

# Parkinson's disease in Action

Dr Ellen Poliakoff

School of Psychological Sciences

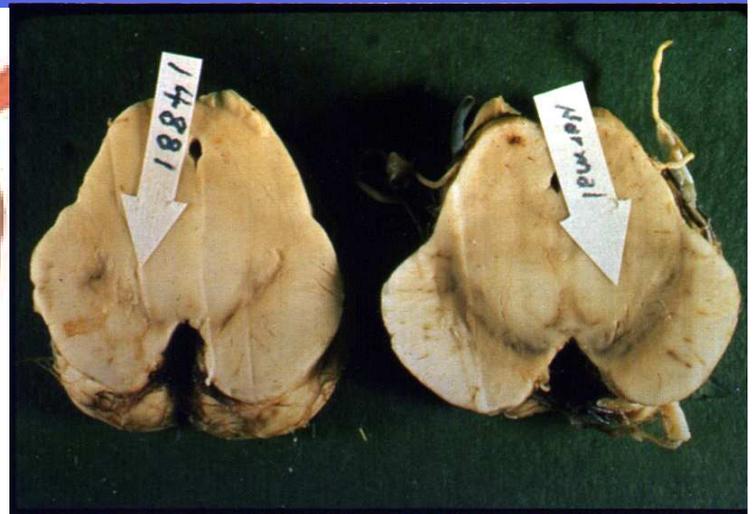
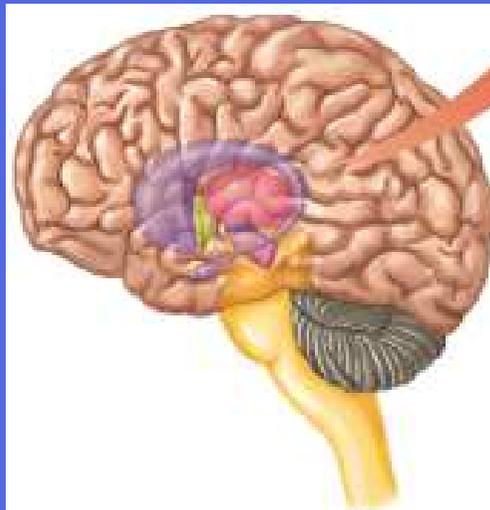


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# Parkinson's Disease

- 1 in 100 over 65s
- Bradykinesia
- Rigidity
- Tremor
- Also cognitive problems



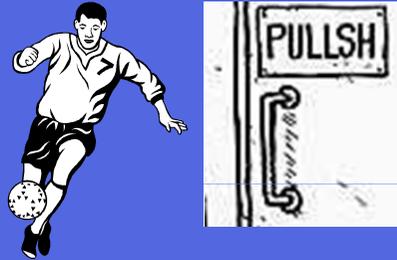
# Moving and the Environment

- Internal v. external movements
- Detrimental - 'Freezing' – edges of doorway
- Beneficial - Paradoxical movement
- Schneider et al. (1987) described a patient *“who dangled a glasses case in front of himself on a string which reached the floor. He took a step with each forward swing of the glasses case, and this seemed to improve his gait. Without the device, he had enormous difficulty initiating a step.”*



# Overview of talk today

1. Observing and evoking actions in Parkinson's  
How does Parkinson's affect perception of actions?

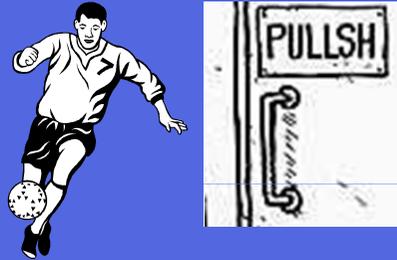


2. Gym training in Parkinson's  
Can exercise improve symptoms of Parkinson's?



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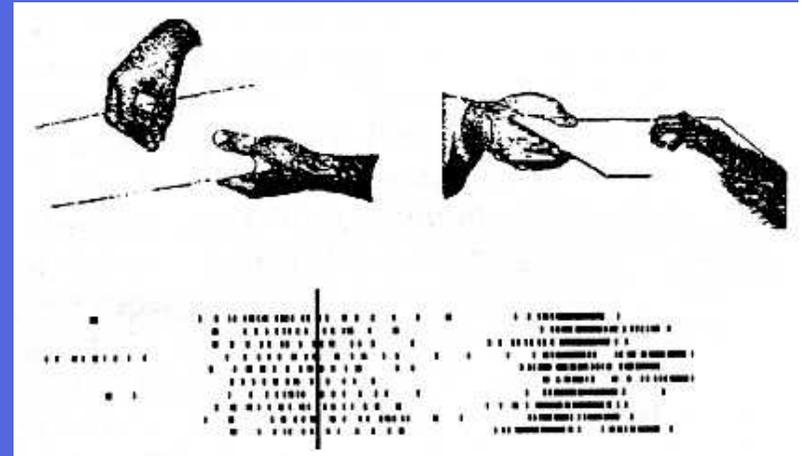


