Supranormal proprioception in blind individuals with residual vision

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Résumé

What are the functional consequences of a severe visual impairment? Some blind individuals such as Stevie Wonder or Ray Charles have extraordinary motor skills, which could be due to intense practice of motor skills, but also to supranormal auditory or tactile perception. However, it remains unclear how blindness influences proprioception, the sense of position and movement of body segments, given that the visual sense has been suggested to calibrate proprioception. Here we directly tested the contrasting hypotheses of cross-modal compensation or alteration by assessing proprioceptive perception in blind and sighted individuals. Results from an ipsilateral passive matching task revealed that arm proprioception is most accurate in individuals who are considered blind but have some limited residual vision (visual acuity below 1/20 for the best eye; n=10). This was found for the preferred and non-preferred arm, at the elbow and at the wrist joints, compared to totally-blind (n=21) and sighted individuals (n=31). We also found that proprioceptive precision was lateralized in sighted but not in blind individuals. Overall, our findings reveal that proprioceptive acuity is supranormal in blind individuals with residual vision. This suggests that even severely impaired visual signals substantially influence proprioception, and provides new insights into the principles of cross-modal sensory recalibration.

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