Supplementary Materials

Aberrant functional connectivity of resting state networks related to misperceptions and intra-individual variability in Parkinson‘s disease

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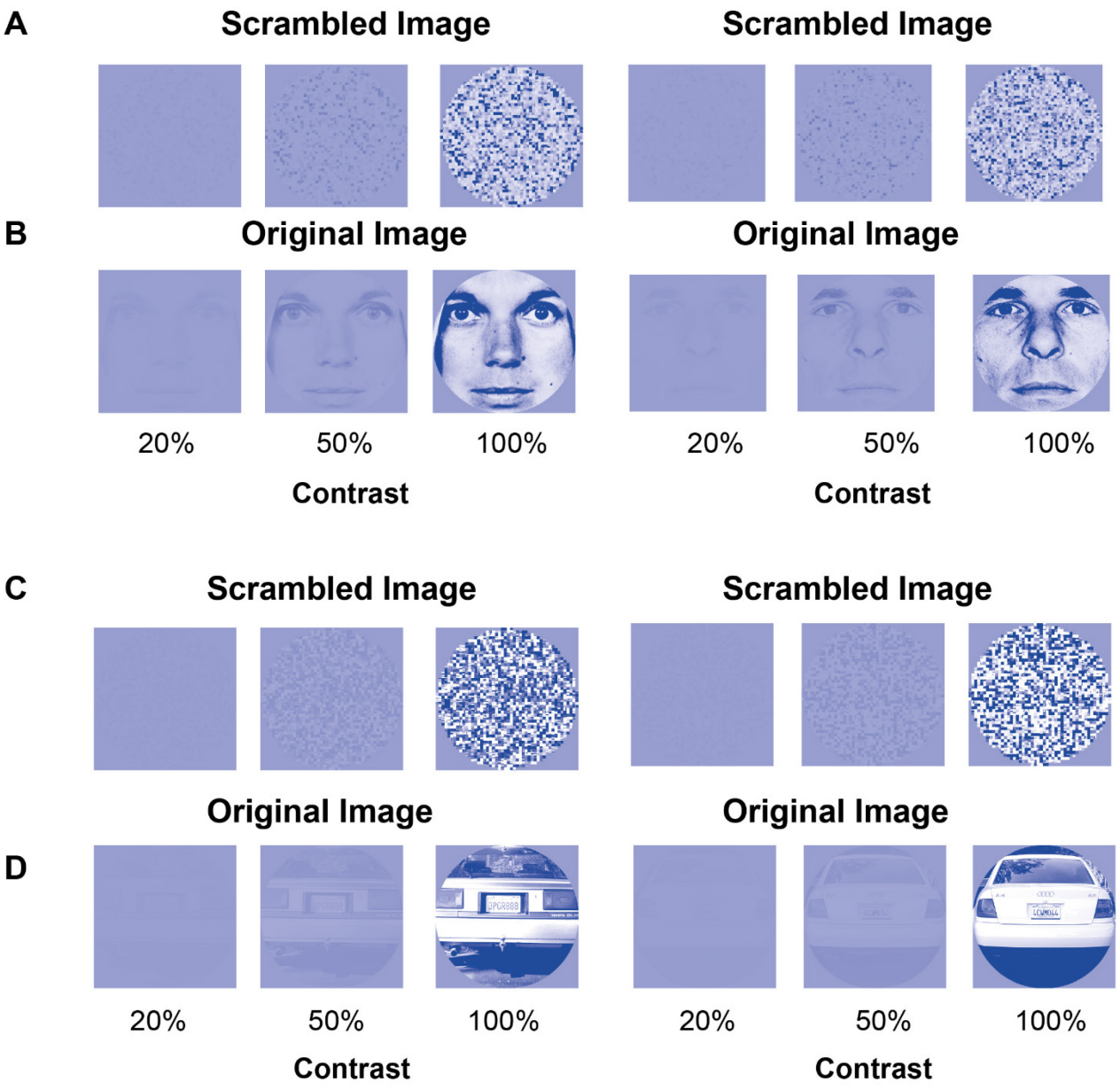
Supplementary Materials contain:

