Screening and Diagnosis of Lewy Body Disease

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What is Lewy Body Dementia

- 2nd most common cause of dementia after AD
  - Causes 10-12% of irreversible dementia
  - Lewy bodies (LBs) found in up to 40% of autopsied brains
- Includes Dementia with Lewy Bodies (DLB) and Parkinson's Disease Dementia (PDD)
  - PDD: Movement Disorder begins 1st, at least 2 years before cognitive
  - DLB: Any other pattern
- More common in men
- May have faster decline than AD
- The combined sum of patients Lewy body dementia is estimated at 1.4 million
- Often significant delay to diagnosis and treatment
  - Commonly misdiagnosed as late-onset psychiatric disorder

Lewy Body Dementia Association (LBDA.org); Galvin JE *Practical Neurology 2019*

LBD Epidemiology (PDD)

- Point prevalence of dementia in PD is close to 30%
- Incidence rate is increased at 4-6 times relative to controls
- At least 75% of PD patients who survive more than 10 years likely to develop dementia
- Mean time from onset of PD to dementia is approximately 10 years
- Old age, more severe motor symptoms (in particular, gait and postural disturbances), mild cognitive impairment at baseline, and visual hallucinations

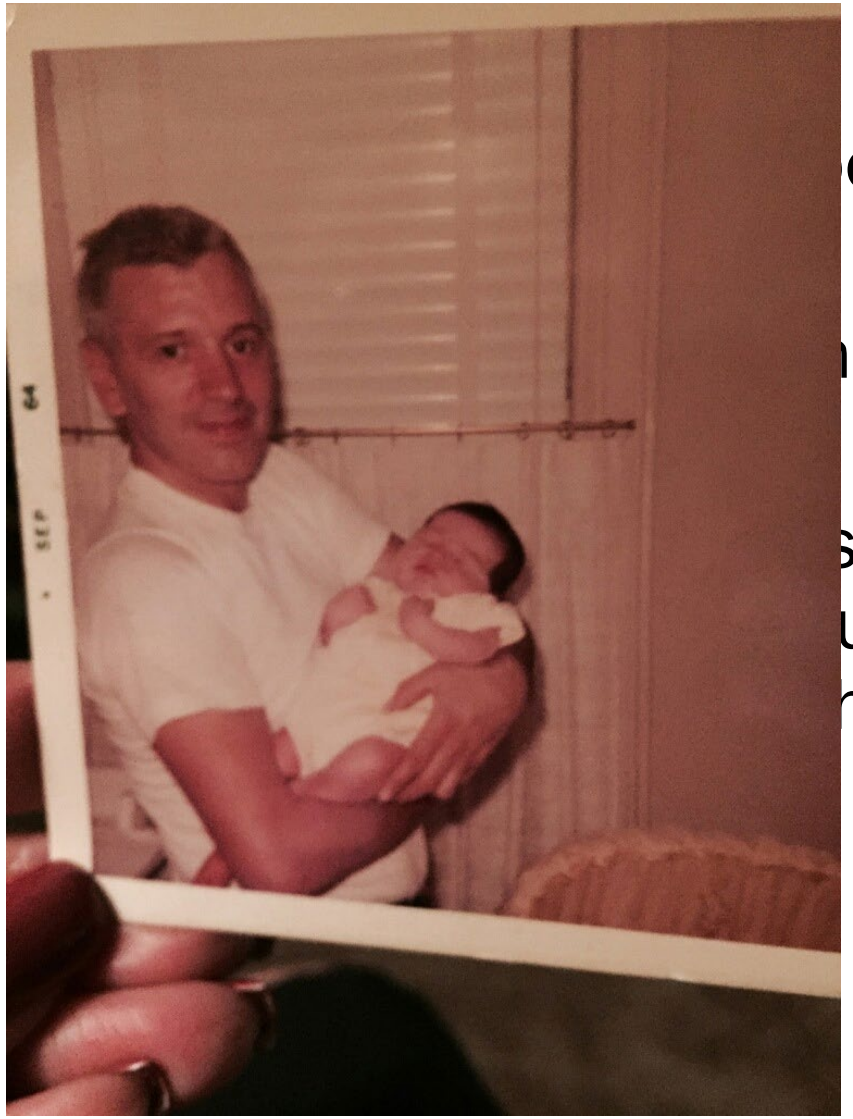
Lewy Body Dementia Association (LBDA.org); Galvin JE *Practical Neurology 2019*

LBD Epidemiology (DLB)

- Prevalence estimates of DLB range from 0% to 5% in the general population and from 0% to 30.5% of all dementia cases
- Incidence rates of 0.1% in the general population, and 3% for all new dementia cases
- A recent review examined 22 studies and reported incidence rates between 0.5 to 1.6 per 1000 person-years, accounting for 3-7% of dementia cases.
- Prevalence estimates ranged from 0.02-63.5 per 1000, higher with increasing age.

Lewy Body Dementia Association (LBDA.org); Galvin JE *Practical Neurology 2019*

Historical Perspective



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Parkinson Disease Dementia

- Develops in the context of established PD
  - At least 2 years after a diagnosis of PD
  - Impairment in more than one cognitive domain
    - Attention, executive, visuospatial, memory, language
  - Decline from premorbid level
  - Deficits severe enough to impair daily life
- Exclusion of other dementias
- MMSE below 26 or Impairment in at least two of the following:
  - Months reversed or Seven backward
  - Lexical (category) fluency or Clock drawing
  - MMSE Pentagons
  - 3-Word recall
- Supportive features: apathy, depression, delusions, or daytime sleepiness.

Emre M, et al. *Mov Disord*. 2007;22:1689-1707, DuBois B et al, Movement Disorders 22:2314-2324,2007

Dementia With Lewy Bodies

Revised criteria for the clinical diagnosis of probable and possible DLB

Essential for a diagnosis of DLB is dementia, defined as a progressive cognitive decline of sufficient magnitude to interfere with normal social or occupational functions, or with usual daily activities. Prominent or persistent memory impairment may not necessarily occur in the early stages but is usually evident with progression. Deficits on tests of attention, executive function, and visuoperceptual ability may be especially prominent and occur early.

Core clinical features (the first 3 typically occur early and may persist throughout the course)

- Fluctuating cognition with pronounced variations in attention and alertness
- Recurrent visual hallucinations that are typically well-formed and detailed
- REM sleep behaviour disorder, which may precede cognitive decline
- One or more spontaneous cardinal features of parkinsonism: bradykinesia (defined as slowness of movement and decrement in amplitude or speed), rest tremor, or rigidity

Supportive clinical features

- Severe sensitivity to antipsychotic agents
- Postural instability
- Repeated falls
- Syncope or other transient episodes of unresponsiveness
- Hypersomnia
- Hyposmia
- Severe autonomic dysfunction, eg, constipation, orthostatic hypotension, urinary incontinence
- Hallucinations in other modalities
- Systematized delusions
- Apathy, anxiety, and depression

McKeith et al. *Neurology*. 2017;89:88.

