

Full-day, in home validation of infant body position measurements from inertial sensors

John M. Franchak¹, Maximilian Tang¹, Hailey Rousey¹, & Chuan Luo¹

Author Note

Add complete departmental affiliations for each author here. Each new line herein must be indented, like this line.

Enter author note here.

Correspondence concerning this article should be addressed to John M. Franchak, UC Riverside Department of Psychology, 900 University Avenue, Riverside, CA 92521. E-mail: franchak@ucr.edu

Abstract

Abstract

Keywords: body position, motor development, everyday experiences, sitting, machine learning

Word count: X

Full-day, in home validation of infant body position measurements from inertial sensors

Current Study

Methods

Participants

Apparatus

Procedure

Body position annotation

Body position classification

Results

Goal 1: Optimize and validate body position classification model

Goal 2: Assess classification accuracy over long recordings

Goal 3: Compare classification estimates to prior literature

Goal 4: Examine wear time and compliance in full-day data collection

Discussion

References

Table 1

Correlations between human-coded and model-predicted body position durations across the entire long delay period. Correlations are provided within each posture and overall, and computed separately using group and individual models with and without outlier participants.

Position	With Outliers		Without Outliers	
	Group	Individual	Group	Individual
Held	-0.02	0.16	0.55	0.63
Prone	0.97	0.83	0.97	0.84
Sitting	0.72	0.93	0.91	0.97
Supine	0.84	0.93	0.94	0.97
Upright	0.84	0.93	0.99	0.94
Overall	0.79	0.90	0.95	0.96

Table 2

Correlations between human-coded and model-predicted body position durations using 10-minute bins during the long delay period. Correlations are provided within each posture and overall, and computed separately using group and individual models with and without outlier participants.

Position	With Outliers		Without Outliers	
	Group	Individual	Group	Individual
Held	0.45	0.44	0.57	0.56
Prone	0.96	0.81	0.96	0.88
Sitting	0.72	0.93	0.91	0.93
Supine	0.75	0.93	0.90	0.94
Upright	0.93	0.95	0.97	0.95
Overall	0.80	0.92	0.92	0.94