5 Supplementary Figures

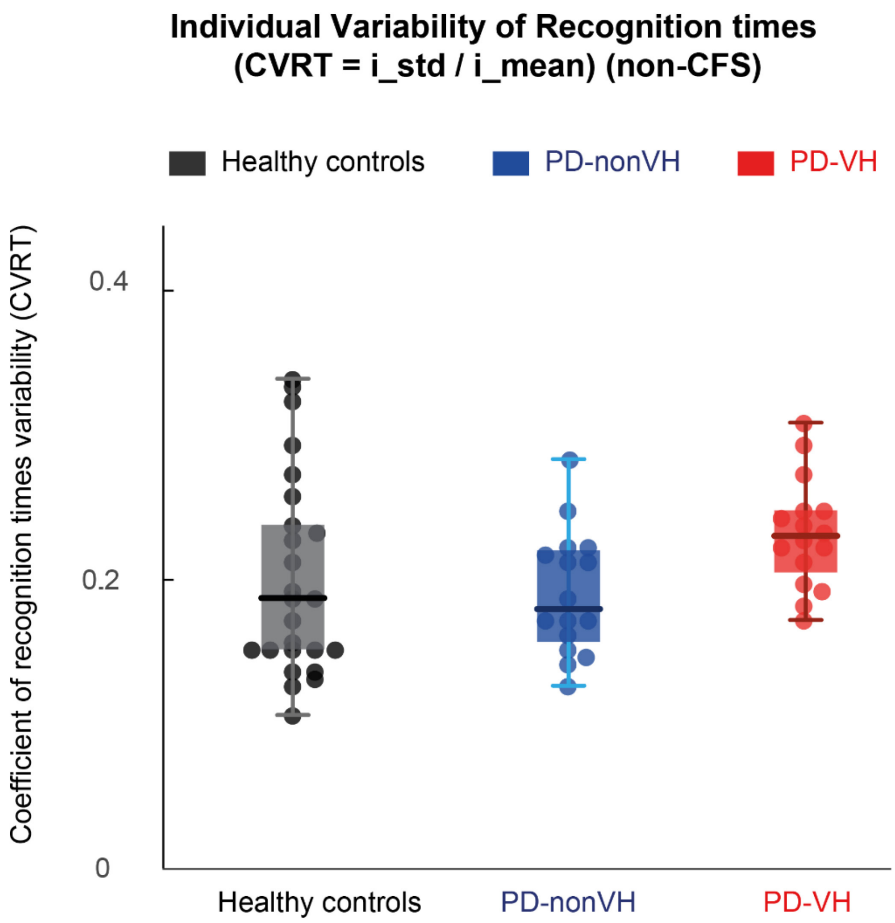
8 Supplementary Tables

Signal Detection Analysis Supplementary Method

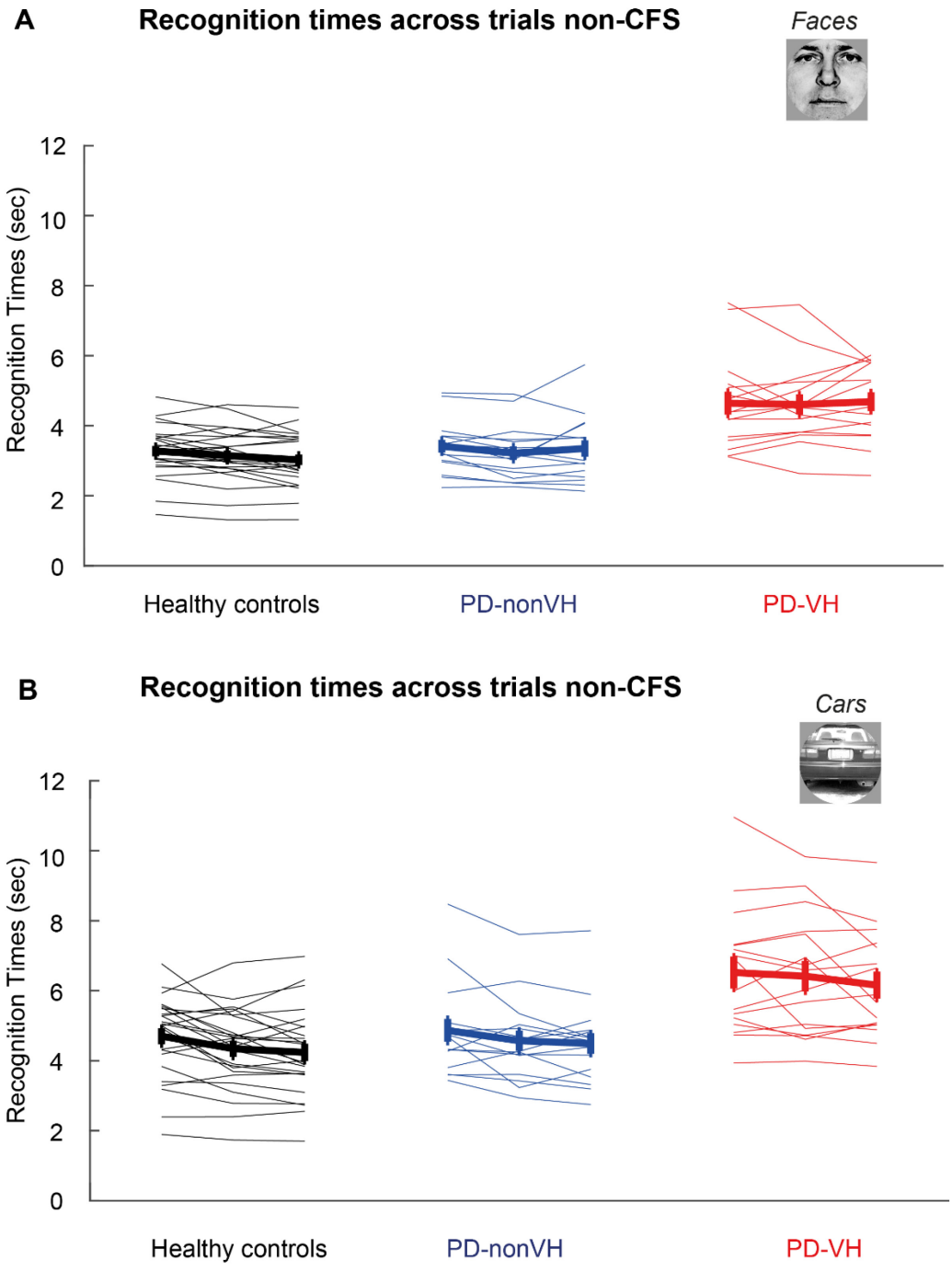
Supplementary Figures



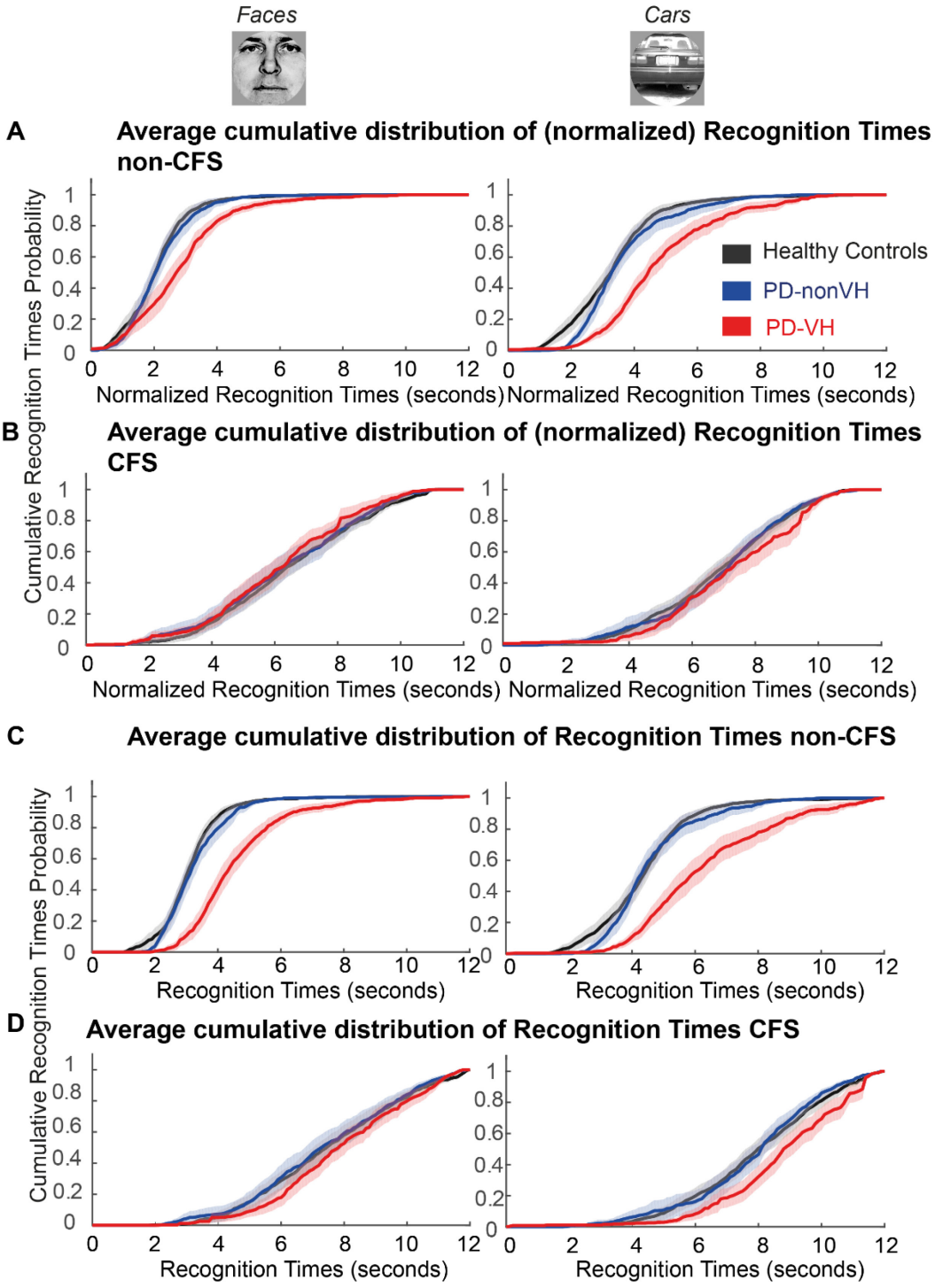
Supplementary Figure S1. Original task stimuli and their scrambled version. (A, B) Scrambled and original facial stimuli in three (20%, 50% and 100%) contrast levels. **(C, D)** Scrambled and original car stimuli in three contrast levels.