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# Observing actions

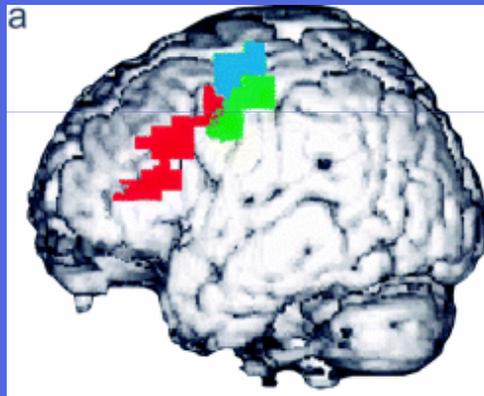
- Mirror Neurons observed in primates (Rizzolatti et al, 1996; Gallese et al, 1996)



Red = mouth

Green = hand

Blue = foot



- Neurophysiological: Somatotopic activation of pre-motor cortex (Buccino et al, 2001).

- Behavioural: Faster responses when observed and executed movements match (Brass et al, 2000, 2001).

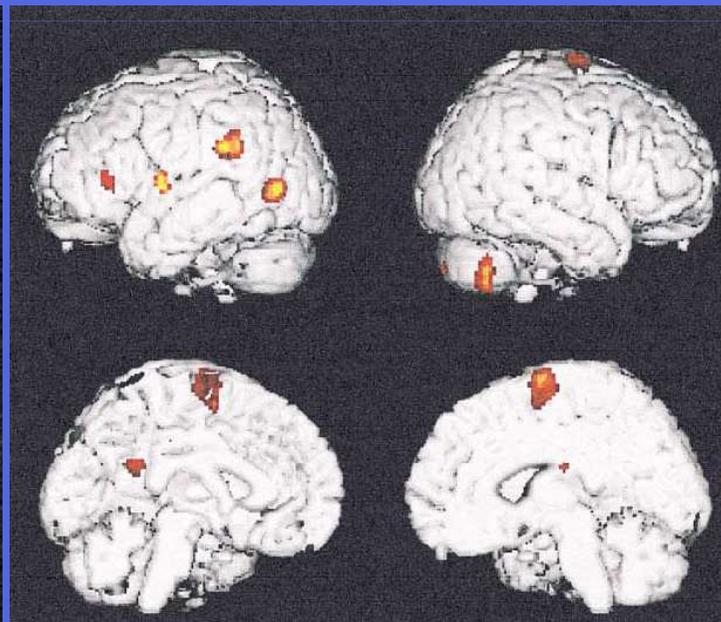


# Action relevant objects – ‘Affordances’

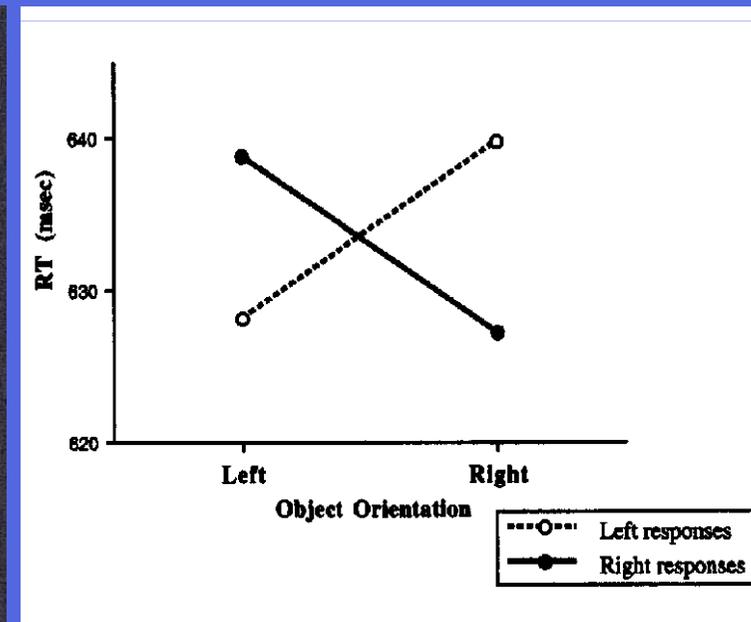


## Viewing graspable objects

- activates sensorimotor brain areas
- Potentiates responses to the hand to which it is oriented