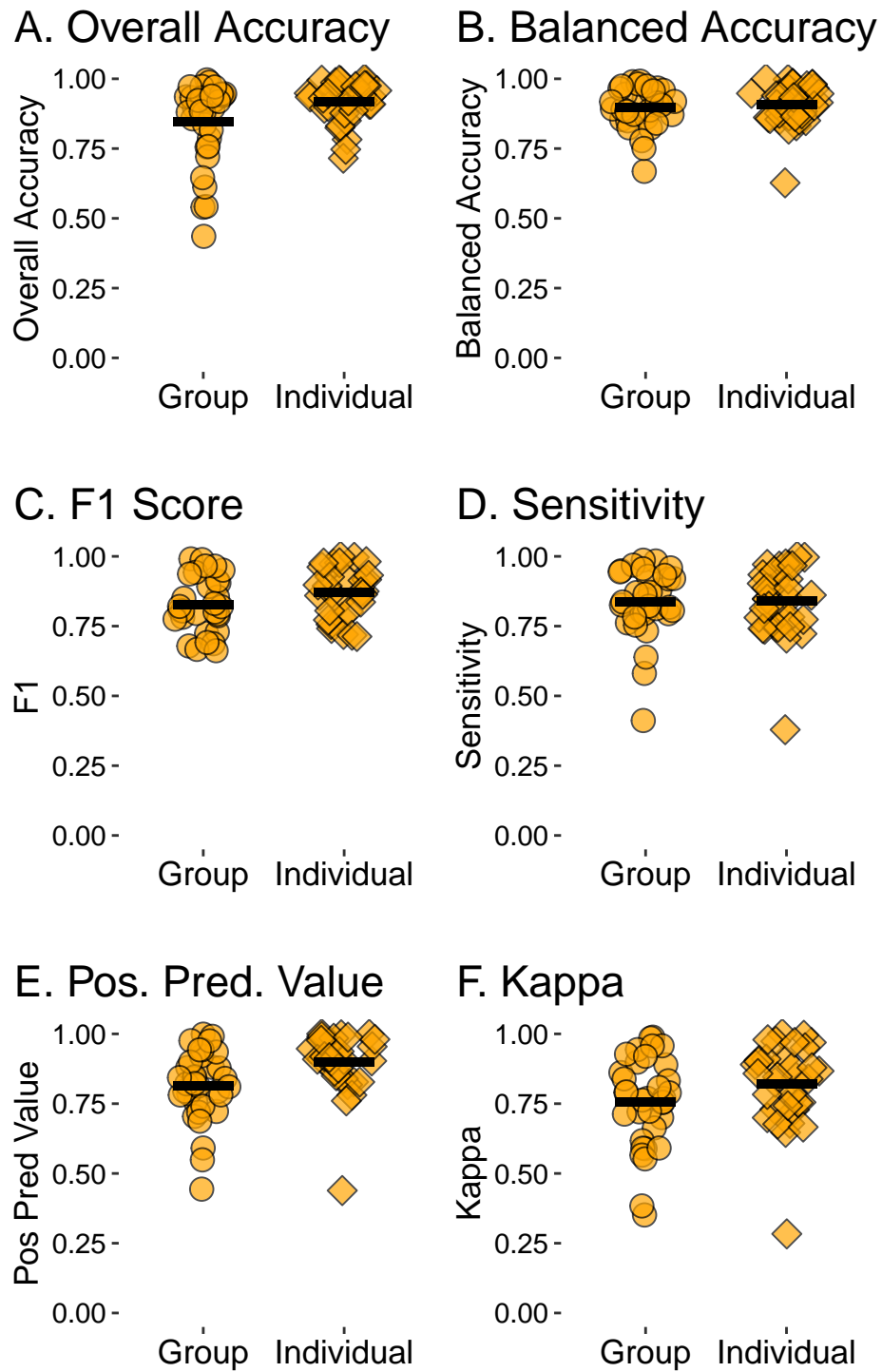
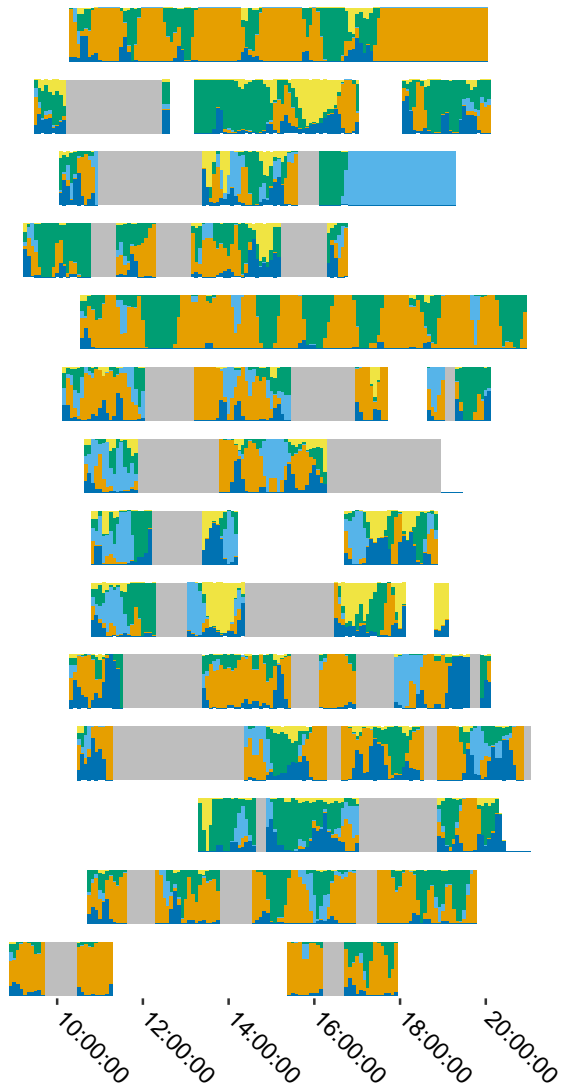