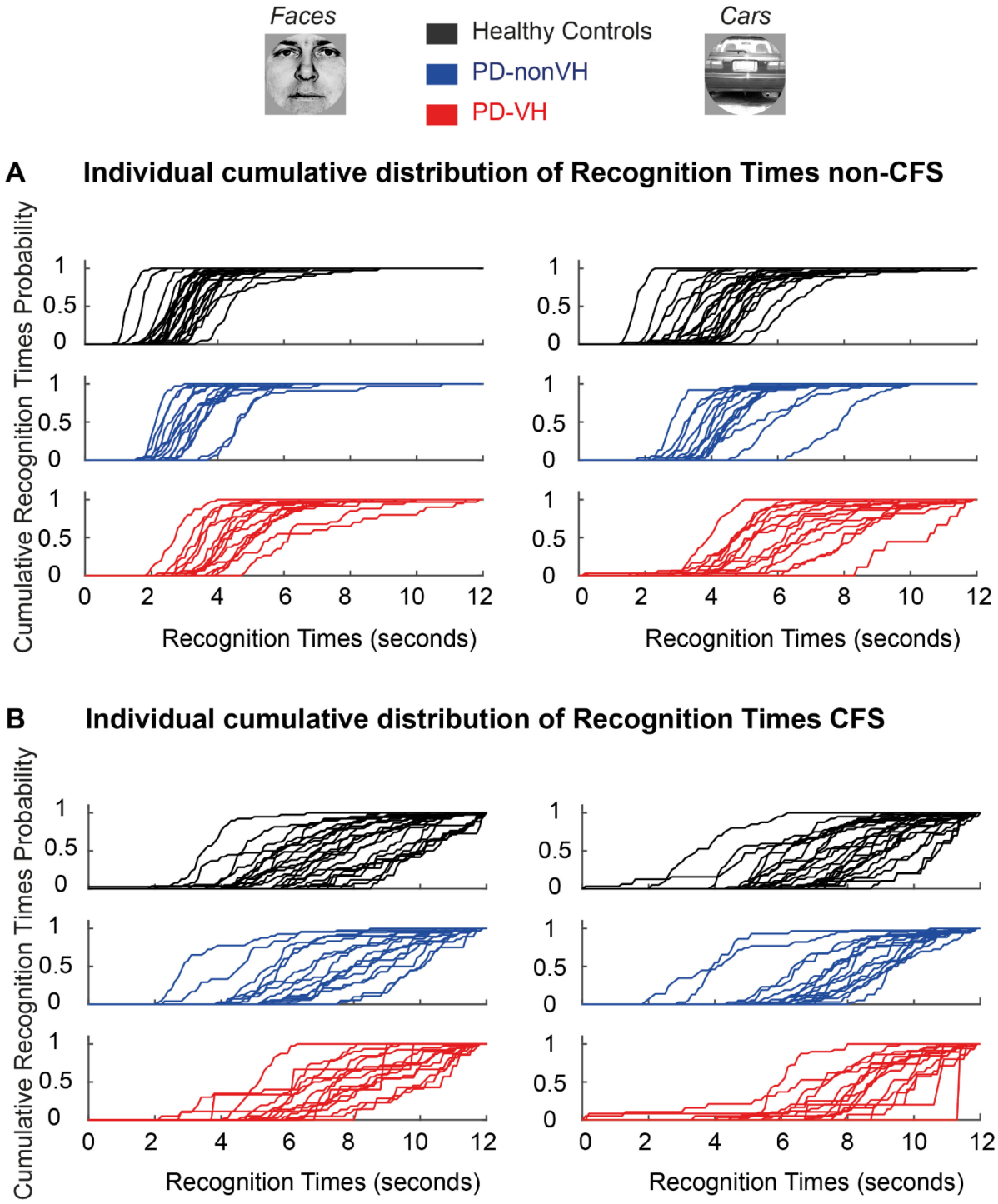
Supplementary Figure S2. Intra-individual variability of recognition times (CVRT) scores. Individual **CVRT** and boxplots illustrating the median in the center of the box, error bars the 95% confidence interval separately for HC (N = 25) in black, PD-nonVH (N = 16) in blue and PD-VH (N = 16) in red.



Supplementary Figure S3. Recognition times across trials. (A) Lines show mean and individual recognition times for the three intervals for **face** images of the non-CFS condition. Each bin corresponds to one third of correct trials. **(B)** Lines show mean and individual recognition times for the three time intervals, each interval consisting of one third of correct trials, of the non-CFS condition for **car** images. In **(A)** and **(B)**, error bars show means and S.E.M. across subjects. HC: Healthy controls; PD-nonVH: Parkinson patients without visual hallucinations; PD-VH: Parkinson patients with visual hallucinations.



Supplementary Figure S4. Average cumulative distribution of Recognition times. Lines show mean cumulative probability of recognition times distribution for **(A-B)** normalized (subtracting the mean recognition times of the control task from the average of the main task) and **(C-D)** non-normalized recognition times separated for face (left) and car (right) images of the non-CFS **(A, C)** and the CFS **(B, D)** condition. HC: Healthy controls shown in black; PD-nonVH: Parkinson patients without visual hallucinations illustrated in blue; PD-VH: Parkinson patients with visual hallucinations shown in red.



Supplementary Figure S5. Individual cumulative distribution of recognition times. Individual cumulative distribution of (non-normalized) recognition times for **(A)** unmasked faces (left) and cars (right) (non-CFS condition) and **(B**) masked condition (CFS condition) plotted separately for healthy controls in black, PD-nonVH in blue and PD-VH in red. Note that only trials with a correct button response within 12 seconds are plotted.

Supplementary Tables

Supplementary Table S1. Results (F and p values) from ANOVA_1 in the non-CFS condition: Repeated Measures mixed ANOVA with the factors Category, Group and their interaction effects for Healthy controls (HC) vs. Parkinson patients (PD-all).

Factor	Proportion Correct Categorization	Proportion Misses	Proportion Erroneous Object Recognition in Scrambled Images	Perceptual Error Score (PES)	CVRT	RT
	F (p)	F (p)	F (p)	F (p)	F (p)	F (p)
Category	0.09	8.73			0.59	292.95
	(0.77)	(0.0046)*			(0.45)	(0.00001)*
Group	11.77	3.16	4.86	9.81	0.47	8.87
	(0.001)*	(0.08)	(0.03)#	(0.003)*	(0.50)	(0.004)*
Category x Group	0.03	3.58			0.38	2.15
	(0.87)	(0.06)			(0.54)	(0.15)

HC: Healthy controls (N = 25); PD-all: Parkinson patients with and without visual hallucinations (N = 32); RT: Recognition times; CVRT: Mean individual variability coefficients (individual SD/individual mean) of recognition times. Between-subjects factor: Group: 2 levels: HC, PD-all; Within-subjects factors: Category: 2 levels: faces, cars (except for PES and Proportion Erroneous Recognition in Scrambled Images); * $p < 0.0125$ significant with Bonferroni correction, # $p < 0.05$ significant only without Bonferroni correction

Supplementary Table S2. Results from (F and p values) the Repeated Measures mixed ANCOVA in the non-CFS condition: Repeated Measures mixed ANCOVA with the factors Category (Cars and Faces), Group, their interaction effects and the covariates disease duration and LEDD for Parkinson patients without visual hallucinations (PD-nonVH) and Parkinson patients with visual hallucinations (PD-VH).

