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winDirect

Studying the Effect of a Wind-Based Haptic Bracelet on Presence and the Detectability of Hand Redirection

SUMMARY

We developed a wind-based wearable haptic feedback device called *winDirect* to investigate if multimodal stimuli can be used to disguise hand redirection (HR) by increasing corresponding perceptual detection thresholds (DTs) in users. Our investigation was motivated by the findings of two previous works, which showed multimodal stimuli to increase presence, and indicated an increased feeling of embodiment to increase the DTs of HR. In contrast to our expectations, we found that the integration of multimodal stimuli did not guarantee increased HR DTs, even when increasing presence – highlighting the need to study correlations between presence and HR more deeply.

EXPERIMENT

We conducted a within-subject psychophysical study with $N = 23$ volunteers to investigate two hypotheses:

H1: Multimodal stimuli increase the participants' *feeling of presence*.

H2: Multimodal stimuli increase the participants' *hand redirection detection thresholds* (HR DTs).

Independent variable: The type of wind feedback with five implementations (*baseline* – no stimulus, *visual* – visual animations of wind, *auditory* – sound of wind, *haptic* – haptic feedback provided by *winDirect*, and *multimodal* – all stimuli together). Dependent variables for each of these conditions: The *feeling of presence* using the SUS presence questionnaire, and the corresponding *HR DTs* determined by a 1 up/1 down staircase method.