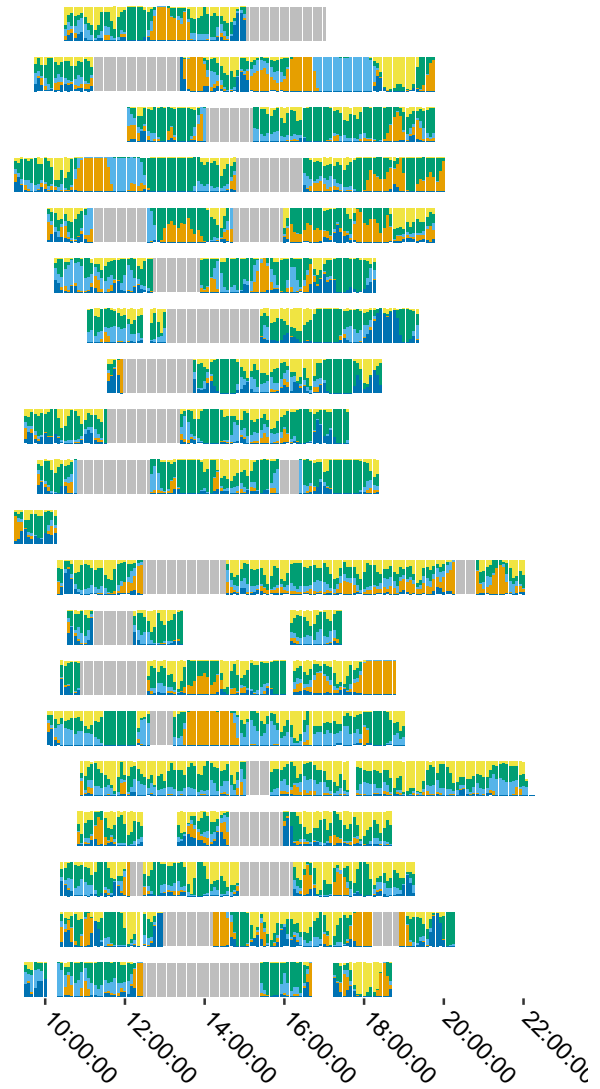
Figure 1. Metrics

A. 4–7 Months



Position  Nap  Sitting  Supine
 Upright  Prone  Held

B. 11–14 Months



Position  Nap  Sitting  Supine
 Upright  Prone  Held

Figure 2. Timelines

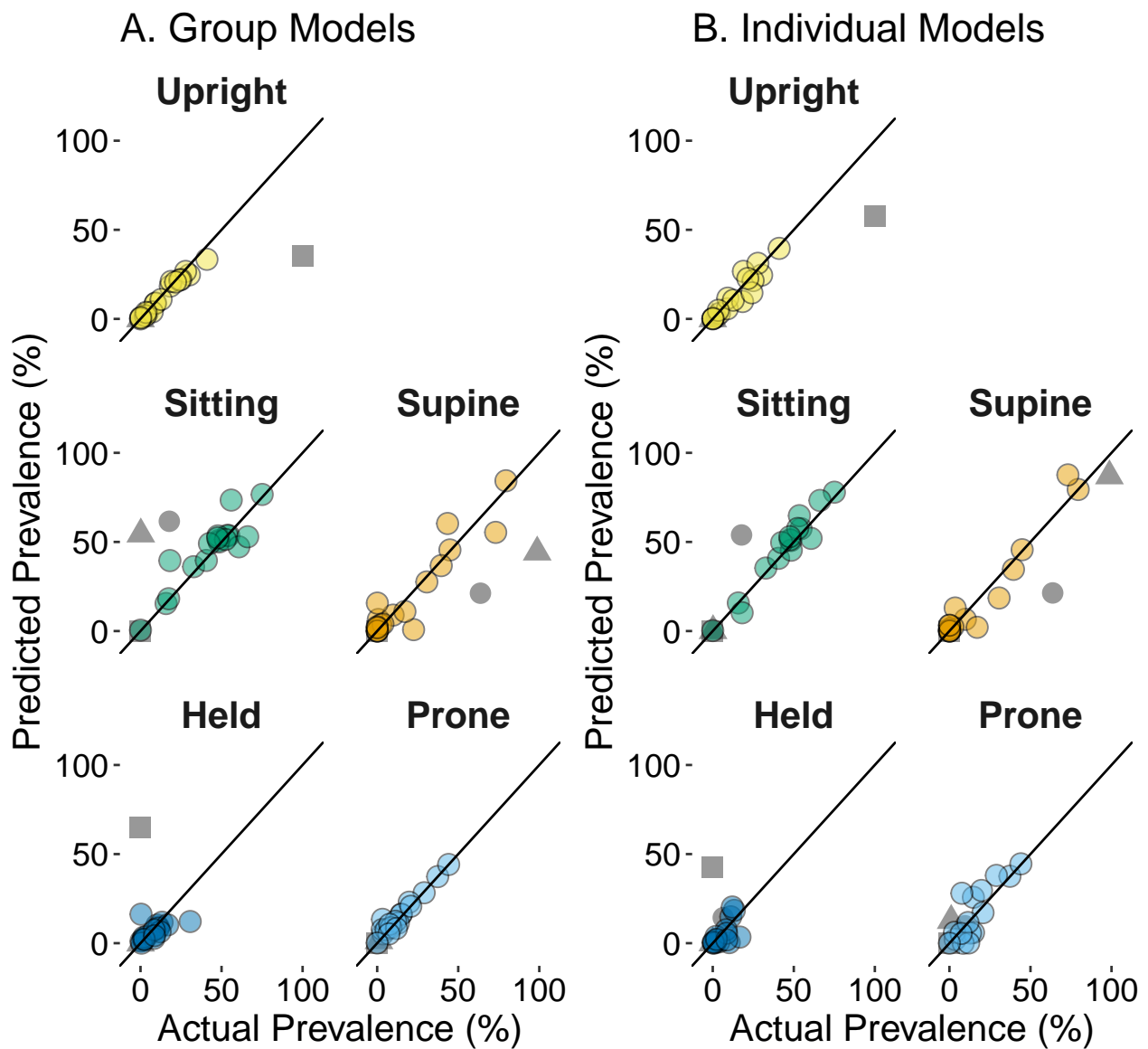


Figure 3. Overall agreement between human-coded body position and model-predicted body position in the long-delay period. Agreement for group models is shown in (A) and agreement for individual models is shown in (B). Plots are shown separately for each body position with a reference line that indicates perfect agreement; each point in a plot represent data for a single participant. The three outlier participants are plotted in dark gray, with a different shape marking each individual.

