# Hand on Heart: A Cardiac Rubber Hand Illusion

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**Abstract**

Body illusions such as the Rubber Hand Illusion (RHI) have highlighted how the multisensory pairing of vision and touch can be integral to the sense of one's own body. Internally arising interoceptive sensations such as the heartbeat also provide information about the body, but it is not yet clear how they influence embodiment.
In a pre-registered study, 42 participants completed a cardiac variation of the RHI, where taps to the finger occurred either in time with the heartbeat (at systole), or between heartbeats (at diastole), and either in or out of synchrony with taps delivered to a rubber hand. Participants also completed two heartbeat detection tasks to assess accuracy at perceiving interoceptive sensations.

We replicated the RHI effect, showing that synchronous but not asynchronous touch to the real and rubber hand significantly increased sensations of embodiment over the rubber hand and caused a shift in the perceived hand location. However, there were no significant influences of cardiac timing on embodiment, nor did it interact with visuo-tactile synchrony. An exploratory analysis found a three-way interaction between synchrony, cardiac timing and interoceptive accuracy as measured by a heartbeat counting task, such that greater interoceptive accuracy was associated with lower embodiment ratings in the systole condition compared to diastole, but only when taps were synchronous.
Although our novel methodology successfully replicated the RHI, our findings suggest that interoceptive senses may make little contribution to the sense of one's body beyond the multisensory integration of vision and touch.

**Keywords:** interoception, touch perception, multisensory integration, embodiment, body ownership

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