RESULTS & CONCLUSION

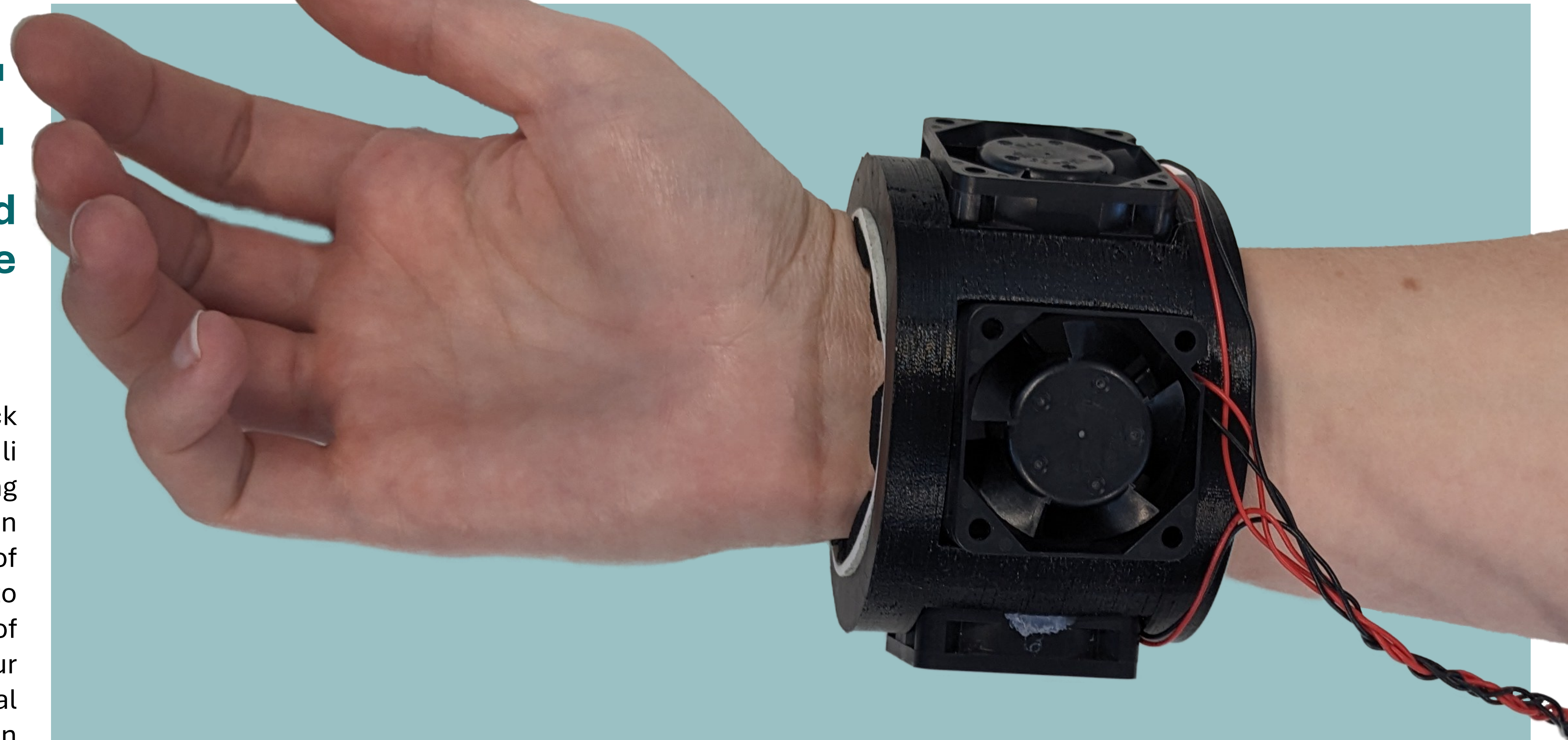
