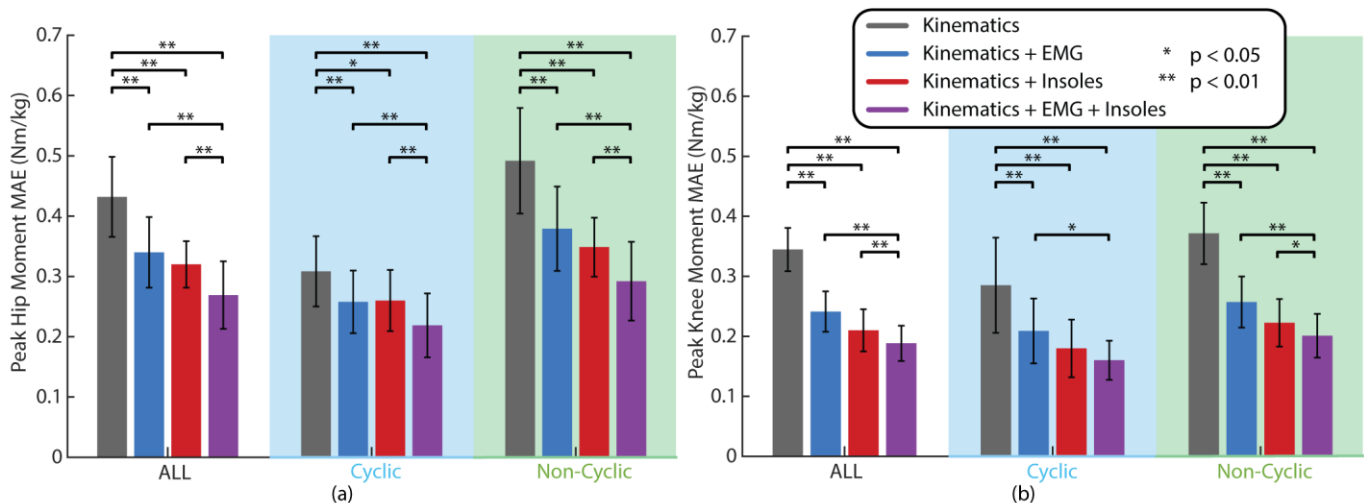


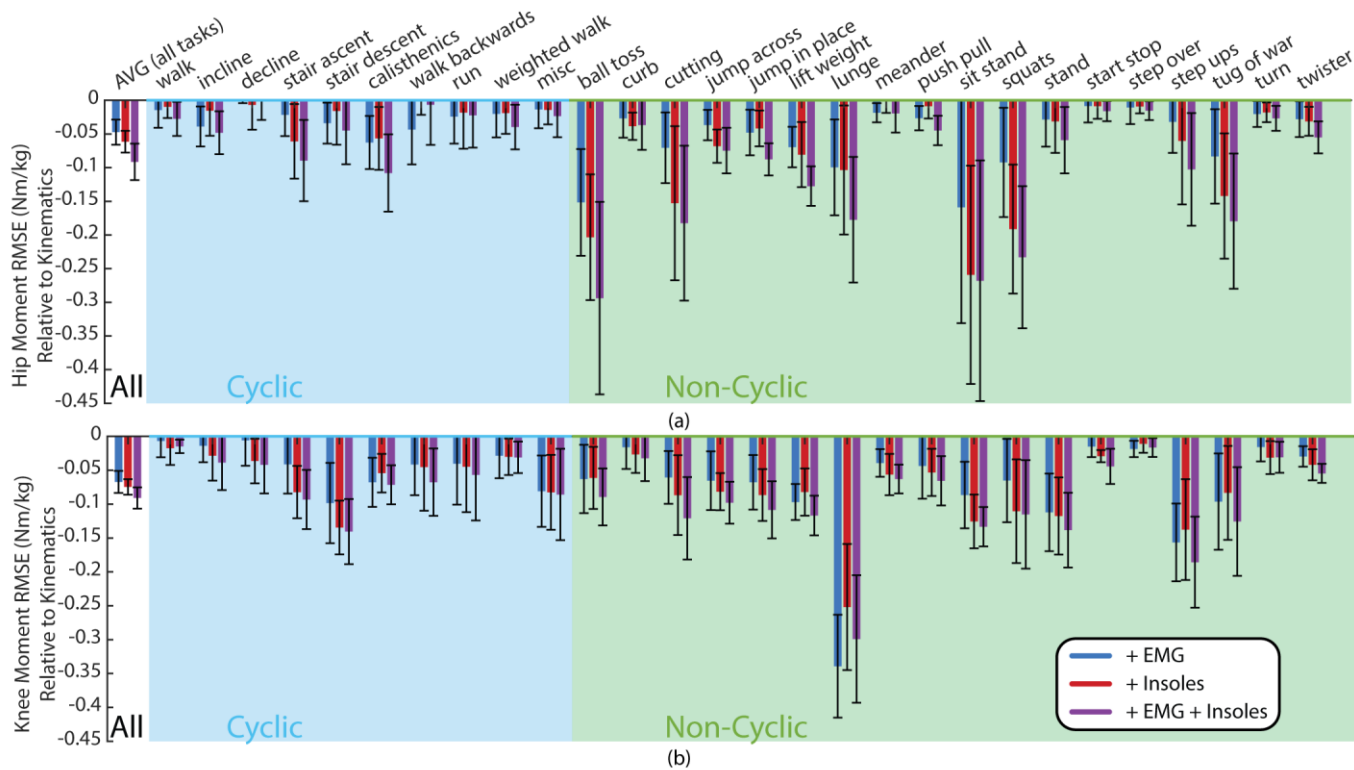
Supplement to Improving Biological Joint Moment Estimation During Real-World Tasks with EMG and Instrumented Insoles- Alternative Outcome Metrics

In addition to RMSE and R^2 , several other outcome metrics are useful for gauging the performance of our deep learning models. The error at the peak joint moment for a given activity is a useful metric, specifically for injury risk. To determine the peak moment, each task was segmented based on the segmentation scheme set forth in our published dataset [11] (activities with a concrete gait cycle were segmented by cycle while those without were segmented by either a velocity threshold or by passes across the force plates). For those tasks that were not segmented in the dataset (e.g. meander or push-pull), each trial was considered a single segment. The peak absolute flexion/extension moment was determined for each segment and the absolute error was computed between the ground truth moment and the deep learning estimate at that point. These absolute errors were first averaged within each task group to get a peak moment mean absolute error (MAE) for each task group and participant. Then similar to the analyses in the main text, these were averaged across groups within the larger task delineation (all, cyclic, non-cyclic). The mean and standard deviation across participants is then presented as a bar with standard deviation in Supplementary Figure 1.



Supplementary Fig. 1. Peak moment mean absolute error (MAE) results from comparing different sensor inputs in a deep learning model for joint moment estimation. Hip (a) and knee (b) moment estimation errors at the peak moment across sensor additions are presented for all of the tasks and then broken down into cyclic and non-cyclic tasks. Error bars represent the standard deviation across the 12 subjects.

Additionally, it is useful to examine the relative decrease in RMSE for each specific task relative to kinematics in addition to the actual RMSE as presented in Fig. 5. This can be calculated using equation 1 for each task and participant. Supplementary Fig. 2 shows these results for the hip and knee.



Supplementary Fig. 2. RMSE results relative to the model with only kinematic input. Results for the hip (a) and the knee (b) are first presented as an average across all tasks and then broken down by each task in the broad categories of cyclic and non-cyclic. This is shown based on the performance for each left out task from a model trained on the other tasks. Error bars represent the standard deviation across the 12 subjects.