

Using Electrodermal Activity to Recognize Ease of Engagement in Children during Social Interactions

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Motivation

Children's emotional self-regulation and co-regulation are key components in understanding engagement.

Can we characterize qualitative aspects of children's social engagement with wearable biosensors?



Experimental Setting



External coder

"Amount of effort required to get child's attention"

Ratings per activity:

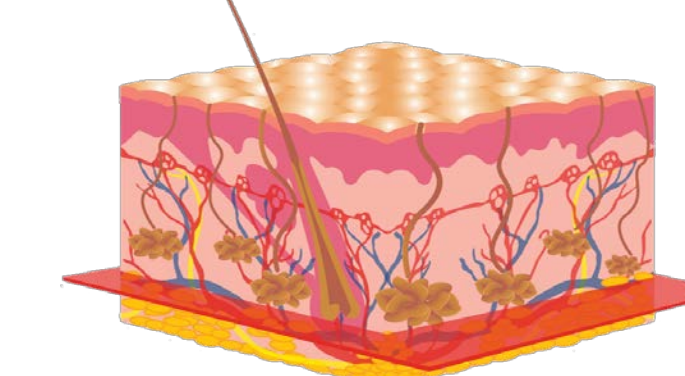
- 0 – little effort
- 1 – some effort
- 2 – extensive effort

23 sessions excluded (artifacts)

51 sessions used for analysis

- Easier to engage (N: 29)
- Harder to engage (N: 22)

Electrodermal Activity (EDA)