DLB Criteria: Biomarkers

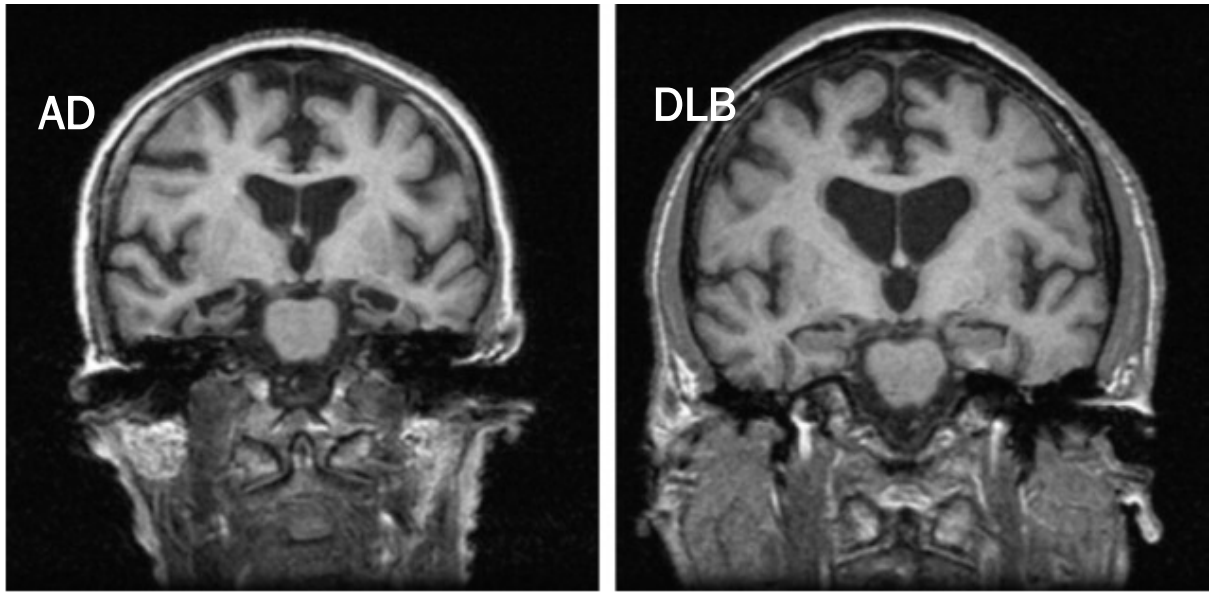
- **Indicative Biomarkers**
  - Reduced dopamine transporter uptake in basal ganglia by PET or SPECT
  - Abnormal (low) uptake MIBG myocardial scintigraphy
  - Polysomnographic confirmation of REM sleep without atonia
- **Supportive Biomarkers**
  - Relative preservation of medial temporal lobe structures on MRI/CT
  - Generalized low upatake on SPECT/PET with reduced occipital activity +/- cingulate island sign on FDG-PET
  - Prominent posterior slow wave activity on EEG

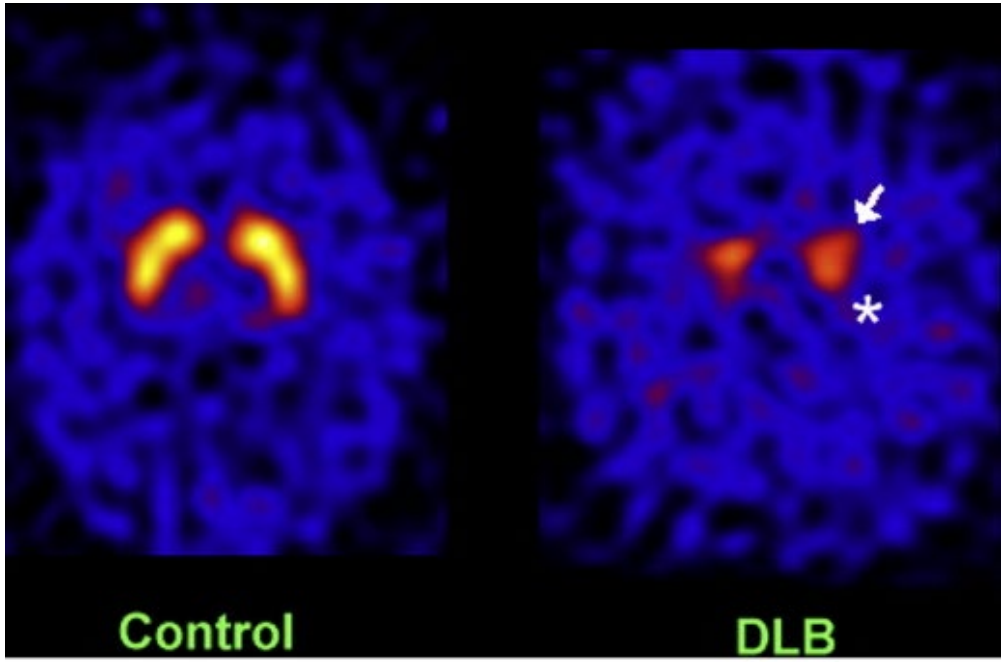
McKeith et al, Neurology (2017)

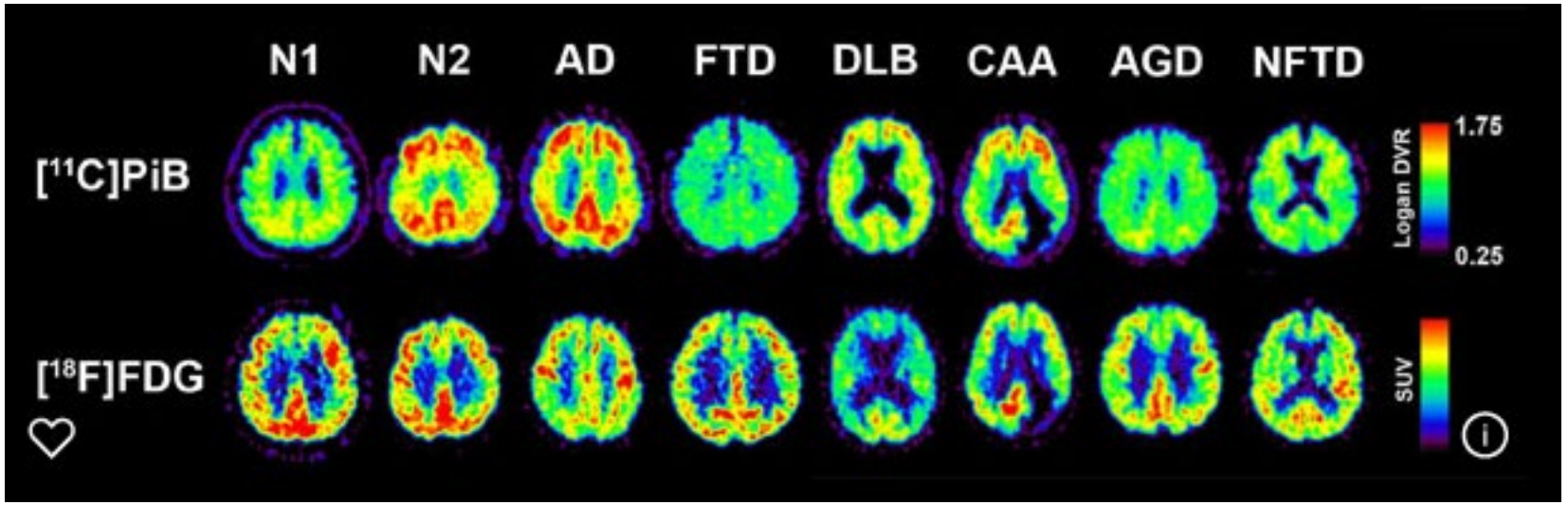
Does MCI exist for LBD?

