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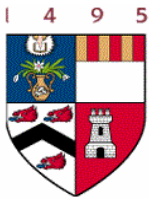
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# Asymmetries in Attention toward the Dominant Hand: Input or Output?

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# Asymmetries in attention toward the dominant hand: input or output?



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## Introduction

Peters (1981) suggested that an asymmetrical bias in **attention** (toward the right hand of right handers) could account for many manual asymmetries in bimanual task performance. Support for this notion comes from Honda (1982), who demonstrated preferential monitoring of the dominant hand during a bimanual reaching task, while Buckingham and Carey (2007) observed shorter refractory periods (dwell time in a bimanual discontinuous double-step reaching task) for the right hand.

Recent evidence may indicate an **intentional** (i.e. selection related behaviour – motor attention) bias toward the dominant hand (Bestelmeyer & Carey, 2004). The current study tests the hypothesis that the right hand is pre-disposed to perform tasks under conditions of bimanual coordination, by examining movement inhibition and selection in a Posner style hand cueing task.

If selection is biased toward the right hand, it should be more difficult to inhibit than the left hand, resulting in:

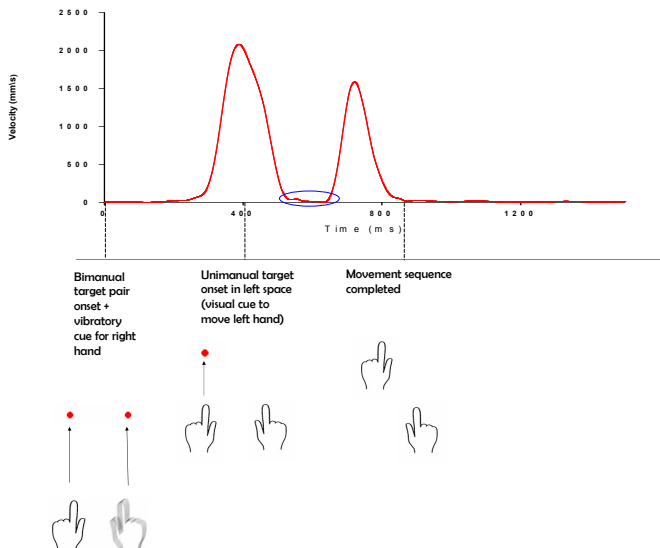
- **Increased rates of error for the right hand following invalid pre-cueing**  
-The right hand will make more incongruous movements.
- **A greater effect of pre-cueing on the refractory period for the left hand**  
-The left hand may only begin movement after the right hand has finished inhibiting it's reach.  
-As the pre-cueing 'cost' should be greater for the right hand, this should increase the left hand refractory period more than it increases the right hand refractory period.

## Method

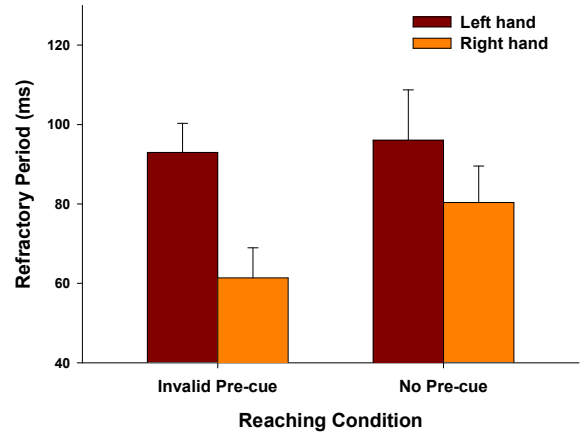
Eighteen right handed participants (1 removed prior to statistical analysis) performed bimanual reaches under 2 conditions: pre-cue trials and control trials:

- During no pre-cue trials, target pairs appeared (one target in each hemispaces) which participants were required to reach to with both hands as fast and accurately as possible.  
-400ms into the bimanual reach (approximately coincident with peak velocity), a single target appeared distal to one of the two bimanual targets, which participants were required to reach to with their closest hand *after landing the bimanual reach*.
- The dwell time (refractory period – circled in the velocity profile below) of this discontinuous double-step reach was recorded for further analyses in a 2 (condition) by 2 (hand) ANOVA.
- The procedure for the pre-cue trials was identical to the control trials, with the addition of a small, but attention grabbing vibration delivered to either the left or right index finger at the same time as the bimanual target presentation.
- The pre-cue provided information about which hand would have to make the unimanual reach following completion of the bimanual reach.
- The pre-cue was valid in 75% of trials, invalid in 25% (i.e. 24 invalidly cued trials per hand).
- When the pre-cue was invalid (as specified by the appearance of the target closer to the non-cued hand), participants had to inhibit the cued limb, and reach to the target with their uncued hand.

### Sample invalid pre-cue trial



## Results



- The mean error rate for the right hand (4.65 errors) under invalidly pre-cued conditions was significantly greater than the left hand error rate (2.71 errors;  $t(16) = 2.64, p < 0.05$ ).
- No main effect of condition;  $F(1,16) = 1.4, NS$ .
- Main effect of hand;  $F(1,16) = 15.95, p < 0.005$ .  
-The *overall* left hand refractory period (94.5ms) is longer than the overall right hand refractory period (70.9ms).
- No condition by hand interaction;  $F(1,16) = 3.19, NS$ .

## Conclusion

This study hoped to demonstrate a bias toward the selection of the dominant hand by examining asymmetries in the refractory period and levels of errors, following an invalid pre-cue. As predicted, the right hand showed significantly more errors (i.e. movements which were not successfully inhibited), which indicates a left hand advantage for the inhibition of movements, possibly as a result of an intentional bias toward the right hand. This proposed bias in motor attention would pre-dispose the right hand of right handers for selection for a task, which in this case is defined during the course of a bimanual movement.

However, the failure to find an effect of condition for the refractory period measure suggests that the experimental manipulation failed in this regard, with the pre-cue being largely ignored by the sample of this study.

It is of interest however that a main effect of hand was observed, suggesting that both conditions (regardless of pre-cue) may have tapped into a bias of attention toward the right hand (c.f. Buckingham & Carey, 2007).

## References

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