2023 NEHS Annual Meeting Abstract Submission

COMPLETE

NEHS Vice President, Daniel Mastella, M.D., is currently accepting abstract submissions for presentation at our Annual Meeting on December 1, 2023.

This meeting will be held at the Sturbridge Host Hotel in Sturbridge, MA.

Therapists, NPs, and PAs are also encouraged to submit.

THE DEADLINE FOR SUBMISSION IS OCTOBER 15, 2023

RESIDENTS AND FELLOWS ONLY. Please indicate if you want your paper to be considered for the prestigious H.Kirk Watson, M.D. Founder's Award. The abstracts for award consideration will be presented in the morning and the award will be presented in the afternoon.

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*** ABSTRACT TITLE**

Development of a Drawing Application to Evaluate Hand and Wrist Function

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Stella den Hengst

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*** Name of who will present abstract at NEHS meeting on December 1, 2023 Please note that the same person cannot present more than one abstract at the meeting.**

Stella den Hengst

*** Please indicate if the presenter is:**

Not currently a resident or fellow

* List full names of abstract authors Please note - one of the lead authors must be present at the meeting to answer questions about the paper.

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* ABSTRACT - should include background information and a description of methods, programs, or practices.

Aims
We developed a custom digital drawing application to assess hand function. We performed an initial validation study of this technique to: (1) assess which drawing features could be good indicators of hand function, (2) differentiate patients from controls for both dominant and non-dominant hands, and (3) assess the correlation of drawing features with previously validated patient-reported outcome scores of upper extremity and global function.

Methods
In this prospective study, participants were asked to draw multiple shapes on an Apple iPad with a digital pen using a custom digital app. Drawings from 142 hands in 73 participants were categorized based on hand dominance and patient/control. Raw data included pen coordinates, pressure, azimuth, and altitude over time. We calculated kinematic/geometric and pressure-based features that generalize to any drawn shape from the raw data. Machine learning models were used to statistically classify patients and controls, and to identify correlation with validated PROMS. Model performance for classification was assessed using accuracy, precision, recall, F1 score, and area under the curve (AUC).

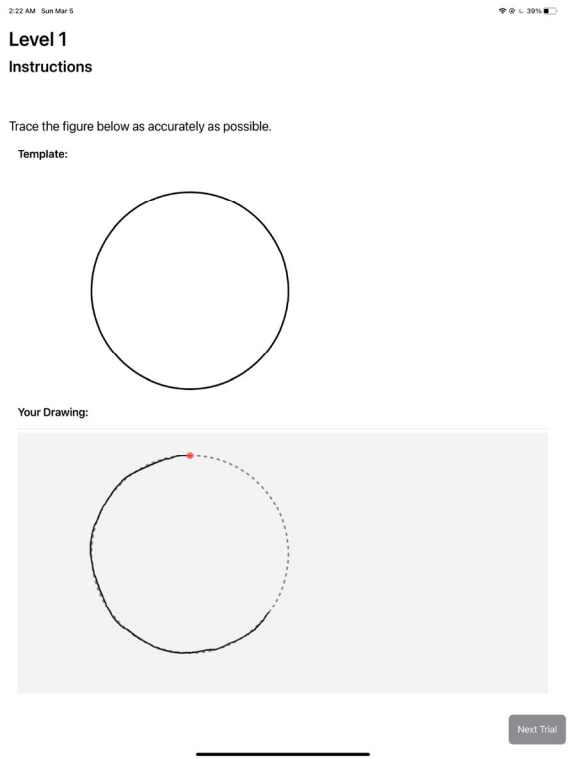
Results
Patients and controls could not be differentiated by simple visual inspection of drawings; however, many drawing features were significantly different ($p<0.01$) between patients and controls for both dominant and non-dominant hand drawings. The circle drawings were the most informative and pressure features were the most important. The dominant and non-dominant hand classification metrics for discriminating patients from controls were similar (AUC = ~ 0.82, Accuracy = ~0.77, F1 = ~0.80). Drawing features were significantly correlated with PRWE, SF12, and qDASH scores ($p < 0.001$).

Conclusion
We developed a novel technique to objectively measure hand function using drawing. Drawing features were correlated with validated patient-reported outcome scores and could differentiate patients from controls, regardless of hand dominance.