- Similar to AD and PD, there are likely a prodromal phases of LBD
  - Movement
  - Sleep
  - Cognitive
  - Delirium
  - Psychiatric or Behavioral
  - Autonomic
- Prodromal stages may begin years to decades before full manifestation of LBD
- No clinical or research criteria are yet published
- Research criteria are being proposed but need to be validated before use in clinical practice
- Biomarkers are likely to be critical to demonstration and validation

Neuroimaging in LBD







Quickie Review of Things Associated With LBD

Movement Problems

- Bradykinesia
- Rigidity
- Postural instability with repeated falls
- Slow, shuffling gait
- Myoclonus
- Rare rest tremor but may have postural or action tremor

Cognitive Problems

- Visual tracking and attention
- Visual-spatial and perceptual
- Verbal and motor initiation
- Clock drawing and block design (construction)
- Timed attention tasks
- Executive tasks

Galvin JE, Practical Neurology (2019)

Quickie Review of Things Associated With LBD

Psychiatric/Behavioral Problems

- Visual Hallucinations
- Hallucination in other modalities
- Delusions
- Depression
- Anxiety
- Apathy
- REM Sleep behavior disorder
- Cognitive fluctuations

Autonomic/Constitutional Problems

- Loss of Smell
- Constipation
- Urinary incontinence
- Drooling
- Runny nose
- Dizziness and lightheaded
- Abnormal sweating
- Sexual dysfunction
- Oily flaky skin

Galvin JE, Practical Neurology (2019)

Frequency of LBD Features

Characteristic (%)	Likelihood of LBD		
	Low	Possible	Probable
Parkinsonism	8.3	53.8	100
Bradykinesia	12.5	61.5	100
Rigidity	0	7.7	100
Tremor	0	7.7	33.3
Postural Instability	4.2	38.5	88.9
Hallucinations (any)	4.2	7.7	66.7
Fluctuations	33.3	59.5	93.5
RBD	4.3	22.2	36.7
Falls	23.3	47.6	83.3
Depression	23.5	28.6	52.0
Anxiety	22.1	25.7	32.0

Galvin JE, Unpublished Data

Cognitive Profiles

	AD	LBD	bvFTD	VaD	Depression
Episodic Memory					
Free recall	+++	++	+/-	+	+
Recognition	+++	-	-	-	-
Prompting	x	√	√	√	√
Intrusions	+++	+++	+++	+	+
Semantic memory	++	+	+	+	+/-
Procedural memory	-	+	-	+	+
Working memory	++	+++	+++	++	+/-
Insight	+++	+	+++	-	-
Attention	++	+++	++	++	+++
Executive functions	++ typical AD +++ frontal variant	+++	+++	+++	++
Visuospatial skills	++ typical AD +++ PCA	+++	-	+	+

+++ Early and severe impairment; ++ moderate impairment; + mild impairment; +/- impairment in some studies but not others; - no significant impairment; x not helpful; √ helpful.

Karantzoulis and Galvin, Neurotherapeutics 2014; Galvin JE Practical Neurology 2019

Cognitive Fluctuations

- Mayo Fluctuations Questionnaire administered to the informant who responded *yes* or *no* to four questions:
  - Daytime Somnolence: drowsiness and lethargy all the time or several times a day despite getting enough sleep the night before
  - Sleeps > 2hrs: daytime sleep of 2 or more hours before 7 pm
  - Illogical, Disorganized thinking: times when the patient's flow of ideas seems disorganized, unclear, or not logical
  - Staring Spells: staring into space for long periods
- Affirmative responses to 3 or more items suggests fluctuation

Ferman T, et al Neurology 62:181-187, 2004, Escandon et al, Neurology 74:210-217; 2010

Relationship of Fluctuation to Cognition

	CDR	Fluctuation Composite	Individual Fluctuation Variables			
			Drowsy	Sleeps > 2 hrs	Illogical, Disorganized thinking	Stares
Cognitive Composite Scores						
Global	**-0.564*** **	**-0.142** **	**-0.123***	**-0.214*** **	**-0.283*** **	-0.083
Episodic memory	**-0.584*** **	**-0.111***	**-0.127** **	**-0.154** **	**-0.203*** **	**-0.104***
Semantic memory	**-0.499*** **	**-0.120** **	**-0.092***	**-0.158** **	**-0.205*** **	-0.083
Visuospatial	**-0.507*** **	**-0.190*** **	**-0.128** **	**-0.237*** **	**-0.283*** **	**-0.122** **
Working memory	**-0.348*** **	**-0.137** **	-0.037	**-0.129** **	**-0.223*** **	-0.046

P-value < 0.05*, <0.01**, <0.0001***

Multiple Regression Models

- Cognitive fluctuations correspond to a decrease in the global (0.59), episodic (0.74), semantic (0.61), visuospatial (0.90) and working memory (0.47) scores
- Explains 3-11% of the variance in neuropsychological test performance

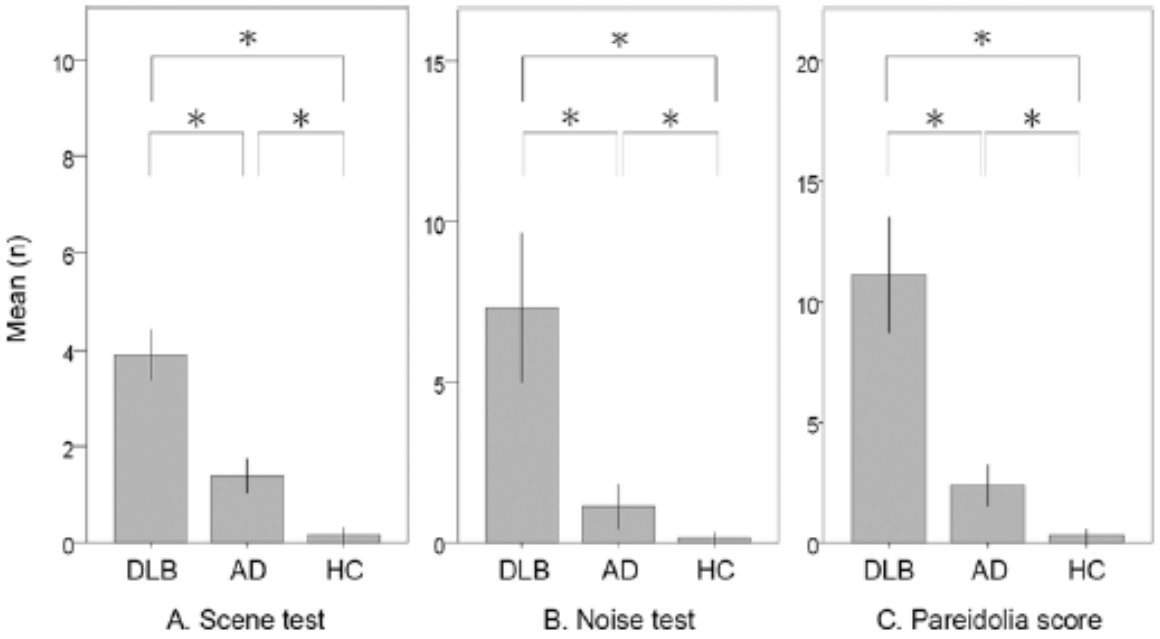
Escandon et al, Neurology 74:210-217; 2010

