconds on correct trials. Calculated across all assessed trials. |
| Spatial Working Memory Strategy (6-8 boxes) | SWMS | The number of times a subject begins a new search pattern from the same box they started with previously. If they always begin a search from the same starting point we infer that the subject is employing a planned strategy for finding the tokens. Calculated across assessed trials with 6 or 8 tokens. |

# Supplemental information: The effects of repetitive transcranial magnetic stimulation antidepressant response on cold cognition: A single-arm prospective longitudinal study

**Table S1**  
*Variable names, abbreviations and descriptions of each cognitive outcome measure*

a The abbreviated variable names are used in the data and code that can be found on Mendeley Data.

**Table S2**

*Means and standard deviations in parentheses of the cognitive subtest outcome measures for all subjects (All), responders (R) and nonresponders (N) by week*

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Variable** | **Baseline** | | | **Week 2** | | | **Week 4** | | | **Week 8** | | |
|  | All | R | N | All | R | N | All | R | N | All | R | N |
| DMSPCADa | 83.48 (12.81) | 86.60 (11.25) | 80.64 (13.99) | 84.36 (8.85) | 84.10 (10.07) | 84.58 (8.15) | 83.00 (13.71) | 85.30 (7.60) | 81.08 (17.40) | 83.14 (13.68) | 81.30 (16.75) | 84.82 (10.72) |
| OTSMDLFCb | 16.46 (8.28) | 20.44 (9.10) | 13.21 (6.19) | 14.99 (9.48) | 16.96 (7.92) | 13.34 (10.66) | 13.23 (7.75) | 13.86 (6.81) | 12.70 (8.71) | 11.80 (8.97) | 13.57 (7.64) | 10.33 (8.03) |
| OTSPSFCc | 11.70 (2.18) | 11.89 (2.03) | 11.55 (2.38) | 10.95 (1.94) | 10.40 (1.90) | 11.45 (1.92) | 11.76 (2.36) | 11.10 (2.13) | 12.36 (2.50) | 11.29 (1.85) | 11.00 (2.21) | 11.55 (1.51) |
| PALFAMS28d | 12.64 (3.63) | 12.90 (3.11) | 12.42 (4.14) | 13.41 (3.72) | 13.90 (3.31) | 13.00 (4.13) | 14.23 (4.71) | 14.00 (4.22) | 14.42 (5.26) | 14.14 (3.77) | 13.90 (2.96) | 14.33 (4.46) |
| PALTEA28e | 11.62 (7.04) | 12.00 (6.58) | 11.27 (7.73) | 12.67 (10.97) | 10.40 (8.06) | 14.73 (13.14) | 9.43 (8.36) | 10.60 (8.19) | 8.36 (8.77) | 11.32 (11.28) | 12.00 (10.98) | 10.75 (11.98) |
| RVPAf | 87.74 (5.68) | 86.92 (5.29) | 88.42 (6.14) | 91.19 (5.78) | 92.99 (4.24) | 89.70 (6.61) | 92.81 (5.19) | 94.38 (4.54) | 91.50 (5.52) | 92.31 (5.39) | 94.57 (3.43) | 90.43 (6.11) |
| RVPMDLg | 493.32 (106.55) | 479.85 (124.60) | 504.54 (93.12) | 492.74 (83.15) | 509.11 (69.47) | 478.00 (95.02) | 475.77 (82.72) | 480.85 (89.85) | 471.54 (80.09) | 489.74 (92.68) | 502.60 (84.45) | 478.05 (102.20) |
| SWMSh | 8.38 (0.92) | 8.60 (0.97) | 8.18 (0.87) | 8.48 (1.63) | 9.00 (1.76) | 8.00 (1.41) | 8.88 (0.96) | 9.12 (0.83) | 8.62 (1.06) | 8.45 (1.23) | 8.30 (1.06) | 8.60 (1.43) |

a Delayed Matching-to-Sample Percent Correct All Delays

b One Touch Stockings Median Latency to First Choice

c One Touch Stockings Problems Solved on First Choice

d Paired Associates Learning First Attempt Memory Score

e Paired Associates Learning Total Errors (Adjusted)

f Rapid Visual information Processing A-Prime

g Rapid Visual information Processing Median Delay Latency

h Spatial Working Memory Strategy (6-8 boxes)

**Table S3**

*Intercept-only models for the subtests outcome measures that did not change over time*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | CANTAB Subtest | | | | | |
|  | DMSPCADa | OTSPSFCb\* | PALFAMS28c\* | PALTEA28d\* | RVPMDLe | SWMSf\* |
| Distribution | Gaussian | Poisson | Poisson | Nbinom1 (θ = 2.71) | Gaussian | Poisson |
| *Fixed effects: Estimate (SE)* | |  |  |  |  |  |
| Intercept | 83.25 (1.75) | 2.44 (0.03) | 2.59 (0.05) | 2.31 (0.16) | 488.71(15.33) | 2.14 (0.04) |
|  |  |  |  |  |  |  |
| *Random effects: Variance (Std. Dev)* | |  |  |  |  |  |
| Intercept: τ00 | 38.30 (6.19) | 0.00 (0.00) | 0.04 (0.20) | 0.40 (0.63) | 3984.17 (63.12) | 0.00 (0.00) |
| Residual: σ2 | 110.99 (10.54) | - | - | - | 4206.93 (64.86) | - |
|  |  |  |  |  |  |  |
| *Zero-Inflation: Estimate (SE)* | |  |  |  |  |  |
| Intercept | - | - | - | -3.08 (0.66) | - | - |
|  |  |  |  |  |  |  |
| *Model summary* | |  |  |  |  |  |
| Observations | 86 | 83 | 88 | 85 | 84 | 78 |
| Subjects | 22 | 22 | 22 | 22 | 22 | 21 |
| Log-likelihood | -333.90 | -193.6 | -236.8 | -280.6 | -486.41 | -162.4 |
| AIC | 673.81 | 391.2 | 477.7 | 569.1 | 978.8 | 328.9 |
| BIC | 681.17 | 396.0 | 482.6 | 578.9 | 986.1 | 333.6 |
| ICC/repeatability | 0.28 (0.11) | 0 (0.04) | 0.36 (0.11) | 0.55 (0.13) | 0.50 (0.11) | 0 (0.04) |