Factor	Proportion Correct Categorization	Proportion Misses	Proportion Erroneous Object Recognition in Scrambled Images	Perceptual Error Score (PES)	CVRT	RT
	F (p)	**F (p)**	**F (p)**	**F (p)**	**F (p)**	**F (p)**
Category	0.40 (0.53)	1.03 (0.32)			1.21 (0.28)	22.78 (0.00005)**
Group	1.09 (0.31)	0.94 (0.34)	12.75 (0.001)**	13.88 (0.001)**	4.34 (0.047)*	2.78 (0.11)
Disease duration	0.14 (0.72)	0.16 (0.70)	0.18 (0.68)	0.01 (0.92)	0.08 (0.78)	6.61 (0.02)*
LEDD	4.23 (0.049)*	0.84 (0.37)	2.10 (0.16)	0.32 (0.57)	0.19 (0.67)	1.06 (0.31)
Category x Group	0.10 (0.75)	0.74 (0.40)			0.01 (0.94)	0.71 (0.41)
Category x Disease	5.66 (0.02)*	0.39 (0.54)			0.02 (0.89)	2.38 (0.13)
Category x LEDD	1.01 (0.32)	3.29 (0.08)			0.72 (0.40)	0.04 (0.84)

PD-nonVH: Parkinson patients without visual hallucinations (N =16); PD-VH: Parkinson patients with visual hallucinations (N = 16); RT: Recognition times; CVRT: Mean individual variability coefficients (individual SD/individual mean) of recognition times; Between-subjects factor: Group: 2 levels: PD-nonVH, PD-VH; Within-subjects factors: Category: 2 levels: faces, cars (except for PES and Proportion Erroneous Recognition in Scrambled Images); Covariates: Disease duration, levodopa-equivalent daily dose (LEDD); ** $p < 0.005$, * $p < 0.05$

Supplementary Table S3. Results (F and p values) from ANOVA_1 in the CFS condition: Repeated Measures mixed ANOVA with the factors Category (Cars and Faces), Group and their interaction effects for Healthy controls (HC) Parkinson patients (PD-all)**.**

Factor	Proportion Correct Categorization	Proportion Misses	Proportion Erroneous Object Recognition in Scrambled Images	Perceptual Error Score (PES)	CVRT	RT
	F (p)	**F (p)**	**F (p)**	**F (p)**	**F (p)**	**F (p)**
Category	1.52	3.21			6.46	18.33
	(0.22)	(0.08)			(0.014)#	(0.00008)*
Group	7.66	0.93	1.21	3.33	0.003	0.33
	(0.0076)*	(0.34)	(0.28)	(0.07)	(0.96)	(0.57)
Category x Group	0.23	2.36			0.10	1.03
	(0.64)	(0.13)			(0.75)	(0.31)

HC: Healthy controls (N = 25), PD-all: Parkinson patients with and without visual hallucinations (N = 32); RT: Recognition times, CVRT: Mean individual variability coefficients (individual SD/individual mean) of recognition times, Between-subjects factor: Group: 2 Levels: HC, PD-all, Within-subjects factors: Category: 2 Levels, cars, faces (except for PES and Proportion Erroneous Recognition in Scrambled Images); * $p < 0.0125$ significant with Bonferroni correction, # $p < 0.05$ significant only without Bonferroni correction

Supplementary Table S4. Results (F and p values) from ANOVA_2 in the CFS condition: Repeated Measures mixed ANOVA with the factors Category (Cars and Faces)**,** Group, their interaction effects for Parkinson patients without visual hallucinations (PD-nonVH) and Parkinson patients with visual hallucinations (PD-VH).

Factor	Proportion Correct Categorization	Proportion Misses	Proportion Erroneous Object Recognition in Scrambled Images	Perceptual Error Score (PES)	CVRT	RT
	F (p)	F (p)	F (p)	F (p)	F (p)	F (p)
Category	1.09	0.05			3.36	12.18
	(0.30)	(0.82)			(0.08)	(0.002)*
Group	6.77	7.01	2.04	8.27	0.37	1.78
	(0.014)#	(0.013)#	(0.16)	(0.007)*	(0.55)	(0.19)
Category x Group	2.58	7.32			0.05	1.01
	(0.12)	(0.011)*			(0.83)	(0.32)

PD-nonVH: Parkinson patients without visual hallucinations (N = 16), PD-VH: Parkinson patients with visual hallucinations (N = 16); RT: Recognition times, CVRT. Mean individual variability coefficients (individual SD/individual mean) of recognition times, Between-subjects factor: Group: 2 Levels: PD-nonVH, PD-VH, Within-subjects factors: Category: 2 levels: face, car (except for PES and Proportion Erroneous Recognition in Scrambled Images); * $p < 0.0125$ significant with Bonferroni correction, # $p < 0.05$ significant only without Bonferroni correction

Supplementary Table S5. Results (F and p values) from the Repeated Measures mixed ANCOVA in the CFS condition. Repeated Measures mixed ANCOVA with the factors Category (Cars and Faces), Group, their interaction effects and the covariates disease duration and LEDD in the CFS condition