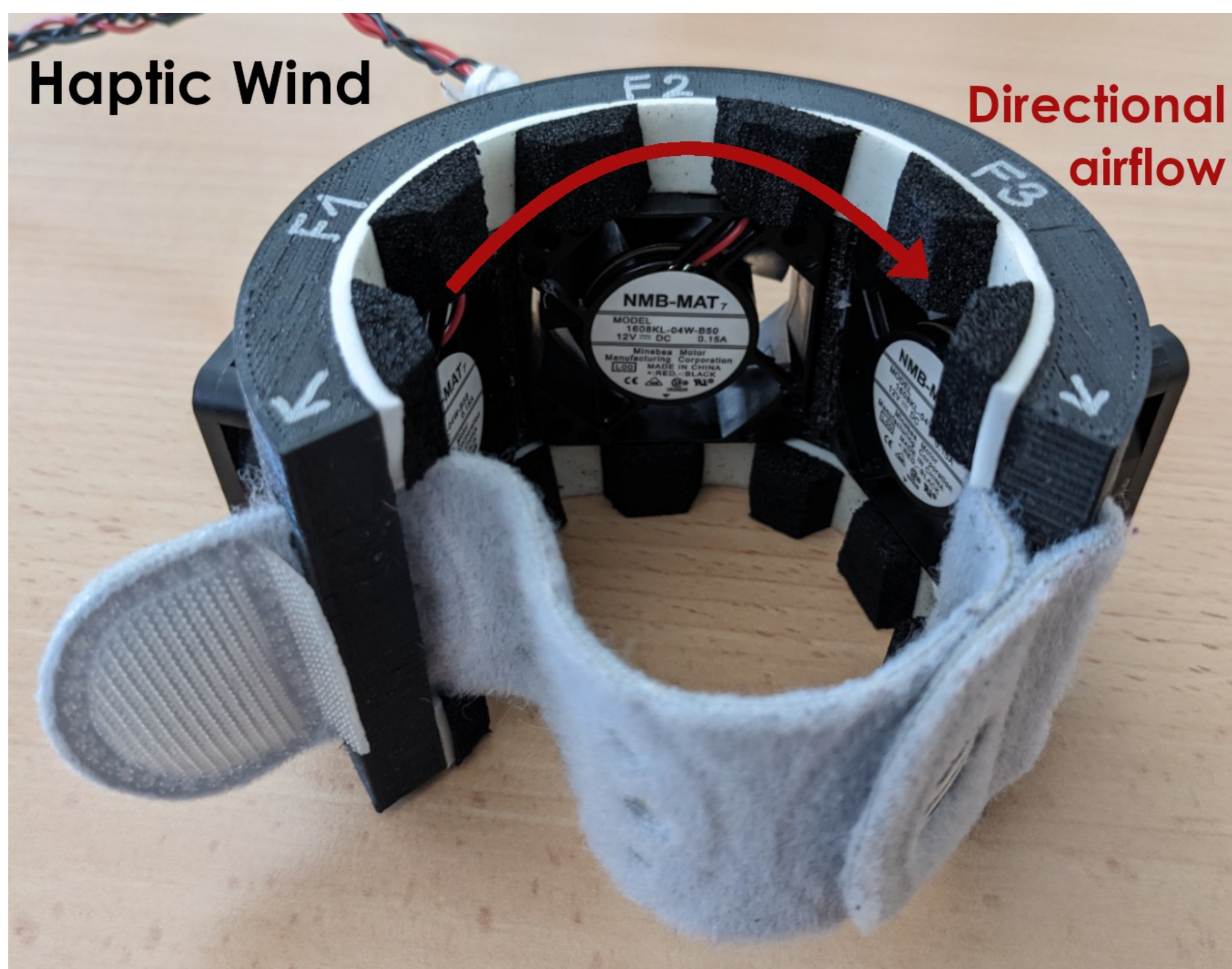
H1: Supported!

