# The Effects of Movement and Spatial Activities on Real and Imagined Spatial Updating

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## BACKGROUND

**Spatial Abilities Malleable**
- Meta-analyses show that different types of training can improve spatial ability in a durable and transferable way[1]
- Spatial ability is affected by experience with spatial activities[2]

**Spatial Updating**
- Translation and rotation components
- Open question about contributions of visual vs. movement cues[3,4]
- Imagined more difficult[4]
- Movement expertise advantage, especially in heading error[5]

**Movement Experts**
- Imagery a part of training
- More motor dependent in small-scale tasks[6]

## AIMS

**1) To examine the effects of movement experience on small and large-scale spatial abilities**

*Hypothesis 1: Experts will outperform non-experts on large-scale task*
*Hypothesis 2: Experts will outperform non-experts on small-scale task*

**2) To test the relationship between imagery abilities and performance on real and imagined spatial tasks**

*Hypothesis 3a: Experts will be better than non-experts at imagined because of imagery used in training*
*Hypothesis 3b: Experts will be more impaired on imagined because they are more motor dependent*

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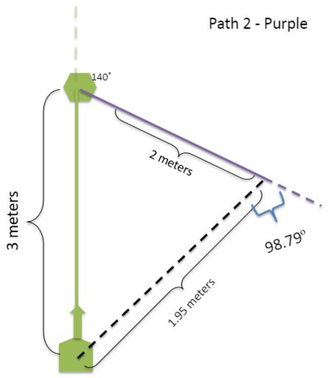
## METHOD

### PARTICIPANTS

39 participants (2 male)
- 19 expert dancers (10+ years)
- 20 non-experts (<10 years)
- Age (M=22.9 years)

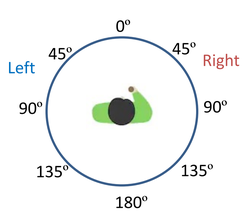
### TRIANGLE COMPLETION TASK

- Blindfolded
- Segments were 2 and 3 m or 3 and 2 m
- Obtuse and acute angle turns
- 3 triangles each
- Angular error

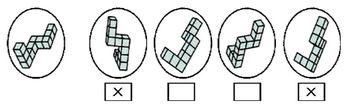



### REAL AND IMAGINED CONDITIONS

- In Real, guided along two outbound paths and turn by experimenter
- In Imagined, stood in center of circle and imagined outbound paths and turn
- DV: Turn angle back to the start




### MENTAL ROTATION



- 20 items, standard 3 minute time limit per 10[8]

### EXPERIENCE QUESTIONNAIRES

- Dance experience
- Spatial activities[7]
- Videogame experience

### IMAGERY

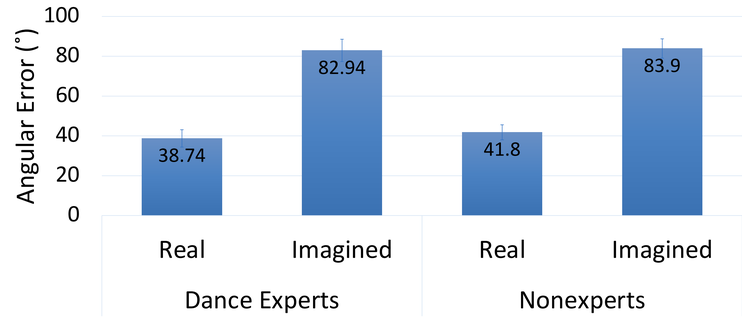
Vividness of Movement Imagery[9] Rate the vividness of movements
(e.g., walking, running, kicking a stone)
1) Watching yourself performing the movement
2) Looking through your own eyes whilst performing the movement
3) Feeling yourself do the movement

Vividness of Visual Imagery[10]
Rate the vividness of non-movement images
(e.g., "Visualize the rising sun")

- Rating 1 – Perfectly clear and as vivid (as normal vision or feel of movement)
- Rating 2 – Clear & reasonably vivid
- Rating 3 – Moderately clear & vivid
- Rating 4 – Vague & dim
- Rating 5 – No image at all, you only "know" that you are thinking of the skill

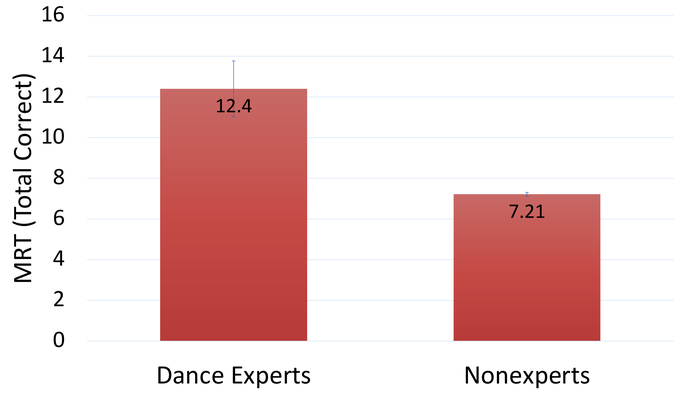
## RESULTS

### TRIANGLE TASK



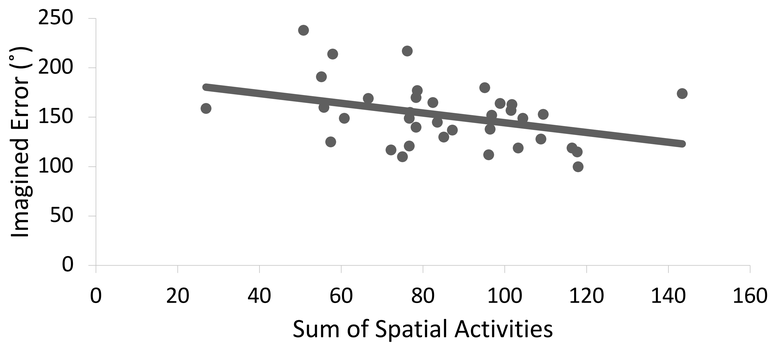

- Real better than imagined ($p<.001$)
- No main effect of expertise or interaction (*ps*>.4)

### MENTAL ROTATION




- Dancers outperformed non-dancers ($p<.01$)

### SPATIAL ACTIVITIES




- Spatial activities better for performance on imagined task ($r$=-.37, $p<.03$)

**NO RELATIONSHIPS BETWEEN TRIANGLE COMPLETION AND VIVIDNESS OF IMAGERY SCALES OR MRT**

## DISCUSSION

- Replication of prior work that imagined spatial updating is more difficult than real
- No evidence for a movement expert advantage in spatial updating on either real or imagined tasks
- Expertise advantage on mental rotation (not often seen in dancers)
- Imagery does not have an effect on spatial updating
- More participation in spatial activities decreases error in the more difficult, imagined task; experience in activities may improve large-scale abilities

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