

Abstract

Human hairy skin contains C-tactile (CT) afferents, which are unmyelinated, slow-conducting, low-threshold mechanoreceptors that presumably code the pleasantness of gentle interpersonal touch. Their rate of activation depends on the velocity with which touch moves across the skin, with 1–10 cm/s stroking velocity inducing maximal CT activation. Velocities outside this range induce lower activation resulting in an inverted U-shaped firing response. This inverted U-shaped response is paralleled by the way stroking velocity modulates touch pleasantness, which is why pleasantness ratings are often used as a proxy to infer CT responding. Importantly, however, a clear inverted U-shaped pattern in subjective rating data only exists at the group level but not the individual level as there appears to be much variability in touch preferences. The goal of this present thesis was to explore this variability and to determine whether it is characterized by an underlying organizing principle. To this end, 90 participants were stroked by a robotic touch device at five velocities (i.e., 0.5 cm/s, 1 cm/s, 3 cm/s, 10 cm/s, 20 cm/s) while the electroencephalogram (EEG) was being recorded. After each stroke, participants rated touch pleasantness. Participants clustered into two groups based on their behavioral ratings: one group matched the predicted CT-typical pattern, whereas the other group responded in a manner more typical of other myelinated mechanoreceptors. This difference was reflected at the level of the cortex and how somatosensory markers in the EEG encoded tactile stimulation. Moreover, right-middle theta activity could predict individual velocity preferences with 62% accuracy. This study highlights the importance to consider the difference in individual preference when investigating any factor pertaining to touch, in order to achieve a fuller picture in how unique individuals perceive touch pleasure.

摘要

人類的皮膚含有 **C** 傳入神經元(**CT**)，它們是無髓、傳導緩慢、低閾口的機械感受器，並對溫和的人際接觸帶來的愉悅感。它們的激活率取決於觸摸皮膚的速度，**1-10 CM/S** 的撫摸速度會引起最大的 **CT** 激活。此範圍以外的速度會導致較低的激活，從而導致倒 **U** 形發射模式。這種倒 **U** 形發射與撫摸速度調節觸摸愉悅度的方式是相似的，因此愉悅度等級經常被用作推斷 **CT** 響應的代理。然而，重要的是，主觀評分數據中的倒 **U** 形模式僅存在於群體層面，而不存在於個人層面，因為觸摸偏好存在很大差異。本論文的目的是探索這種可變性並確定它是否具有潛在的組織原則。為此，**90** 名參與者被機器觸摸設備以五種速度（即 **0.5 CM/S**、**1 CM/S**、**3 CM/S**、**10 CM/S**、**20 CM/S**）撫摸，同時以腦電圖 (**EEG**) 記錄參與者的大腦過程。每次撫摸後，參與者都會對觸摸的愉悅度進行評分。參與者根據他們的行為評級分為兩組：一組與預測的 **CT** 典型模式相匹配，而另一組以其他有髓機械感受器更典型的方式做出反應。這種差異反映在皮層水平以及腦電圖中的體感標記。此外，右中腦 **THETA** 活動可以以 **62%** 的準確率預測個人速度偏好。這項研究強調了在調口與觸摸有關的任何因素時考慮個人偏好差異的重要性，以便更全面地了解獨特的個體如何感知觸摸愉悅。