Good Indicator

- Arousal
- Cognitive Load

Limitations

- Specificity
- Artifacts

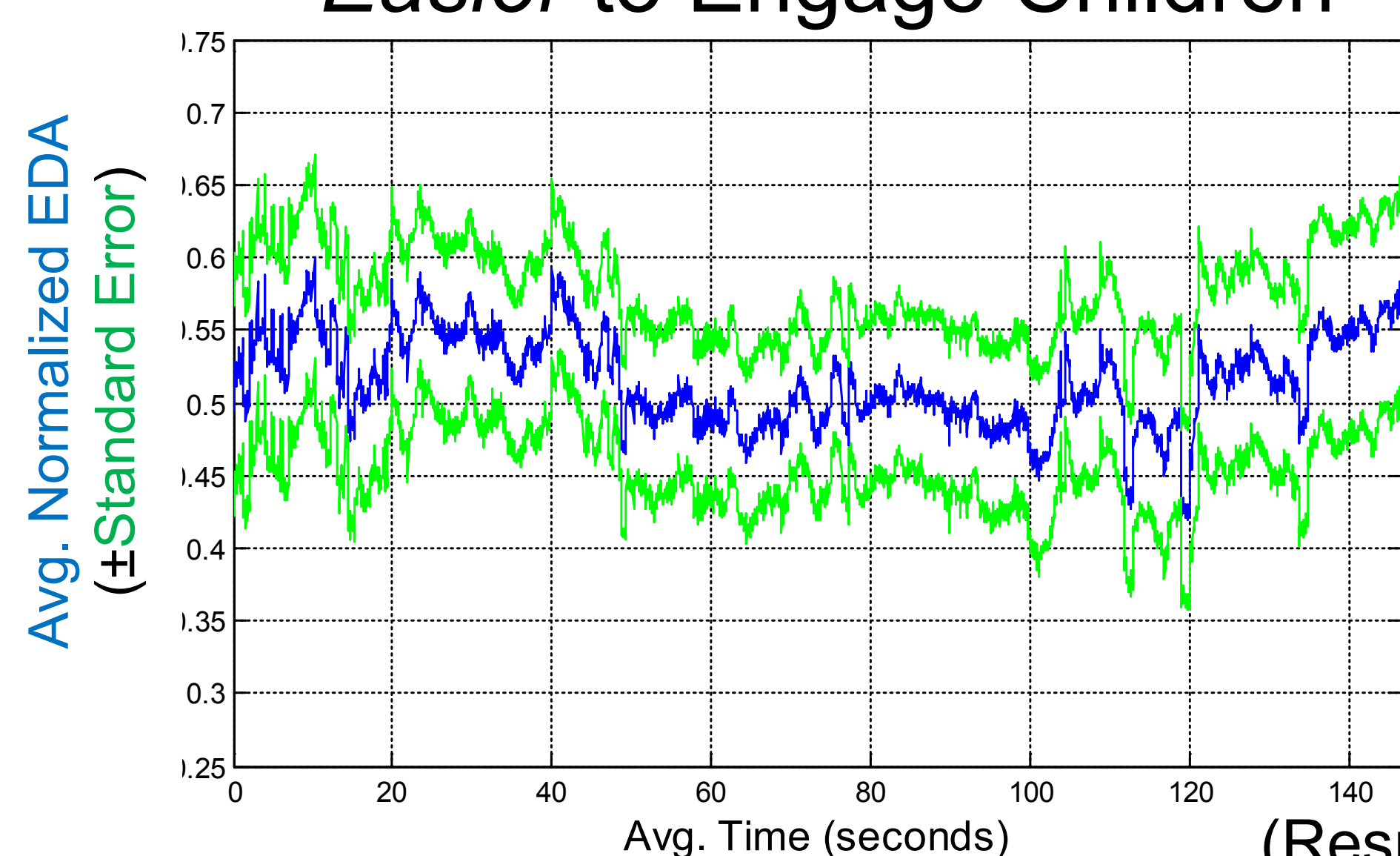
- Wireless
- Comfortable

- 32 Hz
- 4 sensors