New Diagnostic Tests

Noise-Pareidolia

- Yokoi et al, 2014; Mamiya et al 2016

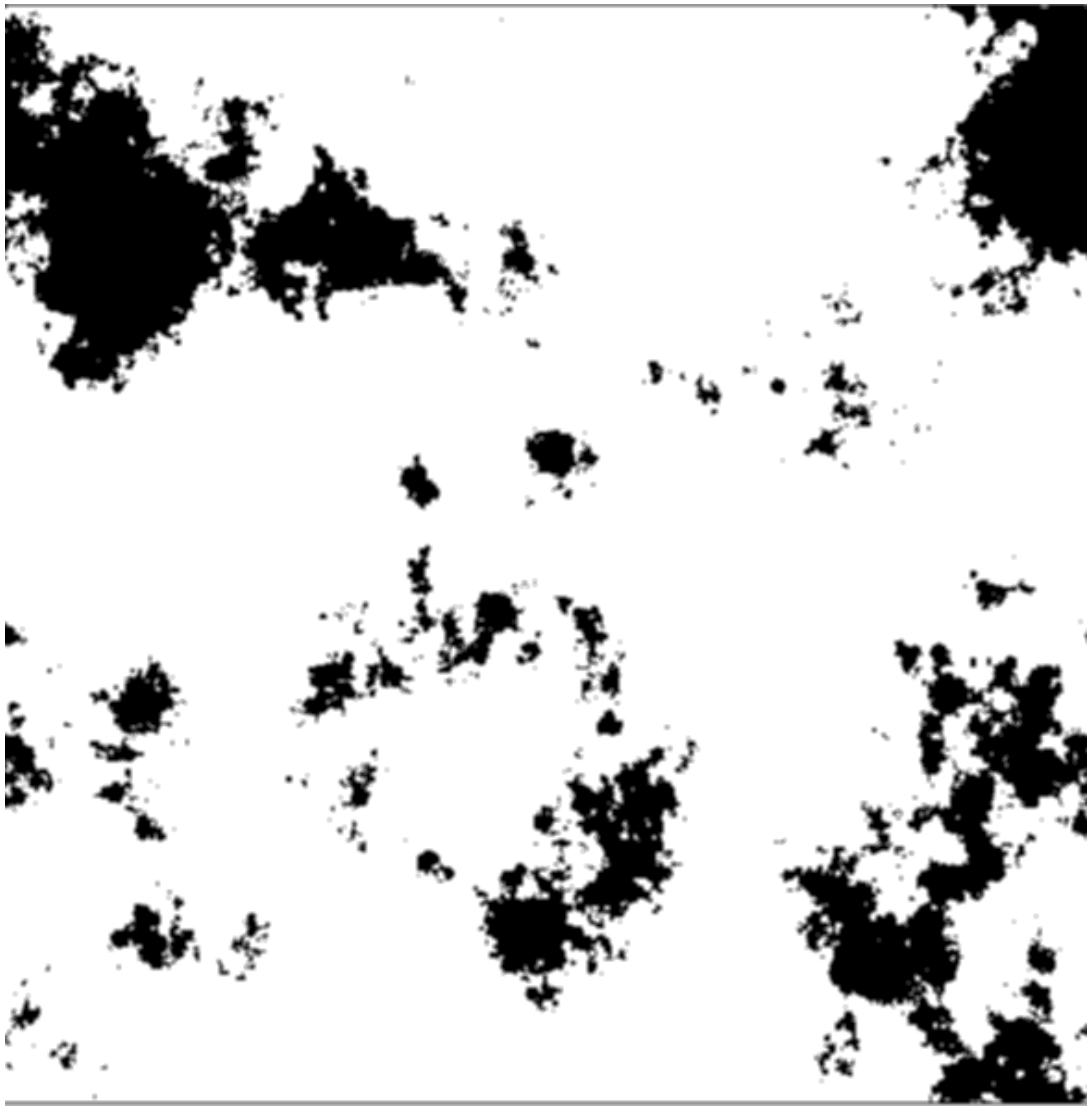
- There are two types of images:
  - An array of ink blots with a facial image (Scene)
  - An array of ink blots with no facial image (Noise)
- Responses are recorded
  - Is there a face: Yes or No
  - Point to where the face is
- The scores are based on the number of:
  - Correct answers: "Yes" when there is a face or "No" when there is no face
  - Pareidolia: "Yes" when there is no face or "Yes" when there is a face but points to wrong spot
  - Missed responses: "No" when there is a face
- Short Form: 20 Items (13 Foils, 7 Faces)
- Each panel 30 seconds (10 minutes max)