(Grezes & Decety, 2002)



(Tucker & Ellis, 1998)

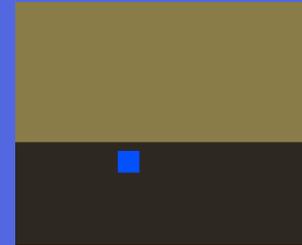
# Our Study

Does Parkinson's disease affect how patients....

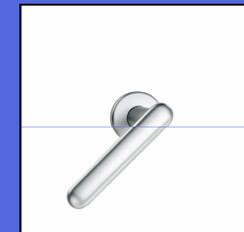
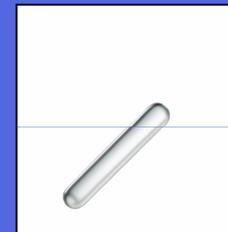
1. Observe the actions of others?

Control

Action-Relevant



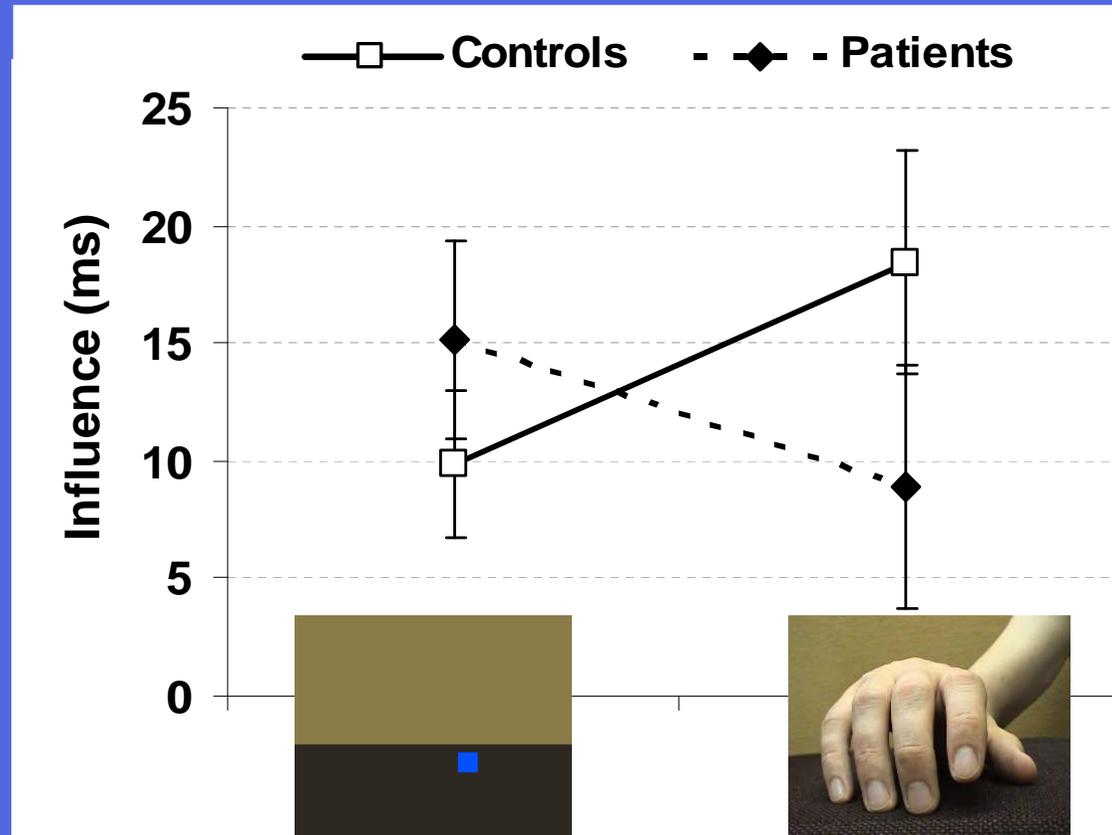
2. Respond to action-evoking objects in their environment?