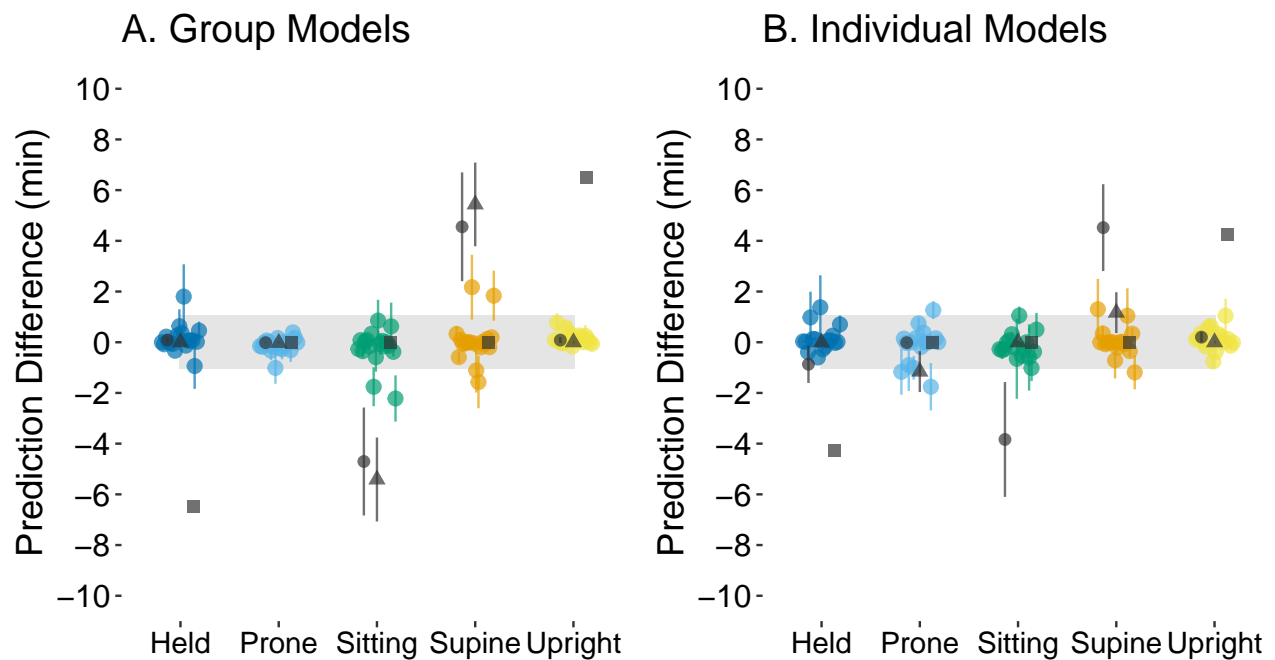


Figure 4. Prediction performance (difference in minutes between human-coded and model-predicted body position) for 10-minute bins in the long delay period. Each point shows the mean and SE for a single participant for each body position, summarizing the prediction difference for each of their 10-minute bins. Points falling within the gray shaded region indicate that average prediction errors were less than 1 minute. Performance is plotted separately for (A) group models and (B) individual models. The three outlier participants are plotted in dark gray, with a different shape marking each individual.