Haptic feedback with synchronized visual and auditory cues has a positive impact on the *feeling of presence*.

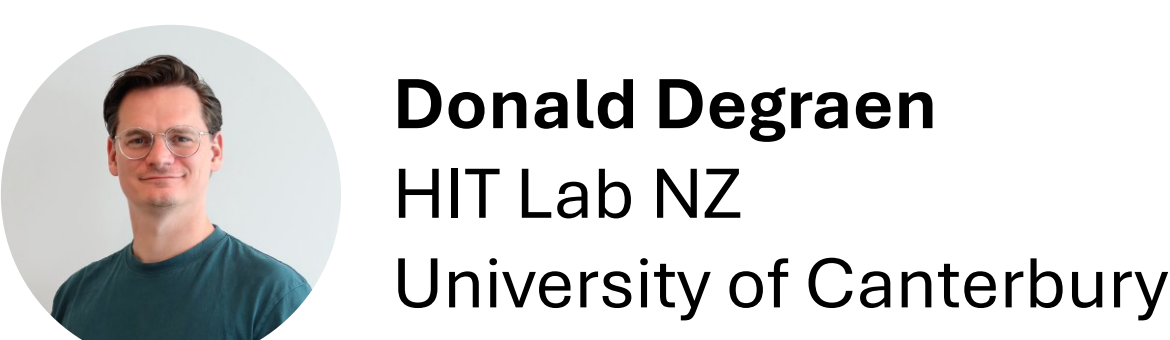
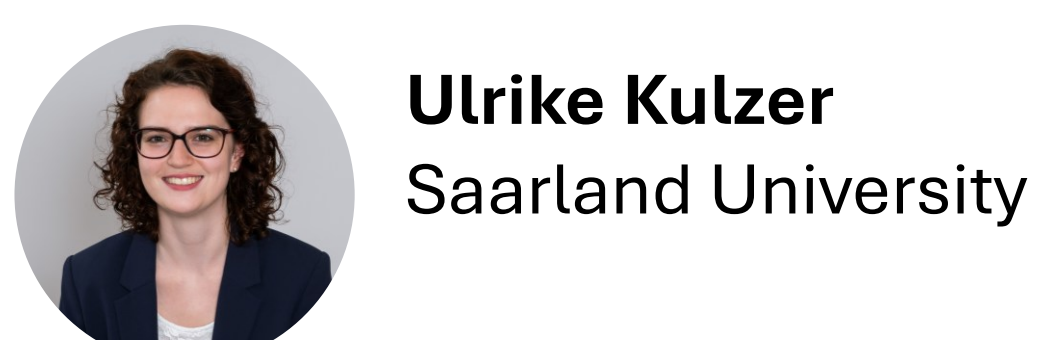
