

# Hand and finger movement strategies for single-shot tactile search

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What movement strategies do we employ to maximize sensory acuity?

To detect very small surface features with a finger, we need to produce relative motion between the fingertip and surface.

We investigated *finger choice* and *movement direction* when people searched for very small features on a silica wafer

If acuity differs between fingers, is it because different of physiological factors like innervation density, or could the control of fingers play a role?

We tested 33 participants' ability to feel microscopic features (2, 6 or 10  $\mu\text{m}$  height) in a two-alternative forced-choice paradigm using the index and little fingers, moving anterior-posterior or medial-lateral

## Methods

We presented participants with two silica wafers. One was smooth while the other had a microscopic feature (2, 6, or 10  $\mu\text{m}$  tall x 500  $\mu\text{m}$  diameter)

Participants performed a Two-alternative forced choice task to indicate which surface had the feature

Exploratory movements constrained by an aperture

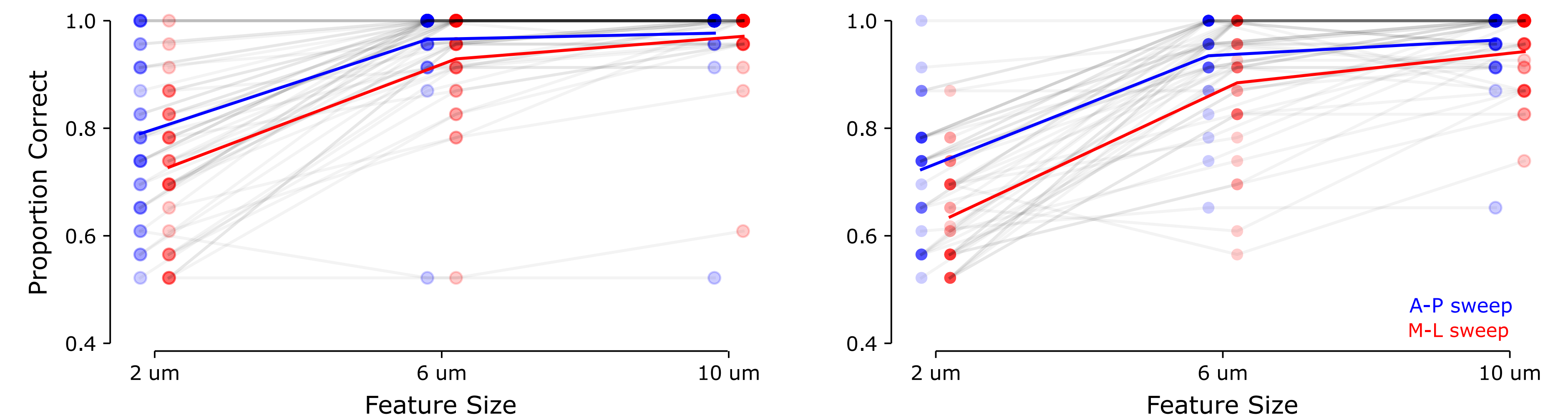
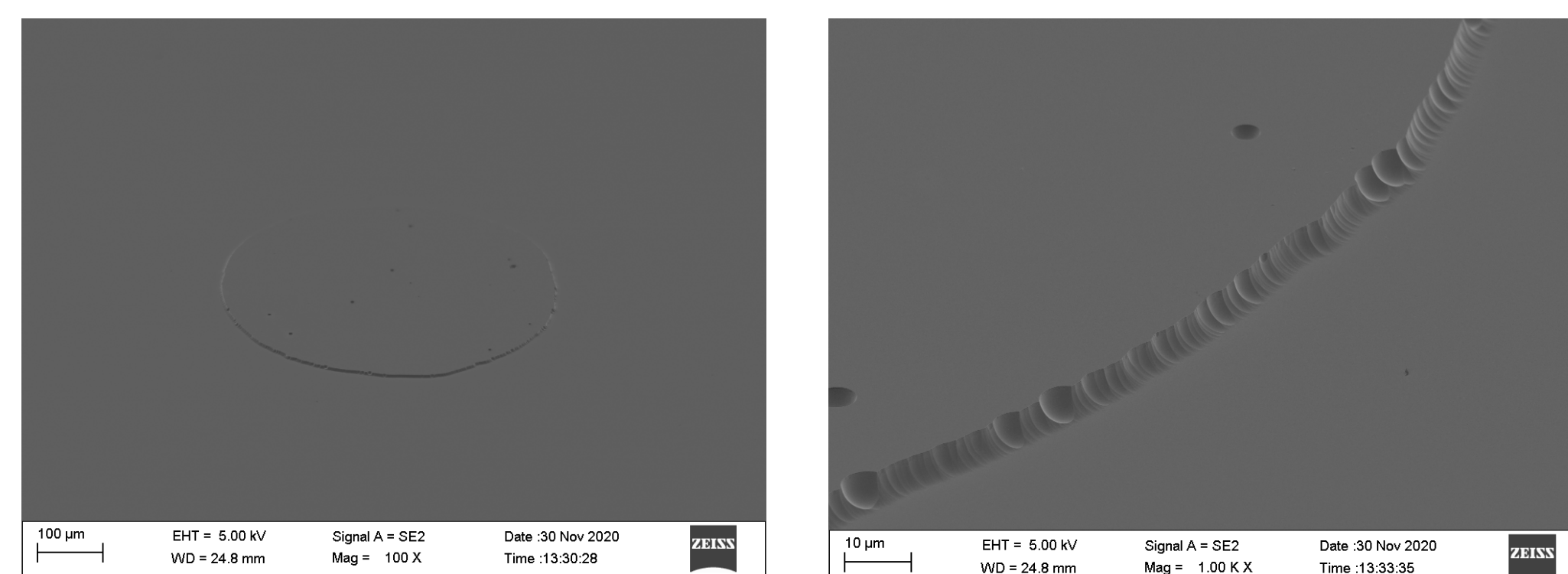
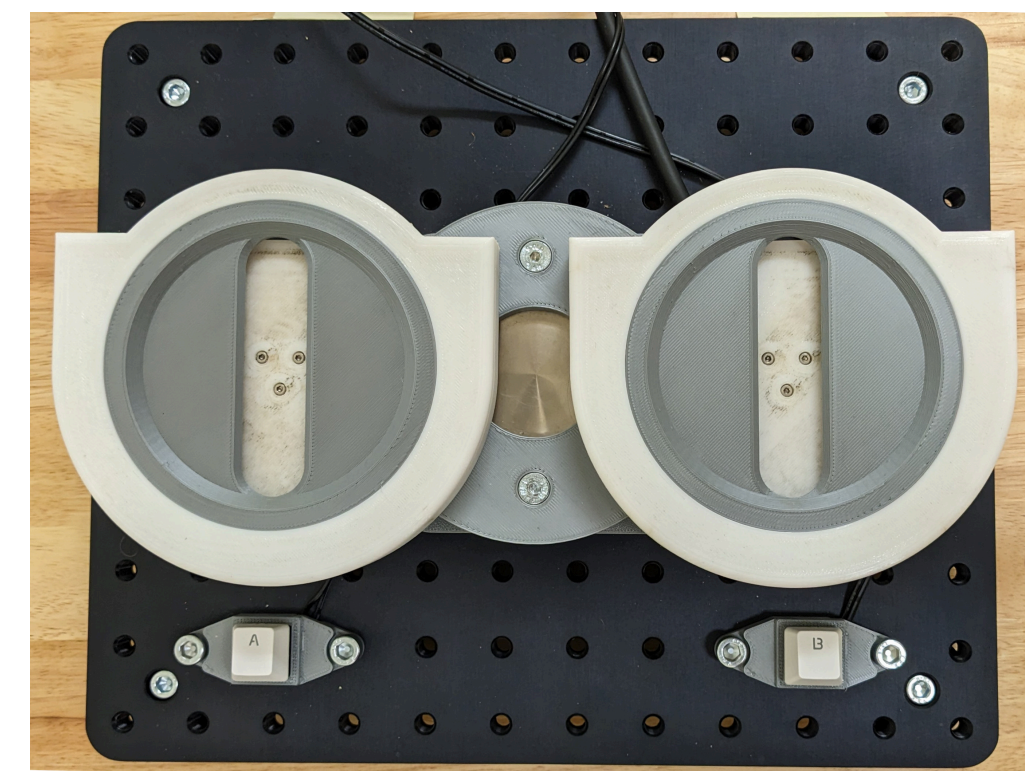
Participants make only one sweep per surface per trial