Characterization of EDA Responses

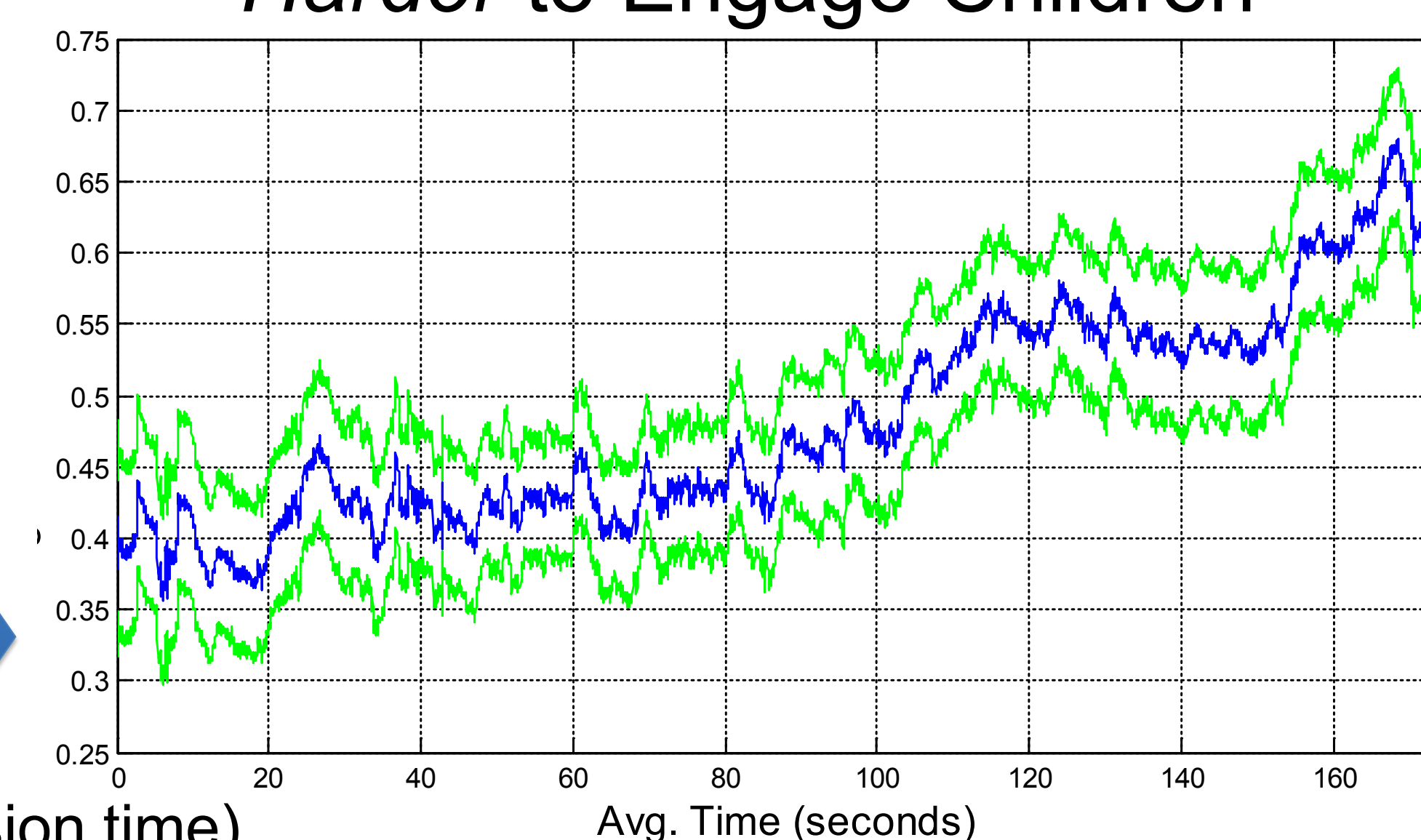
Easier to Engage Children



EDA levels stable
 Shorter sessions
 (N: 29)

EDA levels increase
 Longer sessions
 (N: 22)

