A fully-automated behavioral pipeline for reproducible pain assessment in mice

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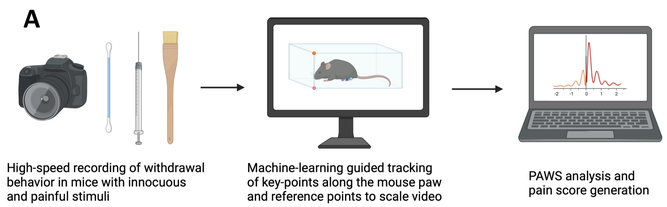
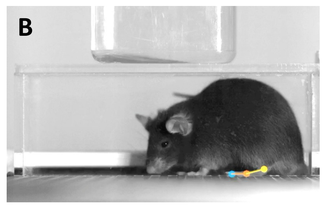
Introduction

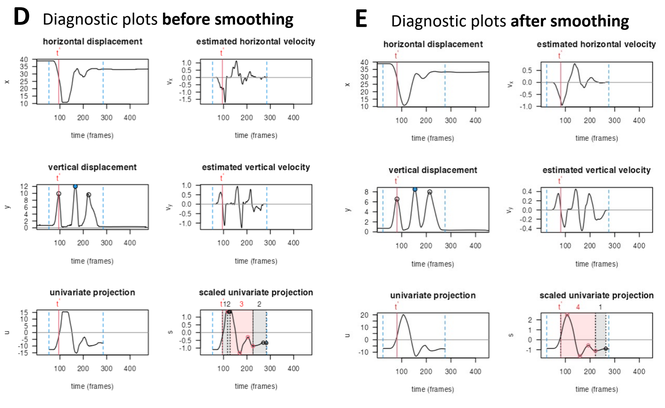
1. Understanding **how individuals express their pain on a reflexive and affective, brain-driven level** may lend crucial insights into delivering personalized treatments for pain disorders.
2. Furthermore, tools to measure pain are robust and established, yet **many lack the resolution to dissect the behavioral underpinnings** of paw withdrawal at the **sub-second timescale**.
3. Here, we introduce our **latest iteration of Pain Assessment at Withdrawal Speeds** (PAWS), a tool to evaluate naturalistic responses to evoked pain assays. With flexibility in mind, we demonstrate the capabilities of our **user-friendly interface for PAWS analysis**.

PAWS: Pain Assessment at Withdrawal Speeds



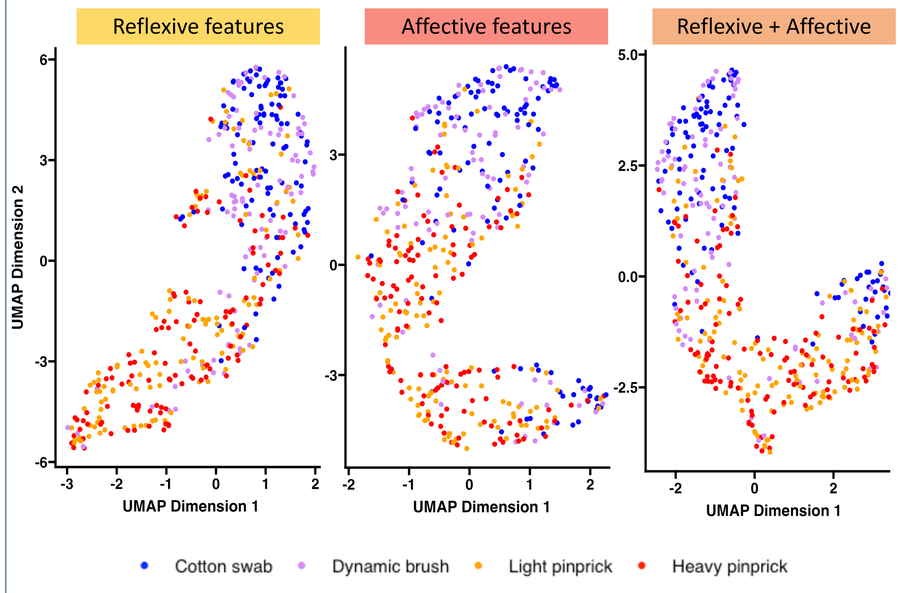



```
C
3  # install PAWS package
4  install_github("osimon81/PAWS")
5
6  # load PAWS package
7  library(PAWS)
8
9  # launch PAWS dashboard
10 paws_dashboard()
```



An interactive graphical user interface enables flexible PAWS analysis without programming experience.

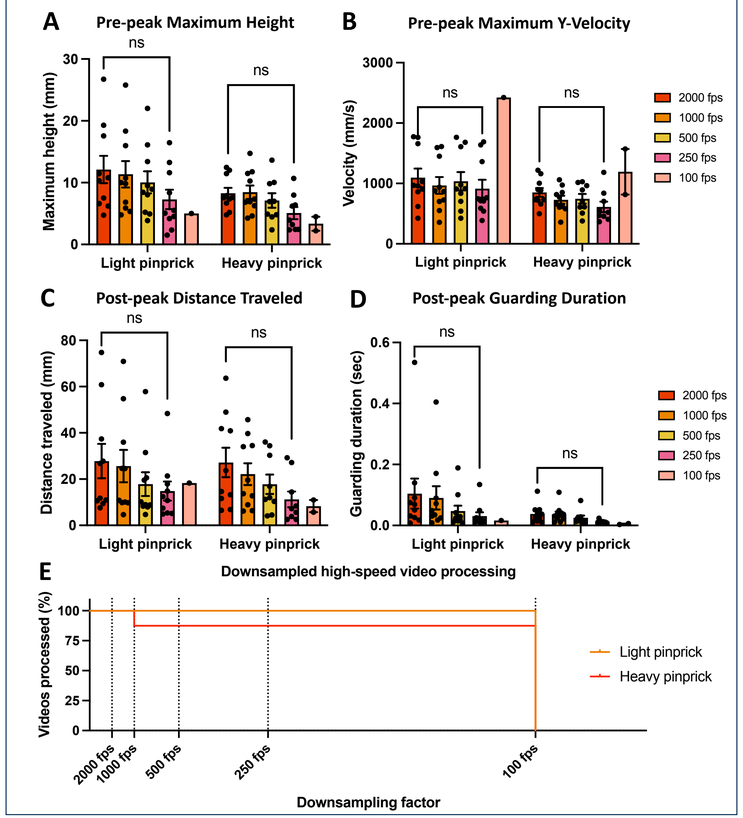
UMAP clustering of reflexive and affective PAWS features separates **touch and pain** states.



Conclusions

1. Key-point tracking using markerless tracking models (SLEAP, DeepLabCut) allows **unbiased quantification of reflexive and affective responses** to innocuous and painful stimuli.
2. With or without programming experience, PAWS diagnostics and smoothing optimization capabilities offer **fine control over kinematic analysis**.
3. Reflexive and affective features alone or in combination are **sufficient to separate touch from pain-like responses**.

PAWS analyzes videos from 2000-250 frames per second.



Acknowledgments

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