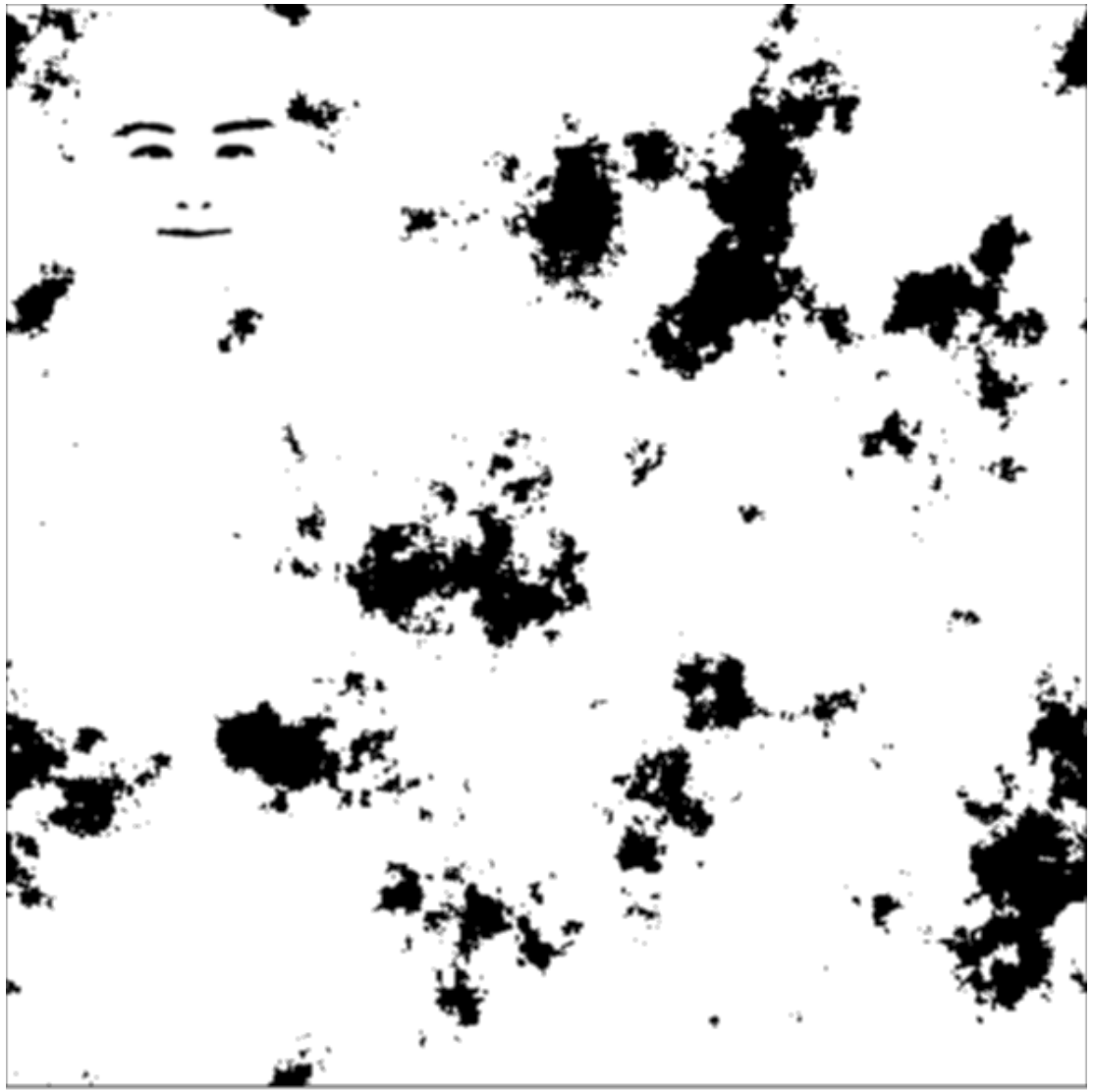


Differentiation between DLB and AD

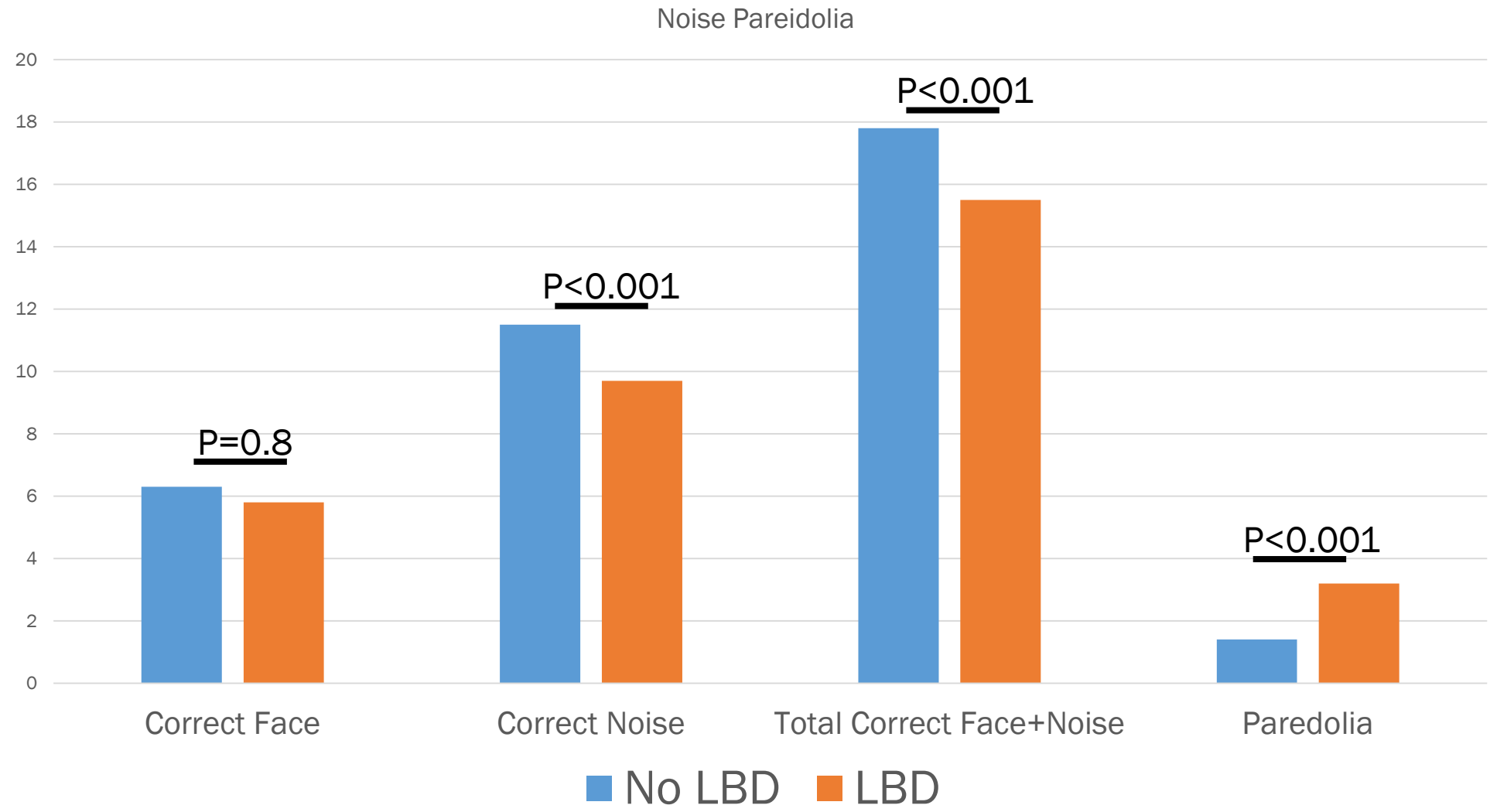
	Scene Test	Noise Test	Pareidolia Score
Sensitivity	0.92	0.60	0.81
Specificity	0.58	0.92	0.92
ROC AUC	0.86	0.82	0.92
Cut-Off Score	1/2	2/3	4/5