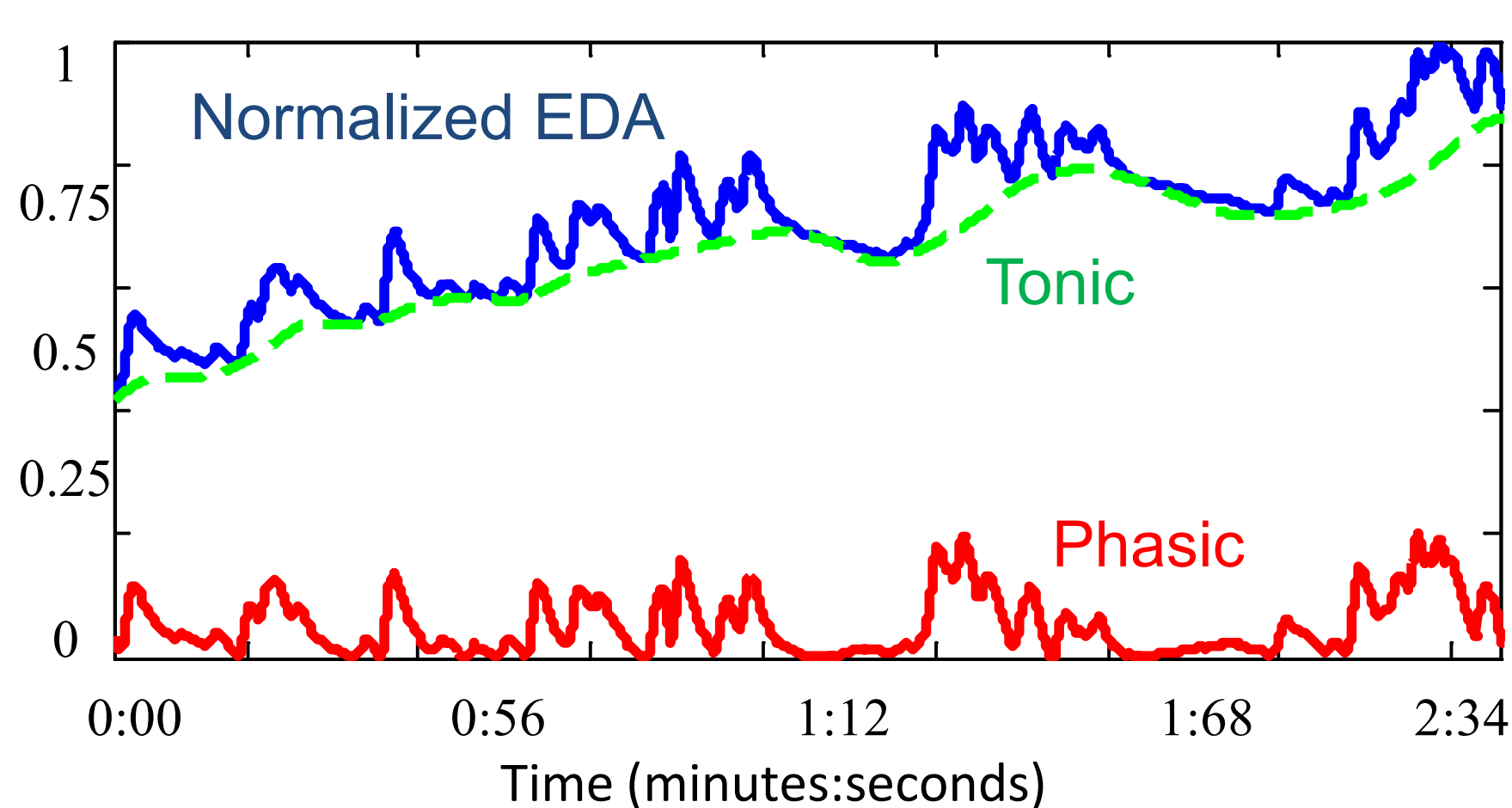
Harder to Engage Children



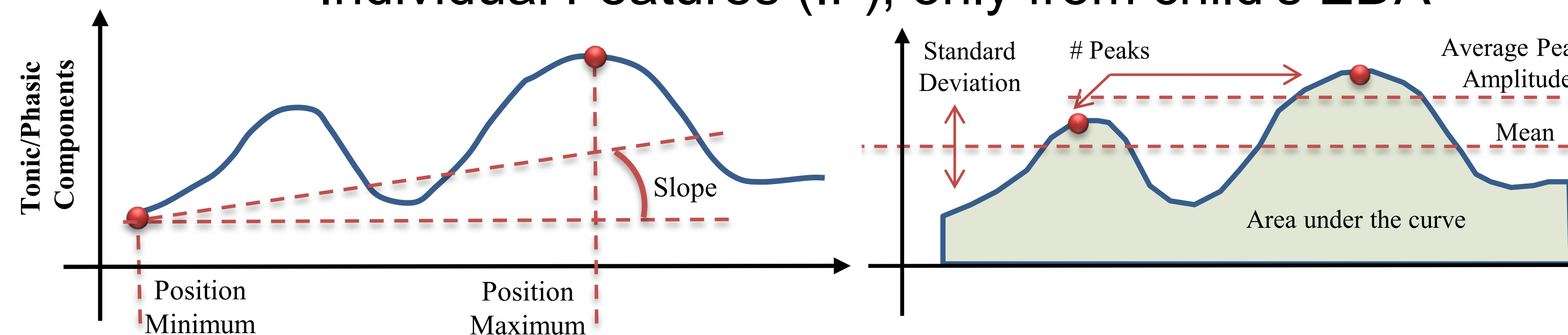
(Responses were resampled to last the average session time)