**Hypothesis:** Due to their reliance on external cues, patients will show more effect of action-relevant stimuli.

**Alt. hypothesis:** Related to the slowness of motor systems, patients will show less effect of action-relevant stimuli.

# Observing actions



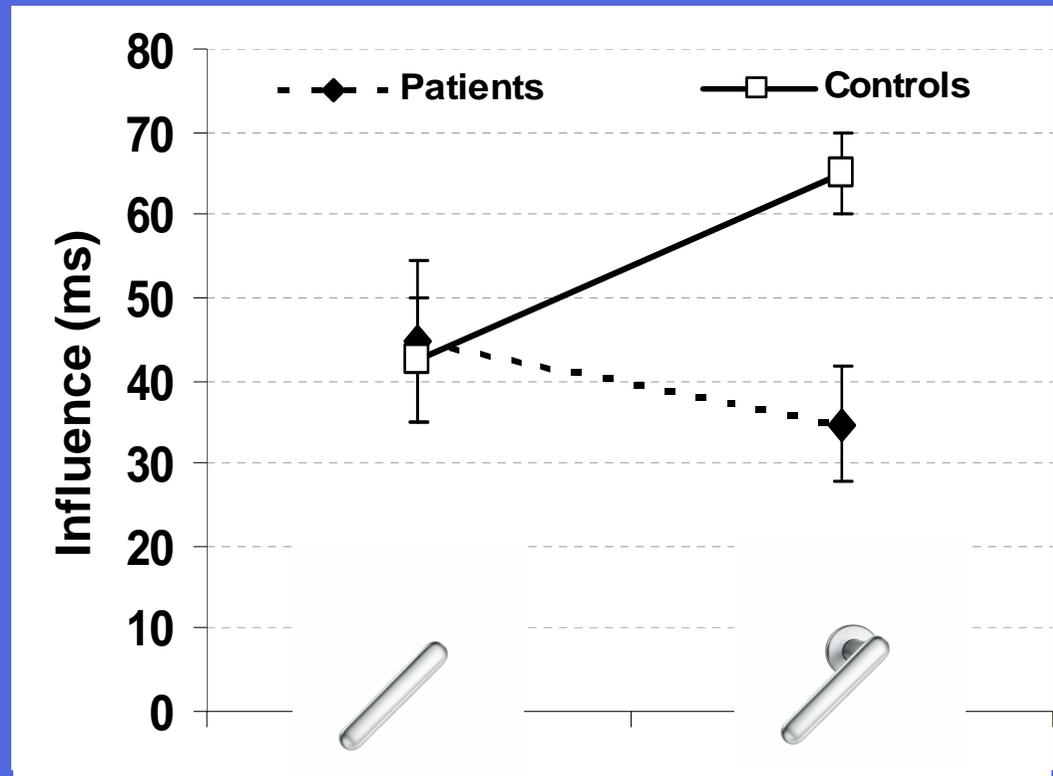
PD patients did not show a differential effect of observing a finger versus a moving object

Poliakoff et al. (2007) *NeuroReport*

# Observing objects related to action

PD group – no differential effect of a handle versus a control object

Poliakoff et al. (2007)  
*NeuroReport*



Follow up – PD group behaved as if the control object was also related to action

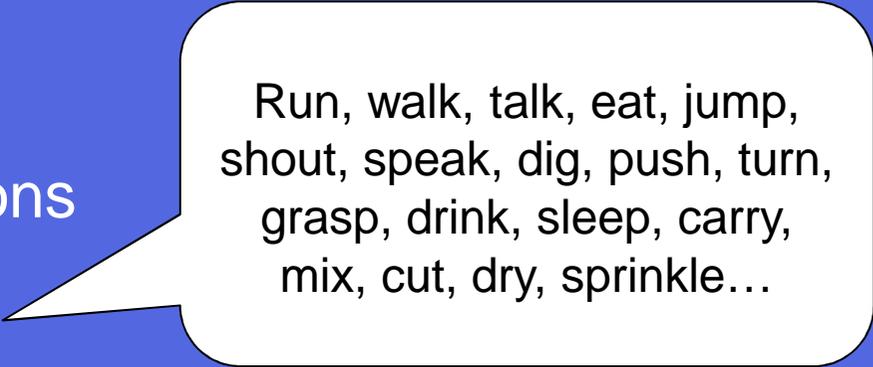
Galpin et al. (2011) *Cortex*

# Discussion – Observing actions in PD

- Lack of specificity – respond to all types of stimuli
- Implications for cueing/intervention

## Current/follow-up work

- Other representation of actions
  - Language
  - Gesture (Cleary et al., 2011)
- Effect of graspable stimuli on reaching movements



Run, walk, talk, eat, jump,  
shout, speak, dig, push, turn,  
grasp, drink, sleep, carry,  
mix, cut, dry, sprinkle...

