“Obstacle Shunning”. A behavioral and psychophysiological study in lower limb amputees with phantom sensations.

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Phantom limb sensation (PLS) refers to the persistent experience of the postural and motor aspects of a limb after its physical loss. PLS is often thought to be a source of interference that hinders the successful embodiment of a prosthesis into a not-able-bodied individual’s body representation.

In the present behavioral and psychophysiological study we focused on an under-investigated aspect of PLS, i.e. the tendency of a phantom to disappear once its phenomenal space is invaded by a solid physical object (“obstacle shunning” – OBS).

We used the paradigm of apparent motion perception of human body parts (AMP – perceptual completion of an actor’s limb movements from two static pictures).

Twelve unilateral lower limb amputees with PLS (mean age: 52.17 years, 11 males, 6 right-sided, 6 presenting OBS) and fourteen non-amputees (mean age: 36 years, 10 males) observed stimuli pairs flashed at either slow or fast stimulus-onset-asynchronies (SOA) and depicting a target limb in front of and behind a solid object. Objects could be of threatening or neutral valence. AMP could consist in limbs moving through (short-pathway) or around (long-pathway) these solid objects.

Compared to controls, amputees showed patterns of enhanced skin conductance response associated with the processing of leg stimuli. Furthermore, AMP of amputees without compared to those with OBS was found to be more likely biased
towards the short-pathway consistently with a fast-SOA and towards the long-pathway in line with a slow-SOA. Our approach offers the potential to implicitly explore the integrity of motor properties of a phantom limb and might provide important insight in the potential outcomes of a prosthetic fit.

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