Noise Pareidolia



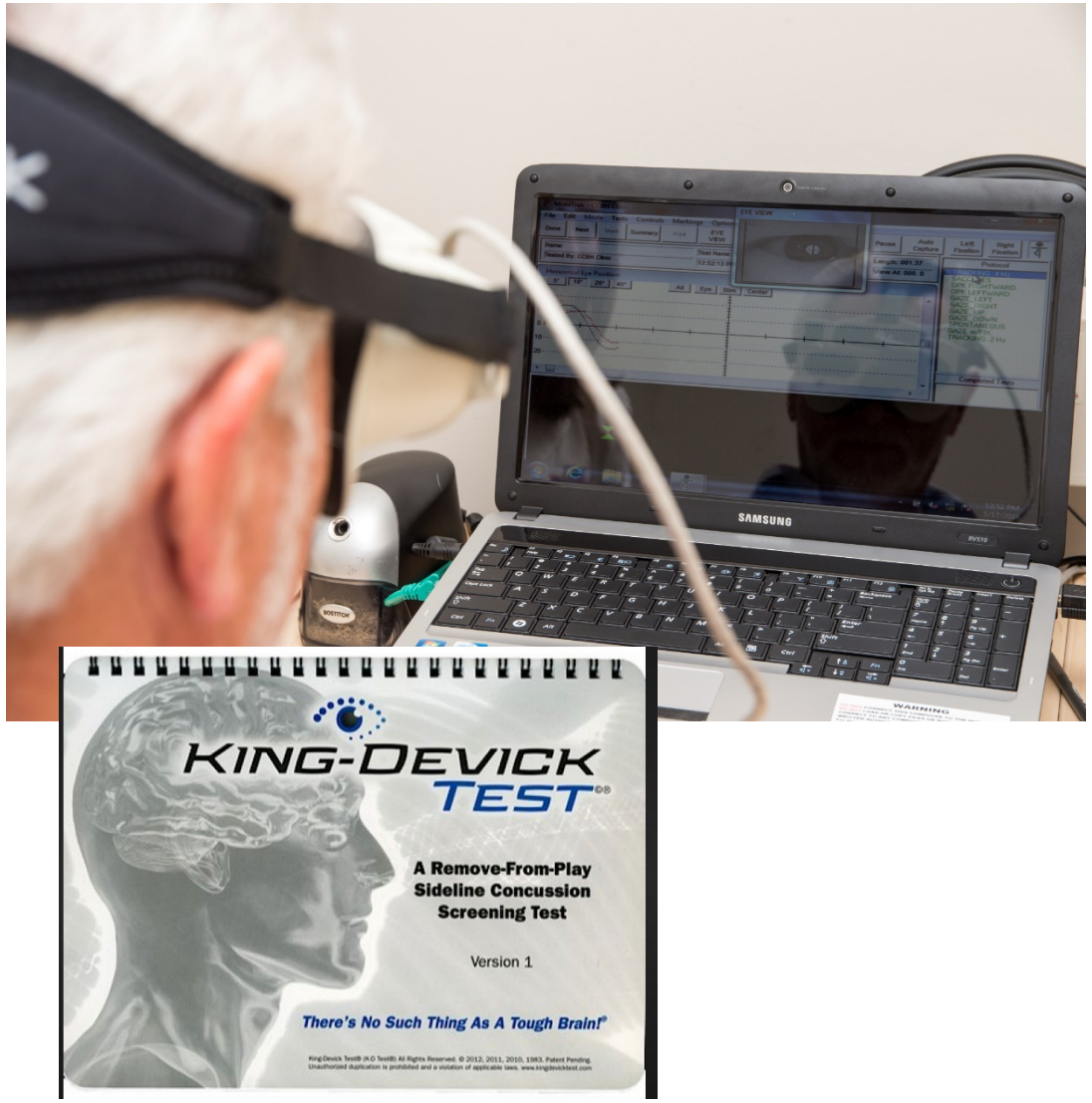


Noise Pareidolia Test Discriminates LBD

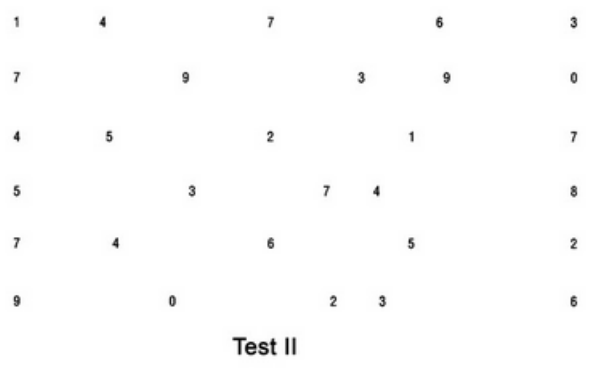


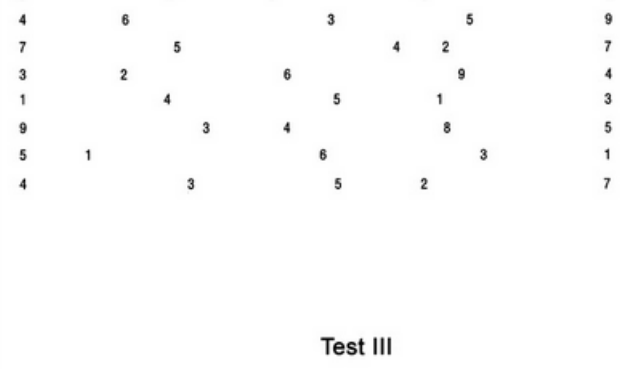
Galvin et al, In Preparation

Proxy Markers of Basal Ganglia Dysfunction



	Pursuits (2 Hz Gain%)	Saccades (Peak Velocity)	Saccades (Latency)
UPDRS	-0.36 (<.001)	-0.41 (<.001)	0.19 (.05)
LBCRS	-0.17 (.09)	-0.31 (.001)	0.22 (.01)
King-Devick	-0.37 (.16)	-0.51 (.03)	-0.71 (.001)
Noise Pareidolia	0.32 (.003)	0.33 (.002)	-0.50 (<.001)


Test II


Test III

Computerized Gait Analyses

- Develop a new metric of nu
- FI captures patients' norma
- Reproducible objective ma
- The FI increased significan and dementia (1.9±0.5).
- ROC analyses: AUC 0.703 (p<.001).
- A cut-off of 1.65 provides a sensitivity of 72.4% to detect individuals with cognitive impairment

Frequency

Table 3: Cognitive Performance by Festination Index Cut-off of 1.65

	<1.65	**>1.65**	***P-value**
MoCA	20.5 (5.3)	16.3 (6.4)	**<.001**
Numbers Forward	6.8 (1.8)	6.6 (1.3)	**.03**
Numbers Backward	4.8 (1.7)	3.9 (1.7)	**.02**
Animal Naming	16.2 (6.2)	10.4 (5.2)	**<.001**
15-item MINT	13.9 (2.6)	12.6 (3.8)	**<.001**
HVLT – Delay	4.2 (3.5)	2.6 (3.2)	**.003**
HVLT – Recognition	9.4 (2.6)	8.0 (3.2)	**.003**
Trails A, sec	53.6 (37.8)	77.7 (52.7)	.08
Trails B, sec	109.9 (51.8)	130.4 (46.2)	**.006**
Number-Symbol	31.6 (12.9)	26.9 (11.2)	**.01**
Noise Pareidolia, errors	1.4 (2.3)	2.2 (3.2)	.1
King-Devick	61.0 (19.6)	61.8 (22.3)	.9
Z-score	.233 (0.4)	-.310 (0.4)	**<.001**
CDR-SB	2.5 (2.4)	5.5 (4.5)	**<.001**