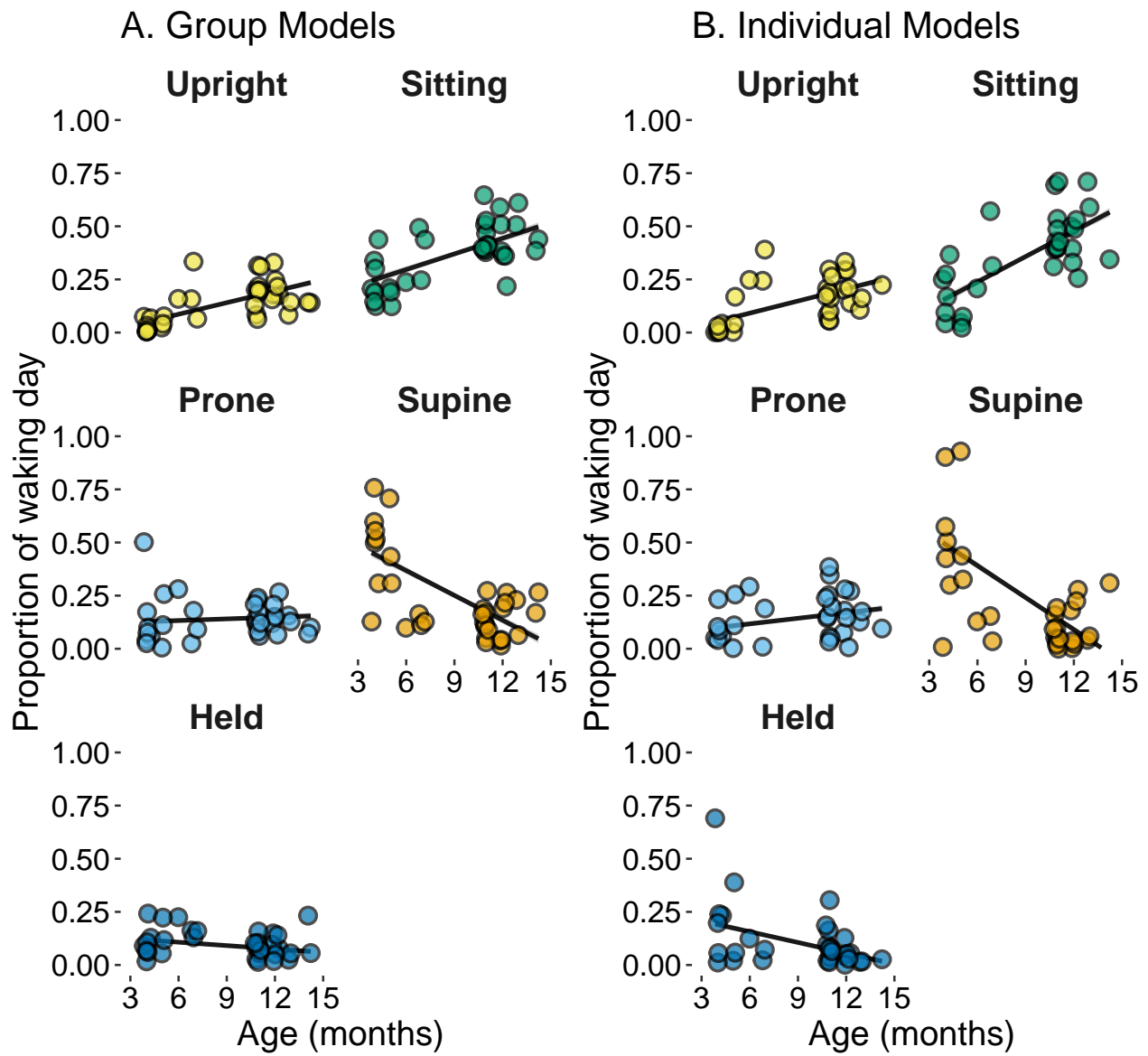


Figure 5. Age trends