Please attach files with diagrams and/or photos to support your abstract (10 MB limit)

figure_2.jpg

* Please attach the abstract presenter's CV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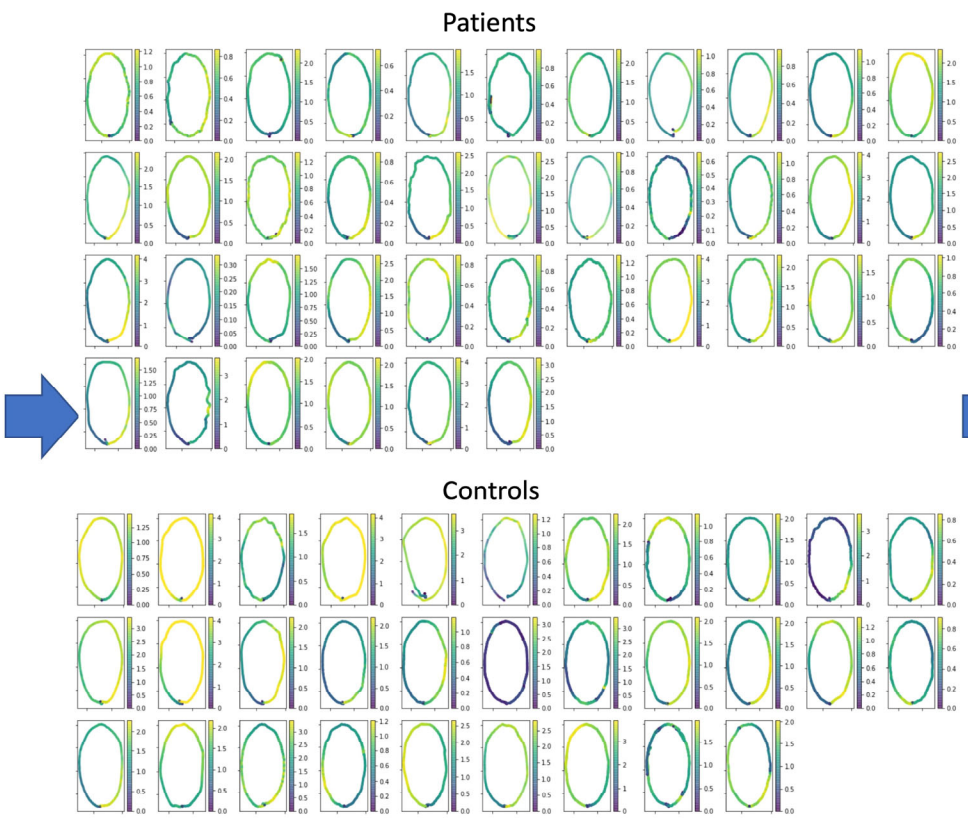
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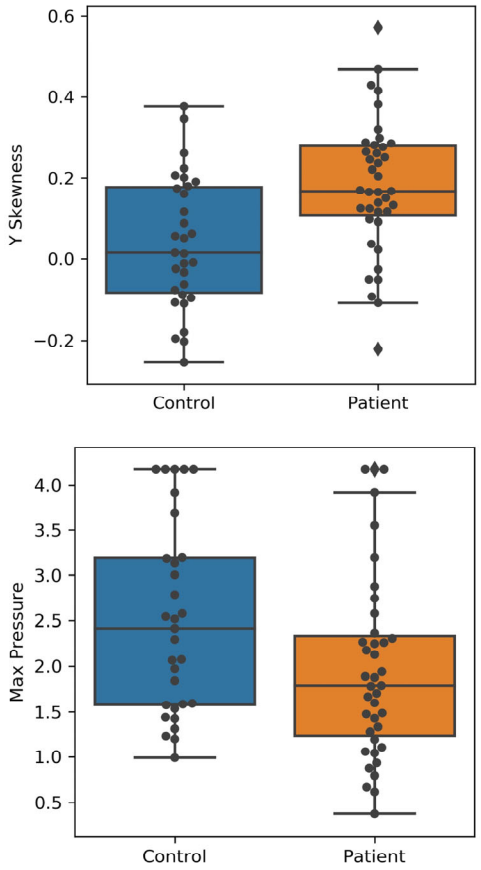
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