Hand To Eye: Examining the Effect of Vision on Tactile Responses

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As humans, we experience the world primarily via what we see and what we feel. While our vision guides us, even the neurological and somatic make up of our hands and the receptors in them are proof enough that we rely heavily on our sense of touch. Researchers question how much one sense affects the other.

Gillmeister, Sambo and Forster (2010) explored attentional selection effects for the purpose of determining whether viewing one's own hand has an effect on tactile-spacial selection among the same fingers of one hand or not. The experiment was carried out as follows. Sixteen participants consisting of nine men and seven women were selected, all right handed with a mean age of 26.3 years of age. Those who participated had their hands obscured by wooden board with a portion altered to allow for hands to be seen or covered up. Tactile stimuli were presented to the fingers by 12 volt charges via rods to the fingertips, white noise being present to mask the electricity. Contact was conducted either continuously for 200ms in a "single tap" or a "double tap" which lasted 200ms long with a 4ms interruption in the middle. Participants were also asked to vocally respond "pa" into a microphone when experiencing the double tap. There were two conditions: a within-hand task which required participants to place the index and middle fingers of their left or right hand on two tactile stimulators, each 2 cm apart from a fixation point or a between-hand task which required them to place the index fingers of their left and right hands on the tactile stimulators. Instruction called for participants to remain focused on the fixation point when the viewing window was open or a location at the exact same point when the window was closed. Each participant went through two blocks of 72 trials of each condition, thus each participant did within-hand and between-hand, hands visible or not visible, or right or left hand being attended. To monitor attention, EEGs were used.Tactile-spatial

selection effects were found in early processing stages were found in both the within and between-hand tasks, however they were only found when fingers were obscured from view. ANOVAS were ran to determine differences between the within and between tasks. It was found that for the within-hand condition there was an interaction between attention and vision and for between hands there was no attentional effect. ANOVAs were also used to determine whether viewing the hands in the within task affected selection and it was found once again that attentional effects were only found when the fingers were covered. With these results, it is indicated that one may experience tactile-spatial effects earlier within one hand rather than split between two, at least when vision is obscured. With there being no real difference when fingers and hands are visible is evidence that vision can actually mitigate perception. An experiment done examined whether this is true in those who are actually blind.

One of the questions that Frings, Amendt and Spence (2011) wished to answer with their experiment was if those who were blind process tactile stimuli differently than those who could see. The subject sample consisted of 19 blind participants with an median age of 45 years old. Half of them were blind since birth and the rest became blind more than 14 years prior to the student. For comparison, a control group of 19 individuals who could see were selected. The experiment had a within subjects factor which was a priming condition that featured a control condition and a condition where the participant was to ignore repetitious stimulation as well as a between subjects factor, separating blind participants from sighted. Participants were seated in front of a computer and told to place their left middle and index finger on the “c” and “v” keys respectively and their right hand index and middle fingers on the “n” and “m” keys respectively. Trials began at the pressure of the spacebar and a 150ms pulse from vibrotactile transducers attached to the palms via Velcro strips. After a 1 second (1000 ms) delay , the prime display was

presented which included the target stimulation coupled with a distractor vibration. Both continued until a response was given by the participant. The results showed that blind participants took an average of 1,543 ms to identify tactile stimuli while sighted participants took an average of 1,819 ms to respond. Additionally, blind participants only had an 18% error rate in comparison to sighted participants' 33%. It was found that there was no clear difference between those who were blind and those who could in regards to tactile processing.

Like the previous two studies, Wesslein, Spence and Frings (2013) aimed to explore the role vision has on making tactile responses as well as how tactile stimulation is processed. In one experiment, 14 participants with an average of 23 years of age performed a tactile version of the flanker task consisting of four kinds of vibration stimuli that were given two responses. In regards to classification of stimuli, the vibrotactile stimuli are either the same in terms of perception and assigned response, different in perception and the same in response or completely different in both areas. Additionally, for the first half of the experiment targets were present to the left hand and the second, targets were presented to the right. Participants were also blindfolded for this experiment. Much like previous experiments, the vibration transducers were attached to the palms and the participants were given armrests to prevent interference and white noise was present to mask the noise of the transducers. Also like previous experiments, participants were instructed to attend to either one hand or the other while ignoring the other which would be considered a distractor. For a total of 96 trials, participants went through 24 of the first and second type of classification and 48 of the third, which was the condition in which perception and response were completely different. In the second experiment, 44 students who had not participated in the prior experiment were presented with either a hands visible or hands not visible task along with either a perceptual or response flanker effect. The materials and setup

were the same as the first experiment. In the third experiment, only one hand was visibly: the hand which was being stimulated or the hand receiving distractor signals. In the first two experiments, flanker effects were significant on a perceptual level, however in the third experiment, it was significant at both the perceptual and the response level. Also in the second experiment, blindfolded participants made more errors than those who were allowed to see, which is contradictory to what was found in Fring's experiment. In third experiment, results indicated that reaction times were highest when the hand receiving the target stimulus was viewed and the distractor was obscured, despite this experiment having the lowest accuracy out of the three.

As both vision and tactile functions are important to our survival as they are our primary tools in experiencing the world's distal stimuli, it can be understand that the two senses would have not only related functions but said processing the two in terms of functionality. As research into the subject progresses and researchers continue to explore the relationship between vision and tactile responses, more light on the actual workings and how it can be applied may be revealed.

References

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