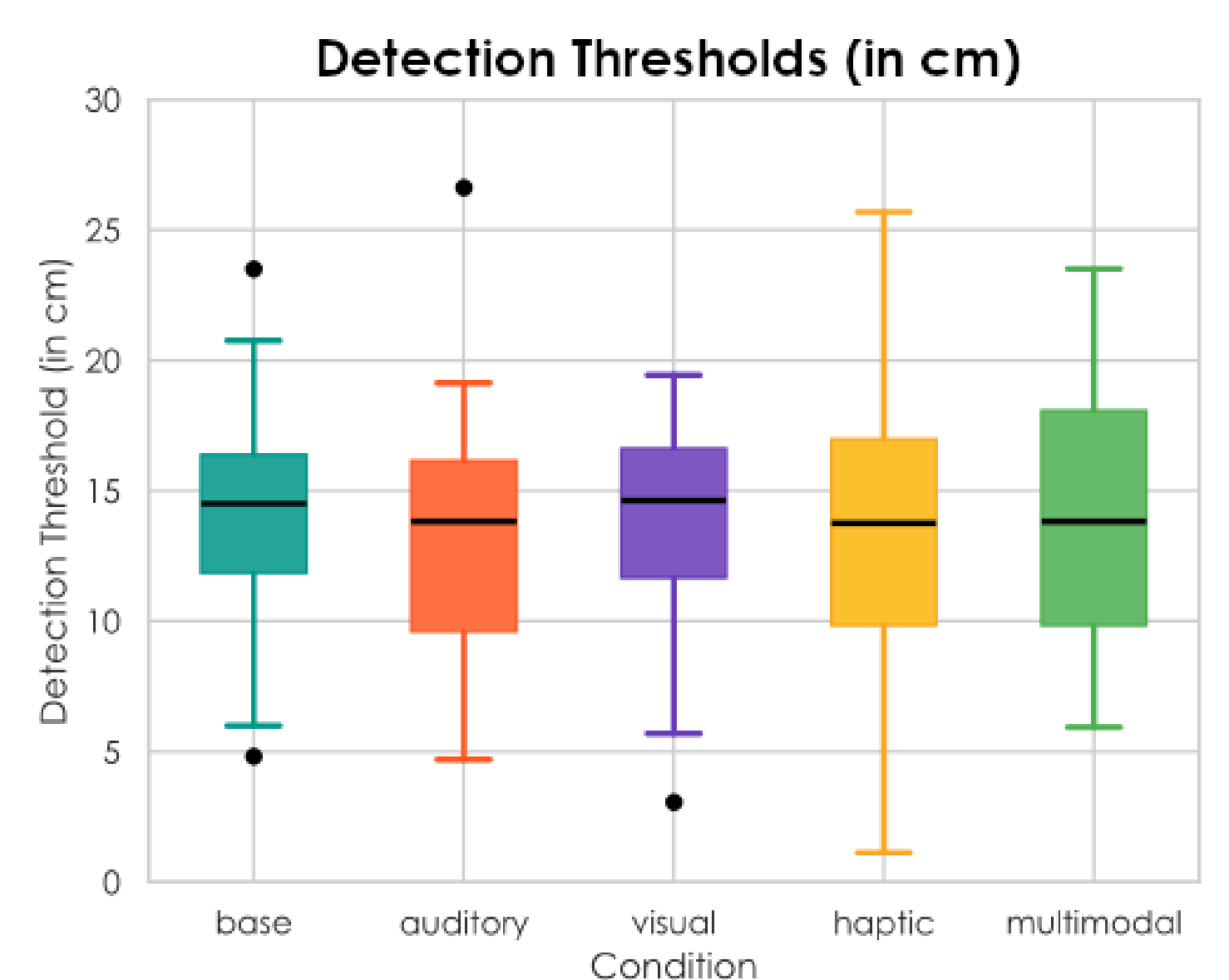
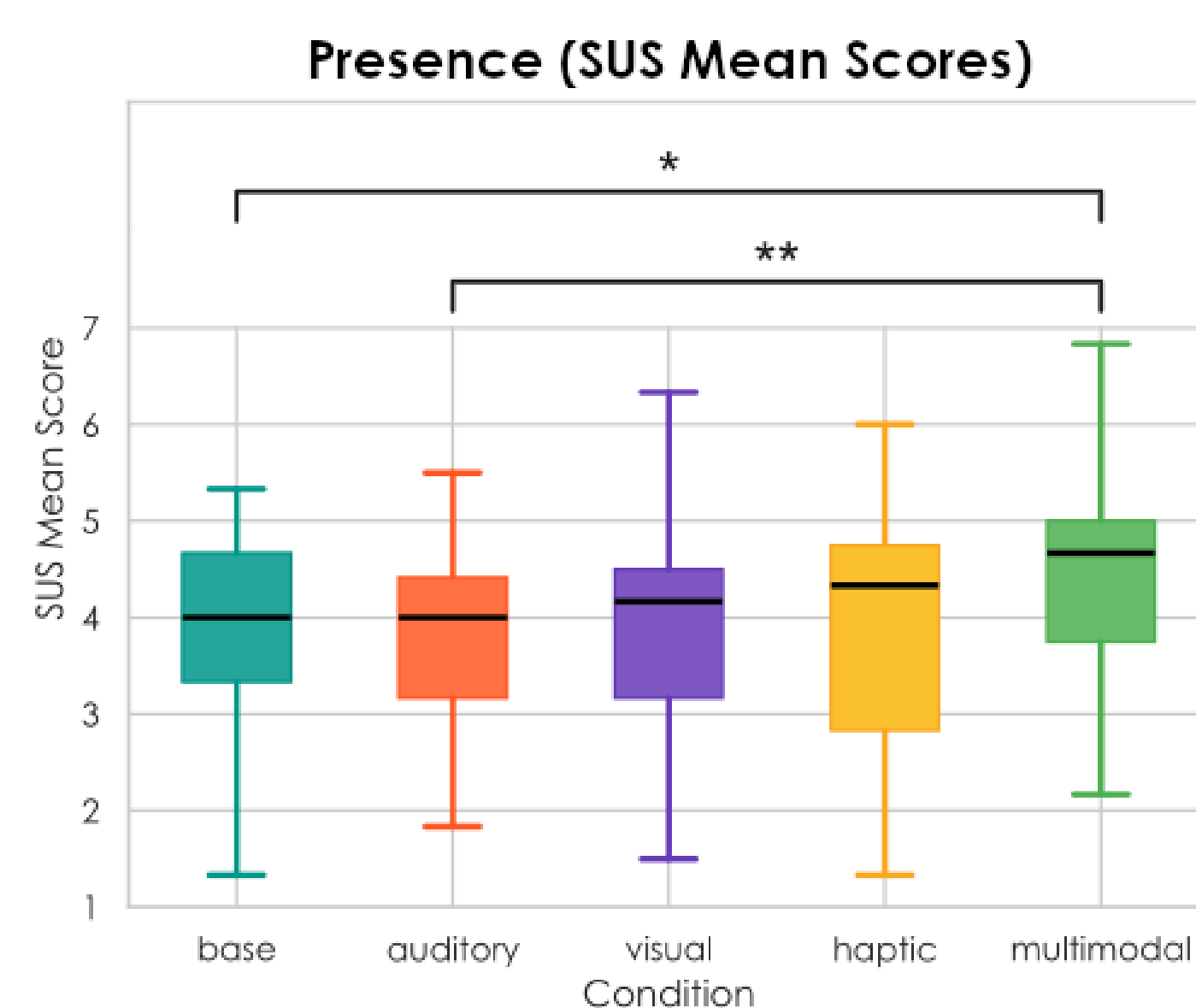
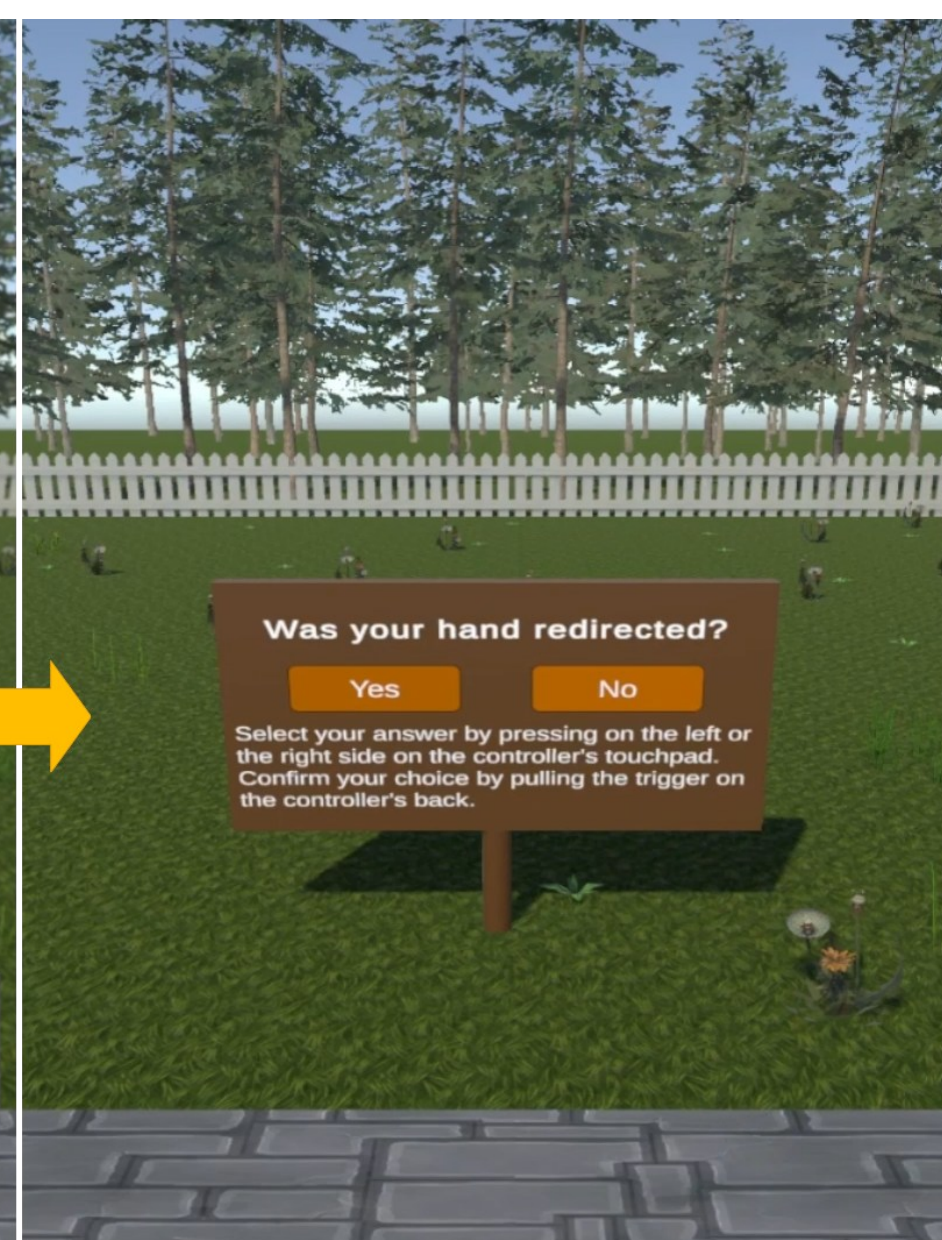
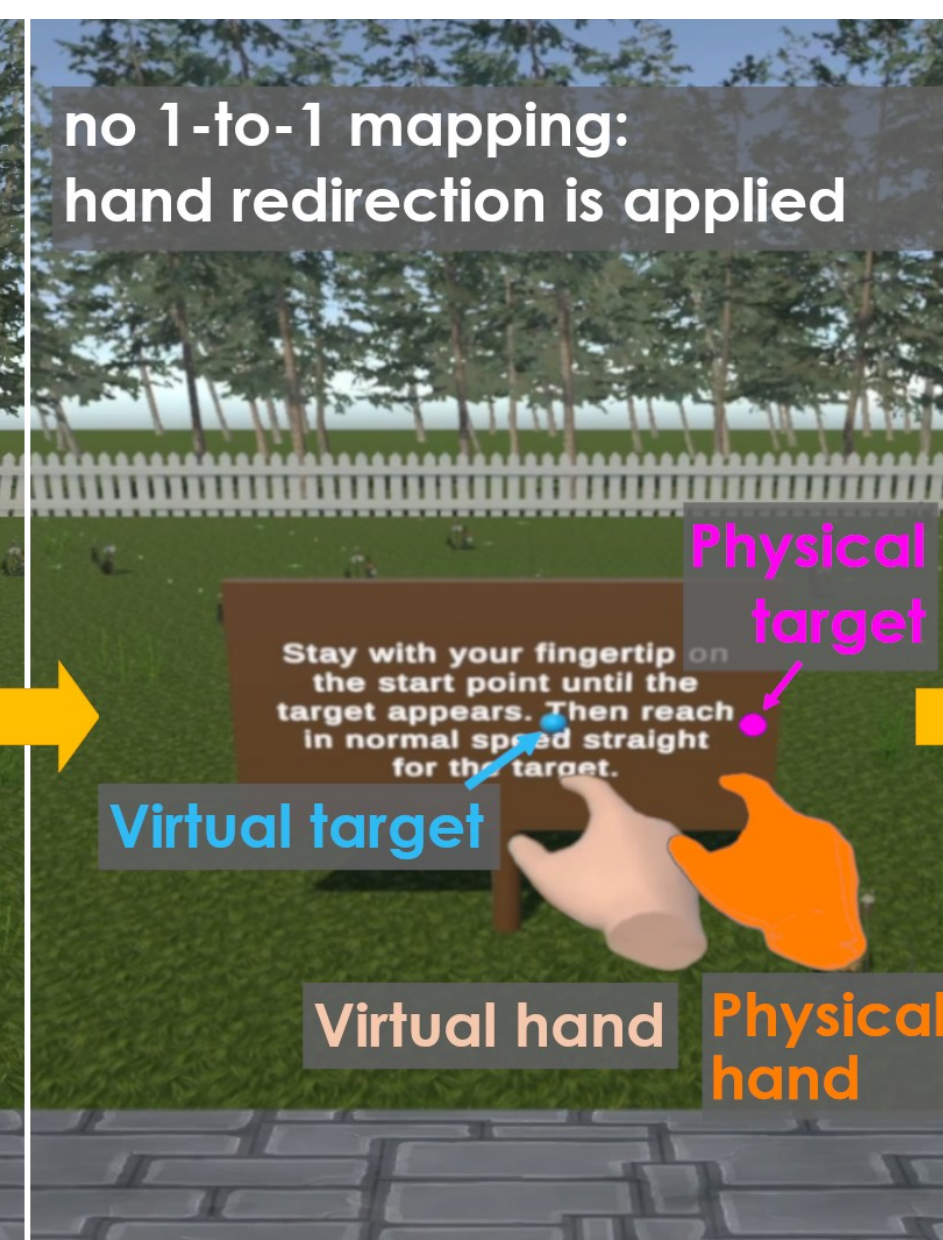
H2: Not supported!

No significant differences between the *HR DTs* of the different conditions could be determined.

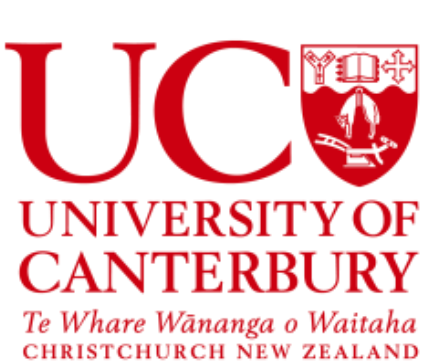
→ Further investigation on the correlations between the feeling of presence and HR DTs is needed!



Multimodal wind increases presence – however, no effect on the detectability of hand redirection was found



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