

# **Parkinson's Disease and Cognition**



# Historical Overview

## James Parkinson

- English physician and paleontologist
- First reported disease - *An Essay on the Shaking Palsy (1817)*
- Asserted that cognitive function was “unimpaired” in Parkinson’s disease (PD)



# Dementia in PD

- Prevalence: approximately 10 to 15 % PD patients meet clinical criteria for dementia
- Risk factors: increased age, duration of PD, stage of PD (Mayeux et al., 1988)
- Mini Mental State Examination (MMSE): a brief and quantitative measure of cognitive status in adults
- Blessed Dementia Scale (BDS): measures the presence and severity of dementia

# Depression in PD

- Approximately 30-50% of PD patients meet clinical criteria for depression.
- Measurement Tests:
  - Beck Depression Inventory (BDS): a self-report rating inventory measuring characteristic attitudes and symptoms of depression
  - Geriatric Depression Scale (GDS) - a basic screening measure for depression in older adults



# Specific cognitive impairments in PD

- Cognitive control processes
  - Set-shifting
  - Attention
  - Performance monitoring
- Working memory
- Processing speed

# Prevalence of specific cognitive impairments in PD

- Growden, Corkin & Rosen (1990): the proportion of patients with  $\geq 1$  specific cognitive impairment increases with PD stage:

Stage 1: 40%

Stage 2: 65%

Stage 3: 75%

Stage 4: 86%



# Cognitive control in PD

- Set shifting: the ability to display flexibility in response to changing patterns of reinforcement
- Set shifting is impaired in PD (Cools et al., 2001; Cronin-Golomb et al., 1994)

# Cognitive control in PD

- Attentional control: the ability to concentrate selectively on one of many sensory inputs and to switch the locus of attention on command
- Attention is compromised in PD (Woodward et al., 2002; Hodgson et al., 2002; Sharpe, 1996)



# Cognitive control in PD

- Performance monitoring: the ability to maintain and update information in working memory while completing a sequence of interrelated tasks
- Assessed using self-ordered pointing tasks
- Impaired in PD (Gabrieli et al., 1996)

# Visuospatial working memory in PD

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- PD patients are impaired on tests of spatial working memory but not object working memory (e.g., Postle et al., 1997)
- Unclear how selectively PD targets specific component processes of working memory (manipulation, maintenance)



# Processing speed

- Processing speed:
  - the amount of time an individual requires to process a given amount of information
  - or
  - the amount of information an individual can process in a set period of time
- Processing speed is sometimes slowed in PD (bradyphrenia)

# Relation of cognitive variables to clinical variables

- Medication status: Medicated PD patients have a different cognitive profile from unmedicated patients (Cools et al., 2001; Cools et al., 2006)
- Motor fluctuations: severity of motor symptoms correlated with cognitive impairment (Brown et al., 1984)
- Age of onset: conflicting reports (e.g., Katzen et al., 1998; Locascio, 2003)
- Side of onset of motor symptoms: conflicting reports (e.g., Growdon et al., 1990)