Abstract

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THE NATURE OF HAND-CENTRIC VISUO-SPATIAL PROCESSING DIFFERENCES FOR OBJECTS IN THE PERIPERSONAL SPACE

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Hands provide critical inputs that are essential for the multisensory integration of stimuli that are in the graspable space. Previous studies have shown that objects that are present in this space are processed differently compared to objects in the space that are beyond the graspable space. Previous studies have also shown these differences irrespective of any intention to act upon them, implying that these effects are not subject to voluntary control. In the present thesis, I report ten experiments organized into four empirical chapters examining issues of stimulus specificity and automaticity associated with visual processing in the peri-hand space. Paradigms used to study questions of control and automaticity of visual selection offer

methodologies that are useful in testing these questions. Moreover, past studies have tried to theorize attentional processing differences in the peri-hand space. The present thesis builds on these foundations and extends the questions about the understanding of visual perception and attentional mechanisms in the space near the hands. In Chapter 1, I pit the existing explanations of the hand-proximity effect on attentional processing, namely perceptual prioritization account and slower disengagement account against each other. That is, the speeds of pre-attentive and attentional mechanisms for the targets appearing near the hand were compared to those for targets appearing relatively farther away and also compared against a baseline no-hand condition. Results showed faster pre-attentive processing of targets appearing near the hand compared to the far and the no-hand conditions. In contrast, the attentional processes seemed to be slower for objects near the hand compared to objects farther away. The findings suggest dissociable effects of hand-proximity on perceptual and attentional mechanisms. In Chapter 2, we followed up on the Modulated Visual Pathway (MVP) hypothesis (Gozli, West & Pratt, 2012) of hand-proximity. MVP proposes processing biases mediated by the magnocellular and parvocellular pathways for stimuli presented in the near and far regions of space of the hand, respectively. In Chapter 2, the role of relevance of the motion and color features was looked-at in the manifestation of hand-proximity effect. In four experiments the type of feature singleton as well as the probability of the feature singleton being the target was manipulated. The results showed hand proximity biasing attentional allocation to the feature singleton only when the feature singleton was irrelevant to the search task. Also, the relative distance of the hand from the feature singleton seemed critical for the feature specificity of the effect to be observed clearly. Chapter 3 tested the automaticity involved in the manifestation of the hand-proximity effect, by changing top-down factors and bringing in more predictability to the task setting. Results of Chapter3 highlighted the sensitivity of hand-related effects to the spatial arrangement of search items. When the search display had items presented either only near the

hand or only far away from the hand, hand-proximity effects were eliminated, suggesting that the processing difference for objects in the far space is not independent of items in the near-space. Similarly, presenting the display in a predictable configuration also removed hand-proximity effects. The set of findings questions the automaticity associated with hand-related effect, highlighting its dependence on situational factors. Chapter 4 aims to look at the visual processing effects associated with performing a goal-oriented reach movement. Performance in the action condition was compared with a static hand condition and a baseline no-hand condition. An action-specific reduction in both keypress RT and saccade latency was obtained for targets presented in the absence of distractors as compared to both static and baseline conditions. Presence of distractors resulted in an interference effect only in the dynamic hand condition, highlighting the effects of the organization of motor resources associated with performing an action on visual processing. Overall, the current thesis highlights how the hands play an important role in interactions with the environment, by looking at how hand position and making reach movements influence the visual processing of proximal compared to distal objects. More importantly, it illustrates the conditions under which the hand proximity effect is seen and also demonstrates the limits of hand proximity in modulating visual processing. The thesis proposes that visual and motor systems partner each other, forming a functional unit, to properly engage with the environment.