**Show some sensitivity! Using motion tracking to improve unconscious measures**

Khen Heller1, Liad Mudrik1,2 and Craig S. Chapman3,4

1 Sagol School of Neuroscience, Tel Aviv University

2 School of Psychological Sciences, Tel Aviv University

3 Faculty of Kinesiology, Sport, and Recreation, University of Alberta, Edmonton, AB, Canada

4 Neuroscience and Mental Health Institute University of Alberta Edmonton, Alberta, Canada

Although invisible to us, unconscious stimuli were shown to still affect our behavior. However, the field abounds with contradicting findings, which in turn evoke an ongoing controversy about the scope of unconscious processing, and specifically for semantic processing. Such contradicting results can be explained by methodological limitations of some of these studies. One limitation, that is studied in this thesis, might be an underestimation of unconscious processing due to the use of insensitive measures of the unconscious effect. The most prominent measure for probing unconscious effects is reaction time (RT), as measured using keyboard presses. However, for invisible primes this effect is usually very small and indexes the final decision but not the process of formulating it. Both problems might be solved by using motion tracking, which has become a popular tool for unraveling cognitive processes. But is motion tracking indeed more sensitive to unconscious effects than a keyboard-RT? To date, only one study directly made this comparison and found that the unconscious effect was marginally significant when probed with a keyboard, but robust when measured via mouse tracking. However, this study suffers from several limitations, both to its awareness measurement and to its motion tracking measure. The current thesis is aimed at testing the hypothesis that motion tracking might be superior to keyboard responses in detecting the effects of unconscious processing, while overcoming the aforementioned limitations. To do so rigorous awareness measures and an intuitive reaching response were used in a series of four studies. Three exploratory studies were aimed at finding the optimal conditions for discovering an unconscious effect when using reaching responses. A fourth confirmatory study directly compared between motion tracking and keyboard responses. All four studies used a priming paradigm following a classical study by Dehaene and colleagues (2001), in which subjects performed a semantic judgment on a target word that was preceded by an identical/different invisible prime. The first experiment produced only marginally significant results, presumably because it used a long RT limit. The second experiment reduced this limit and divided it to onset time and movement duration as well as introduced another training block to improve response speed. Unfortunately, a high proportion of trials were excluded due to problematic response timing. Therefor, the third experiment incorporated a separate training day to improve the response speed. Although the proportion of excluded trials did not diminish, an incongruency effect was found. In the fourth experiment we discarded the training day and included both a reaching task and a keyboard task. In accordance with previous findings, a larger unconscious effect in the motion tracking task was found compared to the keyboard task. This suggests that using motion tracking might highly benefit the study of unconscious processes.