Processing

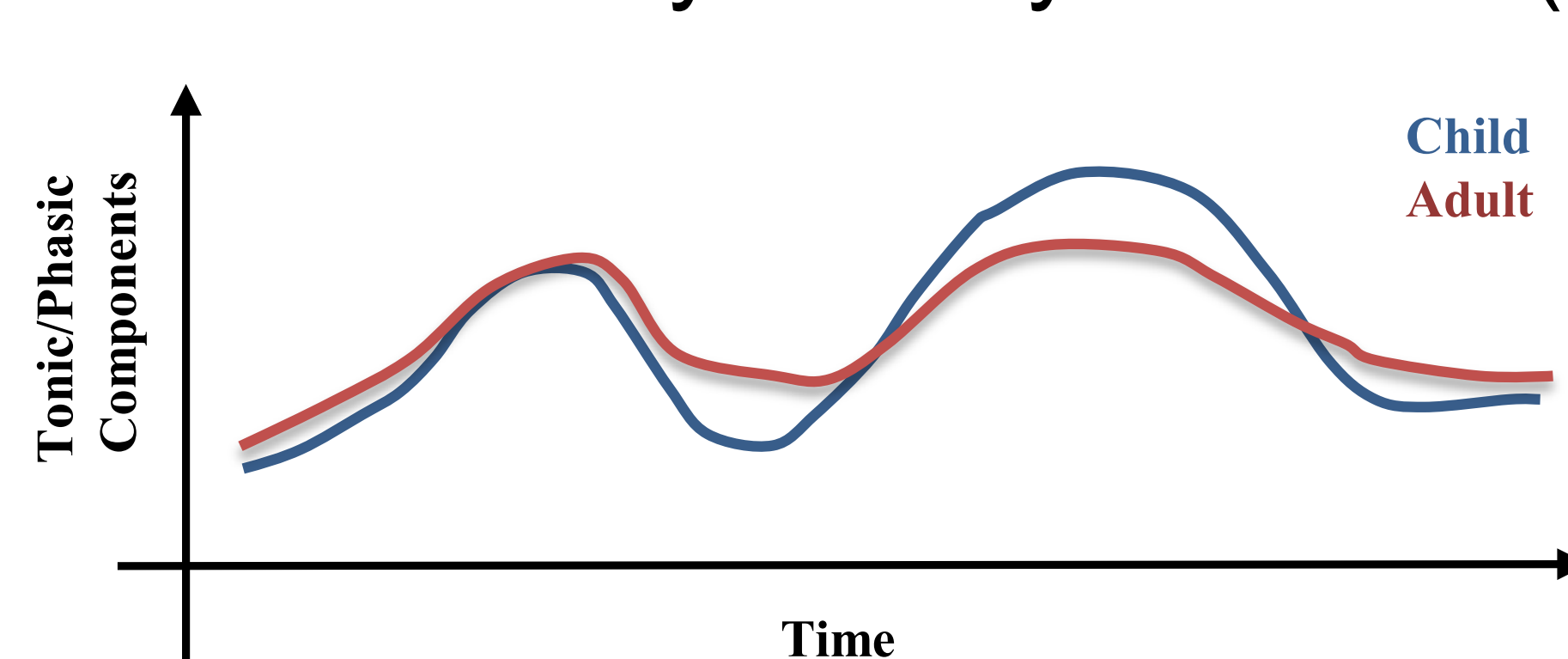
1. Normalize EDA values
2. Reduce noise
3. Extract tonic and phasic EDA (Benedek and Kaemba, 2010)



