ABSTRACT

The information processing of bimanual reaching movements was investigated in this thesis. All of the studies tested symmetric and asymmetric bimanual reaching movements that were made to targets as quickly and accurately as possible. The duration of movement preparation was measured by reaction time (RT). Study one found that bimanual asymmetric movements had longer preparation than bimanual symmetric movements. Donders’ subtraction method was used to isolate this bimanual asymmetric cost to a stage, or stages, of movement preparation that are unique to choice RT tasks; these included target discrimination, response selection, and response programming. Many different movement parameters could cause bimanual asymmetric costs. The results from study two suggested that the relative contribution of three parameters to the asymmetric cost, from most to least important, was movement amplitudes, target locations, and then startling locations. The relationship between unimanual and bimanual movements was tested in the third study by precuing the target for the left arm of a bimanual movement. RT and the start-react effect were used to determine how movement preparation changed. These measures suggested: 1) that the precued movement was not fully programmed but partially programmed before the imperative stimulus, and 2) that the asymmetric cost was caused by increased processing demands on response programming. Overall, the results supported that bimanual movements are not the sum of two unimanual movements; instead, the two arms of a bimanual movement are unified into a functional unit. When one target is precued, this critical unification likely occurs during response programming. Study four used the additive factors method to determine which stages of movement preparation contributed to the asymmetric cost when both targets were cued by the imperative stimulus. The results supported that the asymmetric cost was caused by increased processing demands on response selection. Target discrimination and response programming – contrary to previous hypotheses – did not contribute to the asymmetric cost. The critical process of bimanual unification likely depends on how the task is presented and conceptualised. It occurs during response selection when both targets are cued by the imperative stimulus, and it is deferred to response programming when one target is precued.

BIOGRAPHICAL NOTES

Place of Birth: Milton, Ontario

Academic Studies: B. Sc., University of Waterloo, 2007
M. Sc., University of British Columbia, 2010

GRADUATE STUDIES

Field of Study: Human motor control

Courses

<table>
<thead>
<tr>
<th>Courses</th>
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<tbody>
<tr>
<td>KIN 530A</td>
<td>Directed studies</td>
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<tr>
<td>KIN 563</td>
<td>Measurement of human motion</td>
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<td>KIN 567</td>
<td>Human motor performance</td>
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<td>KIN 568</td>
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<tr>
<td>KIN 570</td>
<td>Research methods in kinesiology</td>
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<tr>
<td>KIN 573</td>
<td>Seminar in mechanical analysis of human movement</td>
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AWARDS

NSERC postgraduate scholarship – Doctoral (2010-2012)
UBC four-year doctoral fellowship (2010-2013)
UBC dean of education scholarship (2011-2012)
NSERC Canada graduate scholarship – Masters (2008-2009)
UBC graduate entrance scholarship (2007-2008)
Ontario graduate scholarship (2007-2008, declined to study at UBC)

PUBLICATIONS


Blinch J, Cameron BD, Franks IM, Carpenter MG, Chua R (in press) Facilitation and interference during the preparation of bimanual movements: contributions from starting locations, movement amplitudes, and target locations. Psychol Res


Blinch J, Franks IM, Carpenter MG, Chua R (under review) Unified nature of bimanual movements revealed by separating the preparation of each arm

PRESENTATIONS

Blinch J, Cameron BD, Cressman EK, Plecash A, Chua R (2012, June) Precuing one or both arms of a bimanual asymmetric movement eliminates preparation costs. Presented at the annual meeting of the North American Society for the Psychology of Sport and Physical Activity (NASPSA), Waikiki, HI

Blinch J, Cameron BC, Lam M, Hua S, Cory M, Chua R (2008, October) Bimanual interference during on-line control to symbolically- vs. directly-cued target locations. Poster session at the annual meeting of the Canadian Society for Psychomotor Learning and Sport Psychology (SCAPPS), Canmore, AB

Blinch J, Chua R (2009, October) Symbolically-cued asymmetric reaches results in spatial interference during initiation and execution. Poster session at the annual meeting of SCAPPS, Toronto, ON

Blinch J, Chua R (2010, October) Bimanual reaches with symbolic cues exhibit errors in target selection. Presented at the annual meeting of SCAPPS, Ottawa, ON


Blinch J, Franks IM, Chua R (2013, July) Eliminating the preparation cost for bimanual asymmetric movements. Poster session at the biannual meeting of Progress in Motor Control, Montreal, QC

Blinch J, Rasman BG, Clark K, May C, Cameron BD, Franks IM, Carpenter MG, Chua R (2013, October) Interference during the preparation of bimanual movements: the role of asymmetric starting locations, movement amplitudes, and target locations. Presented at the annual meeting of SCAPPS, Kelowna, BC


PROGRAMME

The Final Oral Examination
For the Degree of

DOCTOR OF PHILOSOPHY
(Kinesiology)

JARROD BLINCH

B. Sc., University of Waterloo, 2007
M. Sc., University of British Columbia, 2010

Monday, March 9, 2015, 12:30 pm
Room 200, Graduate Student Centre
Latecomers will not be admitted

"Information Processing of Bimanual Reaching Movements"

EXAMINING COMMITTEE

Chair:
Dr. Leanne Currie (Nursing)

Supervisory Committee:
Dr. Romeo Chua, Research Supervisor (Kinesiology)
Dr. Ian M. Franks (Kinesiology)
Dr. Mark G. Carpenter (Kinesiology)

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