Factor	Proportion Correct Categorization	Proportion Misses	Proportion Erroneous Object Recognition in Scrambled Images	Perceptual Error Score (PES)	CVRT	RT
	F (p)	F (p)	F (p)	F (p)	F (p)	F (p)
Category	0.02 (0.89)	3.71 (0.06)			0.33 (0.57)	0.42 (0.52)
Group	6.50 (0.02)*	2.13 (0.16)	5.67 (0.024)*	7.66 (0.01)*	0.008 (0.93)	0.02 (0.89)
Disease duration	1.34 (0.26)	1.87 (0.18)	0.01 (0.92)	0.38 (0.55)	1.04 (0.32)	0.20 (0.66)
LEDD	0.01 (0.91)	3.45 (0.07)	2.85 (0.10)	0.08 (0.78)	0.02 (0.89)	2.50 (0.13)
Category x Group	0.78 (0.38)	1.11 (0.30)			0.51 (0.48)	0.07 (0.80)
Category x Disease duration	0.06 (0.81)	0.02 (0.90)			0.28 (0.60)	0.001 (0.98)
Category x LEDD	0.45 (0.51)	2.40 (0.13)			2.39 (0.13)	0.51 (0.48)

PD-nonVH: Parkinson patients without visual hallucinations (N = 16), PD-VH, Parkinson patients with visual hallucinations (N = 16), RT: Recognition times, CVRT: Mean individual variability coefficients (individual SD/individual mean) of recognition times, Between-subjects factor: Group: 2 Levels: PD-nonVH, PD-VH, Within-subjects factors: Category: 2 levels: face, car (except for PES and Proportion of Erroneous Object Recognition in Scrambled Images); ** $p < 0.005$, * $p < 0.05$

Supplementary Table S6. Mean and SD of hit rate, false alarm (FA) rate, sensitivity (d'), and response bias (criterion, c) for all groups, and results of Mann-Whitney U test for between-group comparisons of d' and c.

Group	Hit rate	FA rate	d prime (d')	criterion (c)	Hit rate	FA rate	d prime (d')	criterion (c)
Subset 1: Faces vs. cars								
	Non-CFS				**CFS**			
HC	0.99 (0.00)	0.01 (0.00)	4.47 (0.06)	0.01 (0.03)	0.98 (0.04)	0.03 (0.06)	4.25 (0.65)	-0.04 (0.17)
PD-all	0.96 (0.07)	0.04 (0.05)	3.89 (0.73)	-0.01 (0.28)	0.91 (0.12)	0.11 (0.17)	3.25 (1.42)	-0.05 (0.25)
HC vs. PD-all			**U=197.5 p=0.0001***	U=353.5 p=0.3696			**U=201.5 p=0.0006***	U=414.5 p=0.8076
PD-nonVH	0.98 (0.02)	0.02 (0.02)	4.25 (0.42)	0.03 (0.15)	0.95 (0.10)	0.04 (0.07)	3.93 (0.96)	0.04 (0.19)
PD-VH	0.94 (0.10)	0.06 (0.06)	3.54 (0.82)	-0.04 (0.36)	0.87 (0.14)	0.19 (0.22)	2.57 (1.50)	-0.13 (0.28)
nonVH vs. VH			**U=60.5 p=0.0077***	U=94.5 p=0.1891			**U=54.0 p=0.0047***	U=85.0 p=0.1020
Subset 2: Faces or cars vs. scrambled								
	Non-CFS				**CFS**			
HC	0.99 (0.01)	0.07 (0.16)	4.50 (0.83)	-0.17 (0.41)	0.86 (0.20)	0.08 (0.20)	3.48 (1.21)	0.23 (0.70)
PD-all	0.95 (0.12)	0.20 (0.27)	3.38 (1.55)	-0.39 (0.57)	0.78 (0.27)	0.15 (0.26)	2.66 (1.68)	0.21 (0.77)
HC vs. PD-all			**U=234.5 p=0.0053***	U=294.5 p=0.0759			U=284.0 p=0.0631	U=408.0 p=0.9039
PD-nonVH	0.99 (0.00)	0.08 (0.23)	4.46 (1.15)	-0.23 (0.45)	0.91 (0.08)	0.08 (0.24)	3.45 (1.33)	0.19 (0.72)
PD-VH	0.90 (0.16)	0.32 (0.26)	2.30 (1.05)	-0.54 (0.65)	0.66 (0.34)	0.21 (0.26)	1.86 (1.65)	0.23 (0.85)
nonVH vs. VH			**U=18.0 p=0.0000***	U=81.0 p=0.0736			**U=64.0 p=0.0167#**	U=112.0 p=0.5591

HC: Healthy controls (N = 25); PD-all: Parkinson patients with and without visual hallucinations (N = 32); PD-nonVH: Parkinson patients without visual hallucinations (N = 16); PD-VH: Parkinson patients with visual hallucinations (N = 16); $p < 0.0125$ significant with Bonferroni correction, # $p < 0.05$ Significant effects with or without Bonferroni correction are shown in bold.

Supplementary Table S7. Mean and SD of hit rate, false alarm (FA) rate, sensitivity (d'), and response bias (criterion, c) for all groups, and results of Mann-Whitney U test for between-group comparisons of d' and c.