# Thanks to

- Dr Adam Galpin
- Professor Steven Tipper
- Dr Judith Holler
- Ms Rebecca Cleary
  
- Dr Jeremy Dick
- Dr Peter Moore
  
- Wellcome Trust Clinical Research Facility

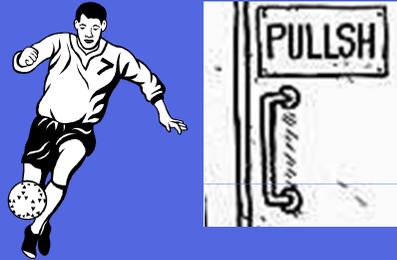


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2. Gym training in Parkinson's

**Can exercise improve symptoms of Parkinson's?**



# Gym training – Our Study

- Can people with PD benefit from exercise in a community setting?
- Bolton Parkinson's Disease Society teamed up with Bolton Arena to deliver a gym training programme for PD patients
- Patients themselves suggested that effects of programme should be formally assessed
- Parkinson's UK funded this pilot study

# The Design of the Study

	February	March	April	May	June		
<b>Gym Group</b>	<b>T1</b>	10 weeks Gym training		<b>T2</b>	10 weeks Gym training		<b>T3</b>
<b>Control Group</b>	<b>T1</b>	No intervention		<b>T2</b>	10 weeks Gym training		<b>T3</b>

- Clinical diagnosis of PD, mild to moderate (Hoehn & Yahr, II-III)
- Randomisation stratified by UPDRS score

# The Gym Programme

- Designed and supervised by staff at Bolton Arena
- Biweekly, 60 minute sessions