Individual Features (IF); only from child's EDA



Synchrony Features (SF); from the dyad's EDA



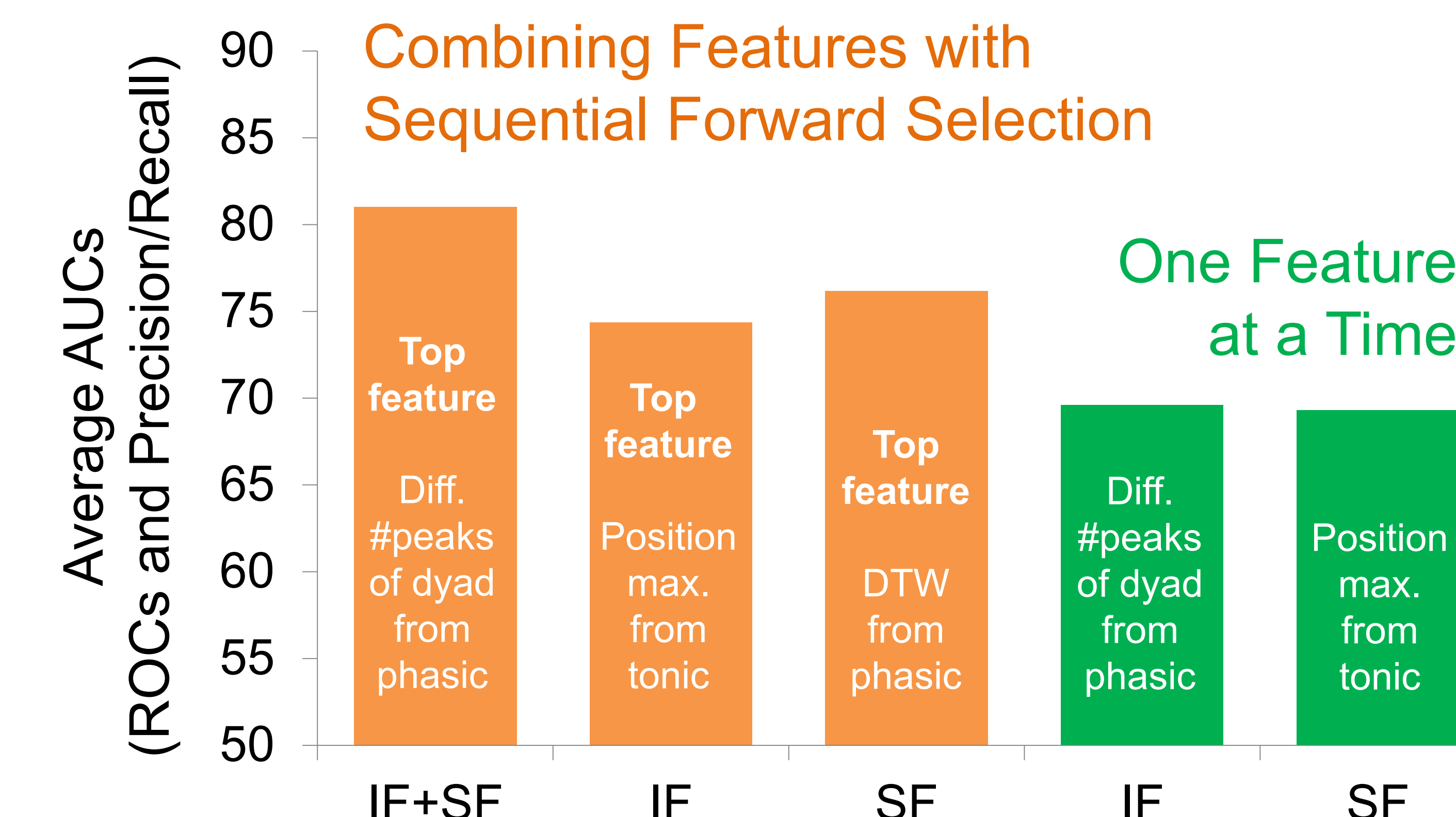
Correlation between responses:

- Pearson correlation
- Canonical Correlation
- Dynamic Time Warping

Differences between features:

- Means
- # Peaks
- Avg. peak amplitude

Easier vs Harder to Engage with SVMs



SF and IF similar performance

IF better from tonic

SF better from phasic

Tonic and Phasic decomposition improved >6%

Feature selection improved >11%

SF slightly better than IF (>2%)

Tonic and phasic equally represented

SF and IF are complementary