Group	Hit rate	FA rate	d prime (d')	criterion (c)	Hit rate	FA rate	d prime (d')	criterion (c)
Subset 3: Faces vs. scrambled								
	Non-CFS				**CFS**			
HC	0.99 (0.00)	0.07 (0.14)	4.16 (0.68)	-0.16 (0.34)	0.83 (0.23)	0.07 (0.18)	3.25 (1.10)	0.26 (0.65)
PD-all	0.96 (0.09)	0.16 (0.23)	3.45 (1.11)	-0.33 (0.53)	0.78 (0.27)	0.12 (0.23)	2.73 (1.46)	0.25 (0.77)
HC vs. PD-all			**U=240.5 p=0.0057***	U=295.5 p=0.0703			U=328.5 p=0.2518	U=415.5 p=0.8087
PD-nonVH	0.99 (0.00)	0.08 (0.22)	4.09 (0.90)	-0.19 (0.45)	0.87 (0.13)	0.08 (0.24)	3.28 (1.15)	0.24 (0.73)
PD-VH	0.93 (0.13)	0.23 (0.21)	2.81 (0.91)	-0.47 (0.58)	0.69 (0.34)	0.17 (0.22)	2.19 (1.57)	0.26 (0.84)
nonVH vs. VH			**U=31.5 p=0.0002***	**U=66.5 p=0.0182#**			U=77.0 p=0.0565	U=109.0 p=0.4848
Subset 4: Cars vs. scrambled								
	Non-CFS				**CFS**			
HC	0.98 (0.01)	0.03 (0.04)	4.27 (0.39)	-0.03 (0.20)	0.88 (0.19)	0.05 (0.15)	3.55 (0.94)	0.21 (0.57)
PD-all	0.92 (0.15)	0.13 (0.22)	3.42 (1.34)	-0.11 (0.48)	0.78 (0.28)	0.10 (0.21)	2.77 (1.53)	0.30 (0.71)
HC vs. PD-all			**U=269.5 p=0.0212#**	U=351.5 p=0.3949			U=279.0 p=0.0512	U=434.0 p=0.5877
PD-nonVH	0.99 (0.01)	0.06 (0.19)	4.24 (0.89)	-0.08 (0.30)	0.93 (0.06)	0.08 (0.24)	3.49 (1.21)	0.10 (0.61)
PD-VH	0.86 (0.20)	0.19 (0.24)	2.60 (1.21)	-0.13 (0.62)	0.63 (0.33)	0.13 (0.18)	2.05 (1.50)	0.49 (0.78)
nonVH vs. VH			**U=22.0 p=0.0000***	U=116.0 p=0.6473			U=60.0 **p=0.0108***	U=140.0 p=0.6640

HC: Healthy controls (N = 25); PD-all: Parkinson patients with and without visual hallucinations (N = 32); PD-nonVH: Parkinson patients without visual hallucinations (N = 16); PD-VH: Parkinson patients with visual hallucinations (N = 16); $p < 0.0125$ significant with Bonferroni correction, # $p < 0.05$ Significant effects with or without Bonferroni correction are shown in bold.

Supplementary Table S8. Partial Correlations (and p values) between within and between network functional connectivity estimates and logarithmic transformation of the Perceptual Error Score, Individual variability of recognition times (CVRT) in Parkinson patients without visual hallucinations (PD-nonVH) (N = 6) and Parkinson patients with visual hallucinations (PD-VH) (N = 10).

Log (Perceptual Error Score +1)								
	DMN	**DAN**	**SAL**	**l FP**	**r FP**	**SMN**	**Visual medial**	**Visual lateral**
	r (p)	r (p)	r (p)	r (p)	r (p)	r (p)	r (p)	r (p)
DMN	< 0.001 (0.99)	0.32 (0.27)	-0.06 (0.85)	-0.01 (0.97)	0.07 (0.82)	0.45 (0.11)	-0.08 (0.79)	-0.03 (0.91)
DAN	0.29 (0.29)	0.07 (0.82)	**-0.54 (0.047)***	0.46 (0.10)	0.34 (0.23)	-0.31 (0.28)	0.34 (0.23)	0.23 (0.44)
SAL	0.05 (0.86)	0.03 (0.93)	-0.21 (0.48)	-0.14 (0.63)	-0.24 (0.40)	-0.25 (0.23)	0.21 (0.48)	0.20 (0.49)
l FP	-0.42 (0.14)	-0.32 (0.27)	-0.35 (0.22)	-0.03 (0.91)	-0.02 (0.95)	-0.51 (0.06)	-0.27 (0.35)	-0.16 (0.58)
r FP	0.02 (0.96)	-0.36 (0.21)	0.44 (0.12)	< 0.001 (0.99)	-0.41 (0.15)	-0.12 (0.72)	0.17 (0.57)	-0.44 (0.12)
SMN	0.49 (0.08)	-0.20 (0.49)	0.08 (0.78)	-0.19 (0.52)	-0.32 (0.27)	-0.09 (0.74)	-0.17 (0.56)	0.02 (0.95)
Visual medial	-0.07 (0.82)	0.48 (0.08)	-0.29 (0.32)	0.15 (0.60)	0.09 (0.76)	-0.23 (0.44)	0.16 (0.58)	-0.03 (0.91)
Visual lateral	0.20 (0.49)	0.34 (0.23)	0.29 (0.31)	0.11 (0.71)	0.04 (0.88)	-0.04 (0.89)	-0.18 (0.53)	-0.09 (0.74)
CVRT								
	DMN	**DAN**	**SAL**	**l FP**	**r FP**	**SMN**	**Visual medial**	**Visual lateral**
DMN	0.19 (0.52)	-0.06 (0.83)	0.08 (0.79)	-0.35 (0.22)	-0.29 (0.30)	-0.18 (0.54)	0.02 (0.94)	0.07 (0.82)
DAN	0.47 (0.09)	-0.20 (0.49)	0.12 (0.69)	0.40 (0.15)	0.31 (0.28)	0.21 (0.48)	0.09 (0.75)	0.51 (0.06)
SAL	-0.29 (0.32)	-0.49 (0.07)	-0.01 (0.97)	-0.15 (0.62)	-0.30 (0.29)	-0.31 (0.28)	-0.24 (0.42)	-0.29 (0.31)