﻿Abbreviation: ICC, Intraclass Correlation Coefficient, SE, standard error, Std.Dev, standard deviation. \*﻿Coefficients and standard errors (in parentheses) are shown on the natural log scale. The ICC/repeatability and standard errors were calculated with the rptR package using 1000 parametric bootstraps for interval estimation1.

a Delayed Matching-to-Sample Percent Correct All Delays

b One Touch Stockings Problems Solved on First Choice

c Paired Associates Learning First Attempt Memory Score

d Paired Associates Learning Total Errors (Adjusted)

e Rapid Visual information Processing Median Delay Latency

f Spatial Working Memory Strategy (6-8 boxes)

**Table S4**  
*Results error structures for the One Touch Stockings (OTS) median latency and Rapid Visual information Processing (RVP) A-Prime outcome measures*

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  | OTS Median Latency  Linear | | |  | RVP A-Prime  Group:Quad | | |
|  | *Nmle command* | df | AIC | BIC | Log-likelihood | df | AIC | BIC | Log-likelihood |
| No error structures |  | 4 | 562.14 | 571.96 | -277.07 | **10** | **-329.34** | **-304.80** | **174.67** |
|  |  |  |  |  |  |  |  |  |  |
| *Correlation Structure* |  |  |  |  |  |  |  |  |  |
| Autoregressive process of order 1 | corAR1() | 5 | 562.01 | 574.28 | -276.00 | 11 | -327.41 | -300.41 | 174.70 |
| Compound symmetry structure | corCompSymm (0.3, form =~1|Subject)) | 5 | 564.14 | 576.41 | -277.07 | 11 | -327.35 | -300.35 | 174.67 |
| General correlation matrix | corSymm(form=~1|Subject) | 10 | 561.27 | 585.81 | -270.63 | 16 | -318.59 | -279.32 | 175.30 |
|  |  |  |  |  |  |  |  |  |  |
| *Variance structure* |  |  |  |  |  |  |  |  |  |
| Exponential of a variance covariate | varExp(form=~1|week) | 5 | 559.08 | 571.35 | -274.54 | 11 | -328.10 | -301.11 | 175.05 |
| Power of a variance covariate | varPower(1) | **5** | **530.10** | **542.37** | **-260.05** | 11 | -329.30 | -302.30 | 175.65 |
| Constant variance (Group) | varIdent(form=~1|Group) | - | - | - | - | 11 | -327.63 | -300.63 | 174.81 |
| Constant variance (week) | varIdent(form=~1|week) | 7 | 557.72 | 574.90 | -271.86 | 13 | -325.11 | -293.20 | 175.56 |
|  |  |  |  |  |  |  |  |  |  |
| General correlation matrix + Power variance | corSymm + varPower |  | Convergence problem | | |  | - | - | - |

**Bold:** final model. Abbreviations: AIC, Akaike Information Criterion; BIC, Bayesian Information Criterion; df, degrees of freedom.

## Normative data

Graphical user interface, chart

Description automatically generated

**Figure S1** Mean and standard errors of the Z-scores by group for six normative cognitive measures over the course of eight weeks. One-sample t-tests with Bonferroni correction indicated that RVP A-Prime and SWM strategy were impaired at baseline compared to the healthy normative sample.

## Post hoc analysis – Rumination

According to the Perceptual Load Theory, success or failure of selective and sustained attention depends on the processing demands of the task2. Distractions are more likely to occur during tasks with low perceptual complexity and demands and could be prevented by increasing the perceptual complexity of a task2. We hypothesized that the low perceptual complexity of the RVP task could have affected nonresponders disproportionately due to a higher susceptibility to negatively biased bottom-up emotional interference and motivational deficits3,4. Although distraction by task-unrelated mind-wandering has been an understudied subject5, we hypothesized that higher levels of rumination would be associated with poorer RVP A-Prime performance and that nonresponders reported higher levels of rumination. Rumination levels were measures with the Chinese version of the Ruminative Response Scale 6 at week 0 and week 4 as part of the original study. Unfortunately, our sample size did not allow for a mediation analysis. Instead, a 2x2 ANOVA was performed to examine the effects of Group (Nonresponders, Responders) and Time (Week 0, Week 4) on rumination (Ruminative Response Scale). Results revealed significant main effects of Time [F(1, 38) = 6.86, p = 0.013, η2 = 0.094] and Group [F(1,38)=26.45, p < .001, η2 = .361], but no interaction effect (Figure S1). Normality check and Levene’s test were carried out and the assumptions were met. The results indicate that 1) responders had on average lower rumination scores than nonresponders, and 2) scores were lower at week 4 compared to baseline.



**Figure S2** Interaction plot of the Ruminative Response Scale by Time in weeks and Group based on rTMS response status showing significant main effects of Time and Group, indicating higher levels of rumination at baseline and in the nonresponder group.