Adjusted for Age and Education

Clinical Predictors of LB Pathology

Clinical Predictor	Present at any time		Present at 1st visit	
	OR	95% CI	Log Rank	p-value
Male gender	1.50	1.01-2.38	2.40	.08
Any EPS	2.50	1.64-3.82	24.50	<.001
Cognitive Fluctuation	4.98	1.63-15.15	4.66	.031
Visual Hallucinations	8.93	2.31-34.50	22.88	<.001
Auditory Hallucination	11.76	1.66-83.30	11.46	.001
Neuroleptic Sensitivity	3.75	1.05-13.30	8.02	.005
Myoclonus	3.90	1.27-12.05	14.75	<.001
Depression	1.81	1.16-2.82	7.51	.007
Sleep Disturbances	1.98	1.33-2.94	8.66	.003

Clinical features associated with AD such as aphasia, apraxia, agnosia not associated

Galvin et al, Neurology (2006) 67:1605-1611

Lewy Body Composite Risk Score

Please rate the following symptoms as being present or absent for at least 3 times over the past 6 months. Does the patient…	Yes	No
Have slowness in initiating and maintaining movement or have frequent hesitations or pauses during movement?		
Have rigidity (with or without cogwheeling) on passive range of motion in any of the 4 extremities?		
Have a loss of postural stability (balance) with or without frequent falls?		
Have a tremor at rest in any of the 4 extremities or head?		
Have excessive daytime sleepiness and/or seem drowsy and lethargic when awake?		
Have episodes of illogical thinking or incoherent, random thoughts?		
Have frequent staring spells or periods of blank looks?		
Have visual hallucinations (see things not really there)?		
Appear to act out his/her dreams (kick, punch, thrash, shout or scream)?		
Have orthostatic hypotension or other signs of autonomic insufficiency?		
TOTAL SCORE		

LBCRS

Demographics and Global Ratings	Dementia		
	AD (n=91)	LBD (n=48)	p-value
Age, y	79.9 (7.9)	78.5 (7.8)	.30
Gender, %M	37.4	60.4	**.009**
Education, y	15.2 (3.9)	14.6 (3.5)	.45
CDR-SB	5.9 (3.4)	8.8 (5.1)	**<.001**
CDR	0.9 (0.5)	1.5 (0.9)	**<.001**
Charlson Comorbidity Index	2.3 (1.3)	2.3 (1.4)	.98
Systolic BP, sitting, mm Hg	133.4 (18.9)	124.9 (23.6)	**.03**
Mean Arterial Pressure, sitting	94.5 (11.2)	89.4 (15.2)	**.03**
Systolic BP, standing, mm Hg	133.2 (18.7)	122.7 (23.9)	**.01**
Mean Arterial Pressure, standing	94.3 (11.1)	89.5 (16.8)	.08
Body Mass Index	25.0 (4.8)	25.4 (4.6)	.67
Mini-PPT	9.8 (2.5)	8.4 (3.2)	**.03**
UPDRS III	7.5 (9.1)	35.6 (23.3)	**<.001**
Hoehn and Yahr Stage	0.5 (1.2)	2.8 (1.5)	**<.001**
FAQ	10.3 (8.7)	17.4 (9.9)	**<.001**
NPI-Q	7.7 (5.7)	11.3 (5.7)	**.001**
Mayo Fluctuation Questionnaire	1.6 (1.1)	2.9 (0.9)	**<.001**
Epworth Sleepiness Scale	6.8 (4.8)	9.8 (5.3)	**.001**
Alertness Rating	7.2 (2.0)	5.6 (1.8)	**<.001**
LBCRS	**2.4 (1.3)**	**6.2 (2.1)**	**<.001**
Cohen's d (Effect Size correlation)	**2.17 (r=0.736)**		

Galvin JE, Alz Dementia 2015

DIAMOND LEWY Toolkit

18th Annual MCI Symposium
Special Topic Workshop
Alzheimer's Public Educational Forum

Assessment Toolkit for Dementia with Lewy Bodies

Name:	Date of testing:
Date of birth:	Tester's name:
NHS No:	Informant:

Please use this Assessment toolkit in all people with cognitive decline. Below are the diagnostic features of dementia with Lewy bodies (DLB) at two levels of confidence (probable DLB and possible DLB) and on the following pages are specific questions to assist in the identification of the core and suggestive features of DLB.

DLB Diagnostic Criteria

		Tick
1	Clinician diagnosis of dementia (cognitive decline sufficient to interfere with social/occupational function).	☐
2	Use screening questions below to cover the four domains of: cognitive fluctuation, visual hallucinations, RBD and parkinsonism.	
	Using your experience identify how many core and biomarker features of DLB are present (see below):	
3	**Core clinical features** • Fluctuation in cognition • Recurrent visual hallucinations • REM sleep behaviour disorder • One or more features of spontaneous parkinsonism	☐ ☐ ☐ ☐
4	**Indicative Biomarkers** • Dopaminergic abnormalities in basal ganglia on SPECT/PET • Low uptake on MIBG myocardial scintigraphy • Polysomnography (PSG) confirmation of REM sleep without atonia	☐ ☐ ☐

Diagnose **Probable DLB** if either 2 core features are identified or 1 core and 1 indicative biomarker feature. ☐

Diagnose **Possible DLB** if any one feature is present. In such circumstances consider whether to refer subject for a dopaminergic SPECT scan (DaTSCAN), or MIBG or PSG, depending on local availability. ☐

Other Diagnoses

Parkinson's Disease Dementia (PDD) (PD >1 yr before cognitive symptoms)	☐
Alzheimer's Disease	☐
Other Dementia	☐
MCI	☐
Patient informed of diagnosis.	Yes ☐ No ☐

Questions to Identify Symptoms of DLB

Please respond to each of the questions below, asking carer or patient as appropriate.

Cognitive Fluctuation (to carer)

If two or more of these are answered 'Yes' the subject is highly likely to have cognitive fluctuation

1	Does the patient show moderate changes in their level of functioning during the day?	Yes ☐	No ☐
2	Between getting up in the morning and going to bed at night, does the patient spend more than one hour sleeping?	Yes ☐	No ☐
3	Is the patient drowsy and lethargic for more than one hour during the day, despite getting their usual amount of sleep the night before?	Yes ☐	No ☐
4	Is it moderately difficult to arouse the patient so they maintain attention through the day?	Yes ☐	No ☐

REM Sleep Disorder
(to carer = bed partner)

Have you ever seen the patient appear to "act out his/her dreams" while sleeping (punched or flailed arms in the air, shouted or screamed)?	Yes ☐	No ☐

If answered affirmatively, then RBD is highly likely to be present.

REM Sleep Disorder
(to patient only if no bed partner and they have sufficient cognitive ability to be confident their answer is reliable)

Have you ever been told that you seem to "act out your dreams" while sleeping (punched or flailed arms in the air, shouted or screamed)?	Yes ☐	No ☐

Visual Hallucinations

For the participant: Some people see things that other people cannot see.

