Who can touch my virtual body where? Psycho-physiological reactivity to touches on different body regions of an embodied avatar

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Embodying an artificial agent through immersive virtual reality (IVR) may lead to feeling somatosensory stimuli on one's body which are in fact never delivered. Whether the vicarious touch in virtual reality reflects the basic individual and social features of real-life interpersonal interactions is currently unclear.
In two appropriately powered studies (n=42 for each study), we used IVR to induce in women and men who self-defined themselves as heterosexual, gay, or lesbian the feelings of ownership over a gender-matched virtual body. The embodied avatars were caressed on different body regions (e.g. the hands, coded as a social region, or the genitals and breast, coded as intimate regions) by female or male avatars while the participants' behavioral and psychophysiological (skin conductance response, heart rate) reactions to virtual touches were recorded.
Heterosexual men rated the female avatar's touch as more appropriate and erogenous, while heterosexual women rated female and male avatar touches as equally appropriate, with the latter being most erogenous. Interestingly, gay men exhibited the same pattern of appropriateness and erogeneity as heterosexual women. In contrast, lesbian women rated more appropriate and erogenous the touches of the female avatar. For all participants, the most appropriate and erogenous regions were the social and the intimate ones, respectively. Importantly, touches on the virtual body's intimate areas elicited the highest skin conductance response when participants were touched by a female avatar, while no effect was found for the heart rate signals. We show for the first time that IVR could be used to induce first-hand vicarious sensations of intimate touch without any actual tactile stimulation on the real body and that these vicarious sensations are sensitive to top-down factors, like the gender of the touching avatar; moreover the virtual caresses delivered to taboo regions of the embodied avatar can elicit maximal reactivity of the autonomic system of the participants suggesting that they reacted as though they received the caress in reality. Future studies are needed to systematically explore these sensations and to better understand the mechanisms that trigger this type of vicarious perception.
Overall, our approach provides the unprecedented opportunity to explore the somatosensory system without actually delivering any somatic stimulus and to explore the role of bottom-up and top-down factors that modulate behavioural, physiological, and neural reactivity to social and intimate touch, with potential important translational implications (i.e., for people with dysfunctional touching behavior and people with neurological dysfunctions).