## 1. Studio – circuit training

- Free movement, movement strategies

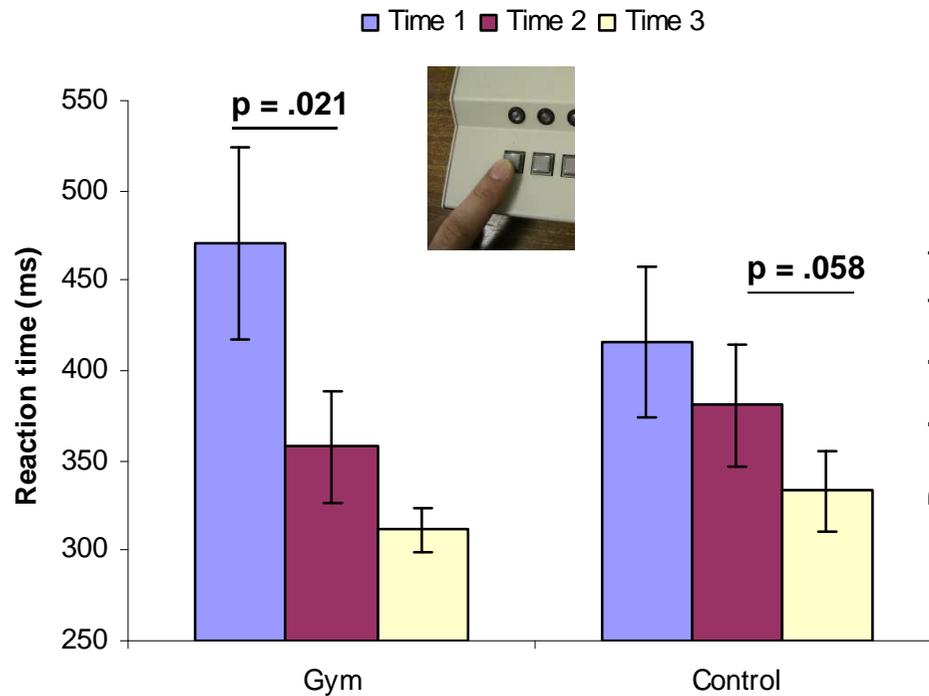
## 2. Gym equipment

- Cycles, treadmills, weights machines

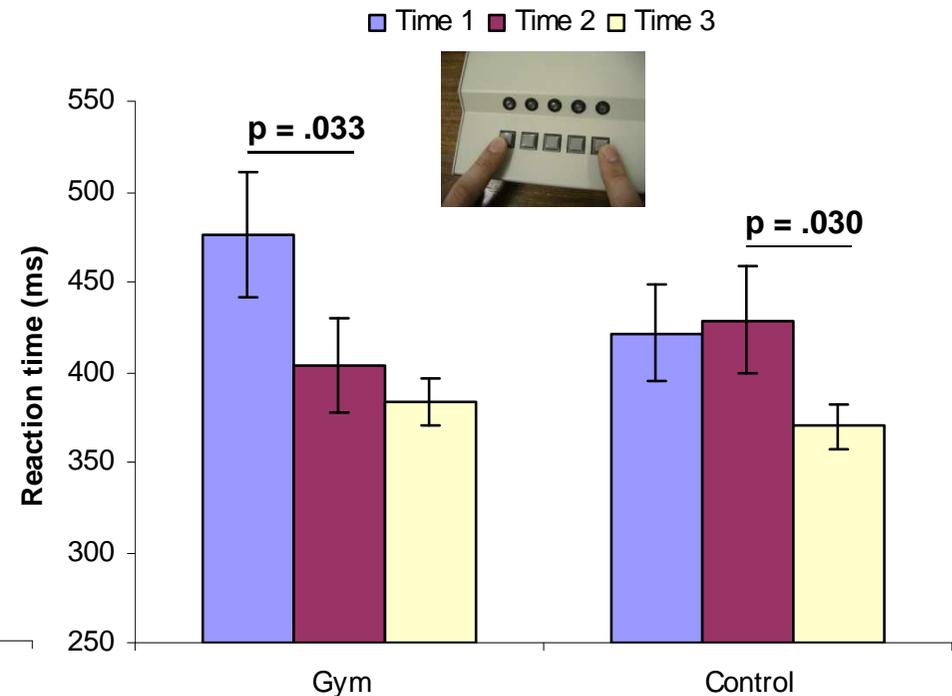


# Reaction Times

## Simple Reaction Time



## Choice Reaction Time



Improvement over period of commencing gym training in both groups  
Similar findings for chair test, but no change in walking or UPDRS



# Self reports/focus-group



- No significant change in quality of life (PDQ-39) or illness perception (BIPQ) subscales.
- Slight worsening? – Awareness of limitations or social comparison?
- Written comments (15/26) were positive
- Improved confidence, fun, enjoyment were common themes
- Valued non-medicalised setting for gym programme

*“When I was diagnosed with PD... I was waiting for the morning when I couldn’t get up – then I came here and I’ve seen people who had PD 17 years, walking through the door with a smile on her face, and I thought she can do it, so can I.”*

## Discussion – Gym training

- Benefits suggested by focus group and reaction time findings
- No effect on questionnaire and UPDRS measures
- Feasibility of community exercise programme
- Importance of other factors - social support
  - increased confidence
  - non-medical setting

# The Gym and Me and PD (extract)

*So I joined the course  
And now I'm on week eighteen  
I've pedalled a bike  
Rowed a rowing machine  
I've stretched and I've pulled  
And I feel a bit sore, but guess what?  
I don't want to stop... I want more!*

*I wish I could remember  
All the names of the friends, no longer strangers  
We have become more than that,  
We share a common enemy  
Which has drawn us together*

# Thanks to

## Research Team

- Dr Adam Galpin
- Dr Kathryn McDonald
- Dr Alison Wearden

## Neurologists

- Dr Jeremy Dick
- Dr Mark Kellett

And the participants

## Volunteers

- Vera Azarova
- Caroline Cox
- Laura Kehoe
- Rebecca Cleary
- Lee Mulligan
- Tom Simpson

## Bolton Arena

- Sue Hayes
- Rob Street
- Katie Ingram



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# Conclusions of talk today

## 1. Observing and evoking actions in Parkinson's

- do not distinguish between stimuli related to actions and basic stimuli.
- implications for understanding the cueing of movement and representation of actions



## 2. Gym training in Parkinson's

- Exercise can improve some symptoms of PD
- group setting provides social support and motivation.



# Other related research topics

## Parkinson's disease

- Measuring everyday cognitive problems
- Potential benefits of cognitive training

## Ageing

- Multisensory processing