1	Do you feel like your eyes ever play tricks on you?	Yes ☐	No ☐
2	Have you ever seen something (or things) that other people could not see?	Yes ☐	No ☐

For the carer:

1	Does the patient have hallucinations such as seeing false visions?	Yes ☐	No ☐
2	Does he / she seem to see things that are not present?	Yes ☐	No ☐

If, according to clinical judgement, visual hallucinations are present, determine as far as possible their frequency and recurrence. As a guide, visual hallucinations associated with DLB should not only occur during delirium, and are often recurrent over a period of months.

Assessment of Parkinsonism (5-item UPDRS)

Parkinsonism in DLB requires the presence of at least one of bradykinesia, rest tremor or rigidity. The 5-item UPDRS is a brief and validated scale for identifying parkinsonism in DLB (See below for further details)

POSTURAL TREMOR OF THE HANDS			
Normal	No tremor.	0	☐
Slight	Tremor is present but less than 1 cm in amplitude.	1	☐
Mild	Tremor is at least 1 but less than 3 cm in amplitude.	2	☐
Moderate	Tremor is at least 3 but less than 10 cm in amplitude.	3	☐
Severe	Tremor is at least 10 cm in amplitude.	4	☐
KINETIC TREMOR OF THE HANDS			
Normal	No tremor.	0	☐
Slight	Tremor is present but less than 1 cm in amplitude.	1	☐
Mild	Tremor is at least 1 but less than 3 cm in amplitude.	2	☐
Moderate	Tremor is at least 3 but less than 10 cm in amplitude.	3	☐
Severe	Tremor is at least 10 cm in amplitude.	4	☐
FACIAL EXPRESSION			
Normal	Normal facial expression.	0	☐
Slight	Minimal masked facies manifested only by decreased frequency of blinking.	1	☐
Mild	In addition to decreased eye-blink frequency, masked facies present in the lower face as well, namely fewer movements around the mouth, such as less spontaneous smiling, but lips not parted.	2	☐
Moderate	Masked facies with lips parted some of the time when the mouth is at rest.	3	☐
Severe	Masked facies with lips parted most of the time when the mouth is at rest.	4	☐
GLOBAL SPONTANEITY OF MOVEMENT (BODY BRADYKINESIA)			
Normal	No problems.	0	☐
Slight	Slight global slowness and poverty of spontaneous movements.	1	☐
Mild	Mild global slowness and poverty of spontaneous movements.	2	☐
Moderate	Moderate global slowness and poverty of spontaneous movements.	3	☐
Severe	Severe global slowness and poverty of spontaneous movements.	4	☐
RIGIDITY			
Normal	No rigidity.	0	☐
Slight	Rigidity only detected with activation manoeuvre.	1	☐
Mild	Rigidity detected without the activation manoeuvre, but full range of motion is easily achieved.	2	☐
Moderate	Rigidity detected without the activation manoeuvre; full range of motion is achieved with effort.	3	☐
Severe	Rigidity detected without the activation manoeuvre and full range of motion not achieved.	4	☐

Total 5-item UPDRS Score =	☐
Is Parkinsonism present? (Use clinical judgement but for guidance a score >7 suggests significant parkinsonism is present, though a high score (>2) in a single domain may be sufficient to meet criteria)	Yes ☐ No ☐

Thomas AJ, et al. Int J Geriatr Psychiatry. 2018

LBD Module for NIA-ADRC Program

•Goals

- Develop a companion module to the Uniform Data Set (UDS) to improve characterization of DLB and PDD
- Harmonize efforts with those of the Movement Disorder Society efforts to characterize the non-motor features of Parkinson's disease
- Capitalize on previous efforts to create a FTD module
- Standardize battery of clinical and cognitive tools for DLB and PDD that can be databased at NACC and shared amongst investigators.

•Requirements

- Choose instruments and measurements from each workgroup
- Harmonize new data with variables captured as part of UDS 3.0
- Capture prodromal symptoms
- Instruments or measurements selected should be free of licensing fees or that an agreement is in place to make their use free
- Not burden sites

Autonomic Symptoms

- Constitutional symptoms
- Decrease quality of life
- Among the most disturbing symptoms to patients
- May begin decades before cognitive, motor, or behavioral symptoms

In the past six months, does the patient ….	Control N=15	AD N=92	DLB N=95
Dribble saliva during the day	0	0	15.0
Have difficulty swallowing	0	5.6	15.0
Have increased interest in sex	8.3	2.9	11.8
Have decreased interest in sex	33.3	26.9	36.0
Have problems having sex	58.3	23.4	57.7
Have a recent change in weight (not related to dieting)	0	19.4	34.6
Report a change in the ability to taste	16.7	15.3	25.0
Report a change in the ability to smell	16.7	13.9	22.5
Experience excessive sweating (not related to hot weather)	8.3	5.5	10.1
Report having difficulty tolerating cold weather	33.3	40.3	48.8
Report having difficulty tolerating hot weather	25.0	8.2	15.0
Experience double vision (2 separate real objects and not blurred vision)	16.7	1.4	6.3
Have difficulty digesting food or a sensation of feeling full long after last meal	8.3	9.7	20.3
Have problems with constipation	8.3	22.5	38.5
Have to strain hard to pass stools	8.3	22.9	33.8
Had involuntary loss of stools	33.3	12.5	21.5
Had the feeling that after passing urine their bladder not completely empty	33.3	20.6	37.7
Report their stream of urine weak or reduced	25.0	19.7	32.9
Have to pass urine within 2 hours of previous urination	50.0	42.0	53.3
Have involuntary loss of urine	33.3	33.3	36.8
Complain of feeling lightheaded or dizzy when standing up	8.3	23.6	49.4
Become lightheaded after standing for some time	0	9.7	21.3
Have fainting spells	0	8.5	11.5

DLB Consortium

- U01 from NINDS (part of the PDBP)
- Cleveland Clinic is primary site
- Miami, Rush, UNC, UPenn, UPitt, UCSD, Thomas Jefferson, UWashington
- 5-Year Longitudinal Study
- Clinical-cognitive-behavioral evaluations
- MRI
- DAT
- LP
- Autopsy

LBD Research Centers of Excellence

- 24 research centers across the country
  - 17 States and District of Columbia
- Excellence in Clinical Care and Research
- Form Clinical Trials Network
- Mayo Clinic – Rochester is the Coordinating Center
- ***U-Miami,*** Cleveland Clinic, Columbia, Emory,, Georgetown, Mass General, Johns Hopkins, Mayo Clinic-Jacksonville, Ohio State, Oregon, Rush, Stanford, Thomas Jefferson, UC-San Diego, U-Colorado, U-Florida, U-Michigan, UNC-Chapel Hill, U-Penn, U-Rochester, U-Virginia, U-Washington

SUMMARY

- The Lewy body dementias
  - PDD and DLB differ only by timing of movement disorder
  - While clinical criteria lack sensitivity, they are highly specific and correlated strongly with pathology
- For the present time, treatments are largely symptomatic
- We are spearheading novel research
  - Improving clinical practice
  - Improving diagnosis
  - Improving lives of patients and their caregivers
  - Developing new medications