Index and little finger, A-P and M-L movement directions

3 feature heights: 2, 6, 10  $\mu\text{m}$

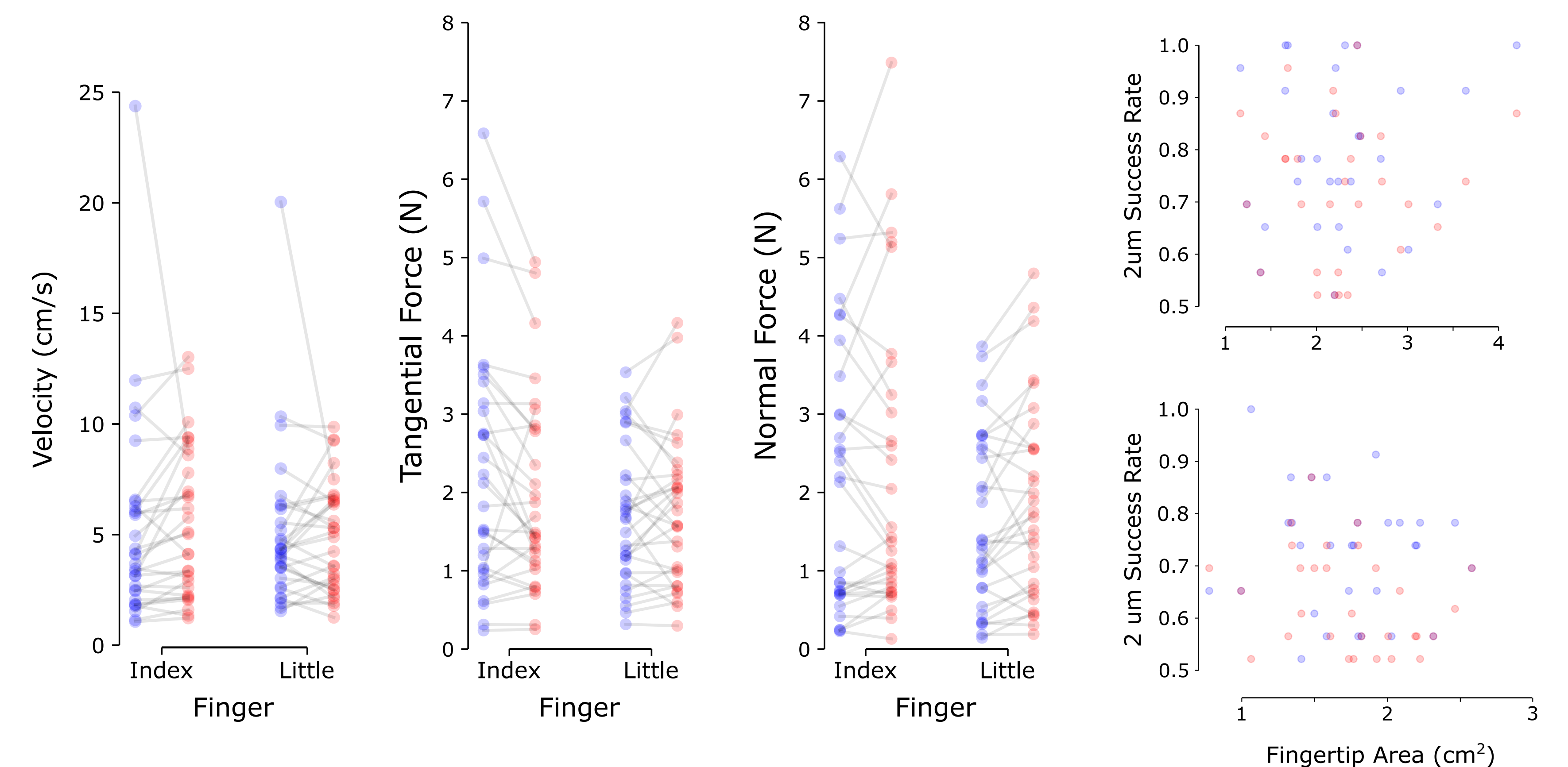
23 repetitions per height x finger x direction

Kinematics reconstructed from Force/Torque data



Index finger detection performance was better than little finger

Anterior-Posterior sweep performance was better for small features



No consistent difference in sweep velocity across directions or fingers

Index finger normal forces were consistently higher than little finger

Index finger tangential forces were higher than little finger in A-P sweeps

We did not observe any relationship between finger size and success rate