l FP	0.05 (0.86)	-0.14 (0.64)	-0.002 (0.99)	0.39 (0.17)	0.26 (0.38)	0.03 (0.93)	-0.23 (0.43)	-0.04 (0.89)
r FP	-0.53 (0.053)	0.01 (0.97)	0.38 (0.19)	-0.28 (0.34)	-0.22 (0.44)	-0.21 (0.47)	-0.16 (0.59)	0.22 (0.46)
SMN	-0.22 (0.45)	-0.08 (0.79)	0.32 (0.27)	-0.08 (0.78)	**-0.55 (0.04)***	0.33 (0.25)	-0.18 (0.53)	0.14 (0.63)
Visual medial	-0.05 (0.87)	0.09 (0.76)	-0.19 (0.52)	-0.18 (0.55)	-0.27 (0.36)	0.08 (0.79)	-0.16 (0.59)	-0.02 (0.96)
Visual lateral	-0.002 (0.99)	0.27 (0.34)	0.18 (0.54)	0.36 (0.21)	0.16 (0.59)	0.18 (0.55)	0.10 (0.73)	-0.03 (0.93)

Partial correlations corrected for disease duration and levodopa-equivalent daily dose (LEDD) of hallucinating and non-hallucinating Parkinson patients (n = 16). Significant correlations * $p < 0.05$ are shown in bold.

Signal Detection Analysis Supplementary Method

In order to assess whether the observed perceptual differences between the healthy controls and PD patients with and without hallucinations were due to changes in perception and/or decision criterion we used the standard signal detection theory framework to calculate detection sensitivity (d') and criterion (c):

$$d' = Z(H) - Z(FA)$$

$$c = -0.5\,[Z(H) + Z(FA)]$$

where Z is inverse of the cumulative normal distribution, H is the hit rate, and FA is the false alarm rate. When the hit rate was 1, and the false alarm rate was 0 (i.e. 100% performance), or the false alarm rate was 1, the following approach was used to correct for the $Z(H) = \infty$ or $Z(FA) = \pm\infty$: rates of 1 are replaced with (N-0.5)/N, and rates of 0 are replaced with 0.5/N, where N is the number of trials where the “signal” was present (for example, for N=40 trials the hit rate H=1 is replaced with 0.9875, which together with the false alarm FA=0 replaced by 0.0125 results in d' = 4.4828) (Stanislaw and Todorov, 1999).

To apply Signal Detection Analysis to our data, they were converted into a yes/no signal/noise task format, as described below. Since each trial in the actual task included one of three possible stimuli (faces, cars, scrambled) and one of three corresponding responses (left button: face, right button: car, no button: scrambled), for these analyses we separated the trials into fours subsets: 1) trials where faces or cars were presented and the response was a face or a car; 2) trials where an image (a face or a car) or scrambled image was presented and the response was a (correct) image or a scrambled image; 3) trials where faces or scrambled images were presented and the response was a face or a scrambled image; 4) trials where cars or scrambled images were presented and the response was a car or a scrambled image.

For each of the four subsets, responses were sorted into hits (H), misses (M), false alarms (FA), and correct rejections (CR) as follows:

Subset 1. Faces vs. cars (faces represent “signal”, cars – “noise”)

H: face presented, face reported

M: face presented, car reported

FA: car presented, face reported

CR: car presented, car reported

Subset 2. Faces or cars vs. scrambled (faces or cars represent “signal”, scrambled – “noise”)

H: face presented and face reported or car presented and car reported

M: face or car presented, scrambled reported

FA: scrambled presented, face or car reported

CR: scrambled presented, scrambled reported

Subset 3. Faces vs. scrambled (faces represent “signal”, scrambled – “noise”)

H: face presented, face reported

M: face presented, scrambled reported

FA: scrambled presented, face reported

CR: scrambled presented, scrambled reported

Subset 4. Cars vs. scrambled (cars represent “signal”, scrambled – “noise”)

H: car presented, car reported

M: car presented, scrambled reported

FA: scrambled presented, car reported

CR: scrambled presented, scrambled reported

The subset 1 was used to check the difference in detection of face and car images, ignoring scrambled images (which are analyzed in the subsets 2-4). The subset 2 was used to check the detection of either a face or a car vs. scrambled images. Subsets 3 and 4 were used to assess the detection of faces vs. scrambled and cars vs. scrambled, separately Furthermore, each of these four subsets has been split into trials with continuous flash suppression (CFS) masking and without CFS. This resulted in 8 pairs of d' and c values for each group (healthy controls, PD patients, PD patients without

hallucinations, PD patients with hallucinations), shown in **Supplementary Tables S6** and **S7**. SDT Analysis of subsets 1 and 2 is also shown in the main text in **Figure 6**.

Statistical Analysis of sensitivity (d') and criterion/response bias (c).

Since some of the d' and c distributions violated parametric assumption, we used the Mann–Whitney U test for comparing the groups. Equivalent to the ANOVAs described in the main text, we compared the healthy subjects (HC) with all Parkinson patients (PD) and the PD-VH with the PD-nonVH: 1) U test with the “Group” factor HC vs. all PD patients (PD-VH + PD-nonVH) together and 2) To investigate behavioral markers that are specific for VH in PD we used a separate U test with the “Group” factor PD-nonVH vs. PD-VH.