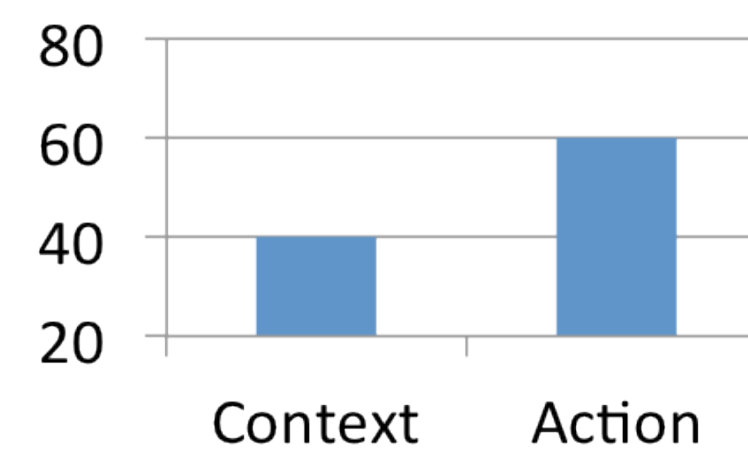


## BACKGROUND

- **Children with Autism Spectrum Disorders (ASD):**
  - Poor **linking of causal events** [Losh et al. '03].
  - Weak **emotional understanding** within a story [Losh et al. '03].
  - Less **coherent narratives** [Diehl et al. '06].
- **Parental elicitation strategies** affect:
  - The narrative **content** and **structure** [Peterson et al. '92].
  - The overall narrative **quality** [Clarke-Stewart et al. '99].
  - Children's **understanding of emotions** [Slaughter et al. '07].



## HYPOTHESIS



**Context:** description of people, objects, etc.

- e.g. "Is that grass?", "How does he look?"

**Action:** focus on events, more structured story

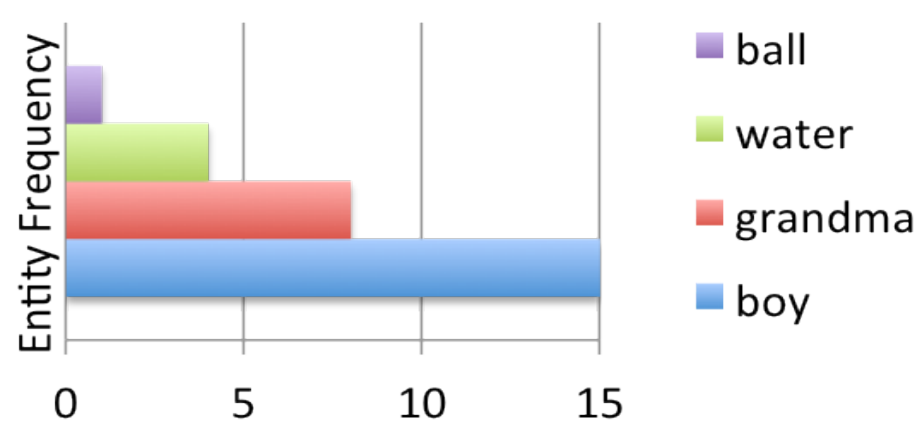
- e.g. "What is going on in this picture?"

**Narrative Structure**

**The way parents scaffold the story, and specifically whether they ask more context or action questions, affects the overall narrative structure.**

## NARRATIVE STRUCTURE FEATURES

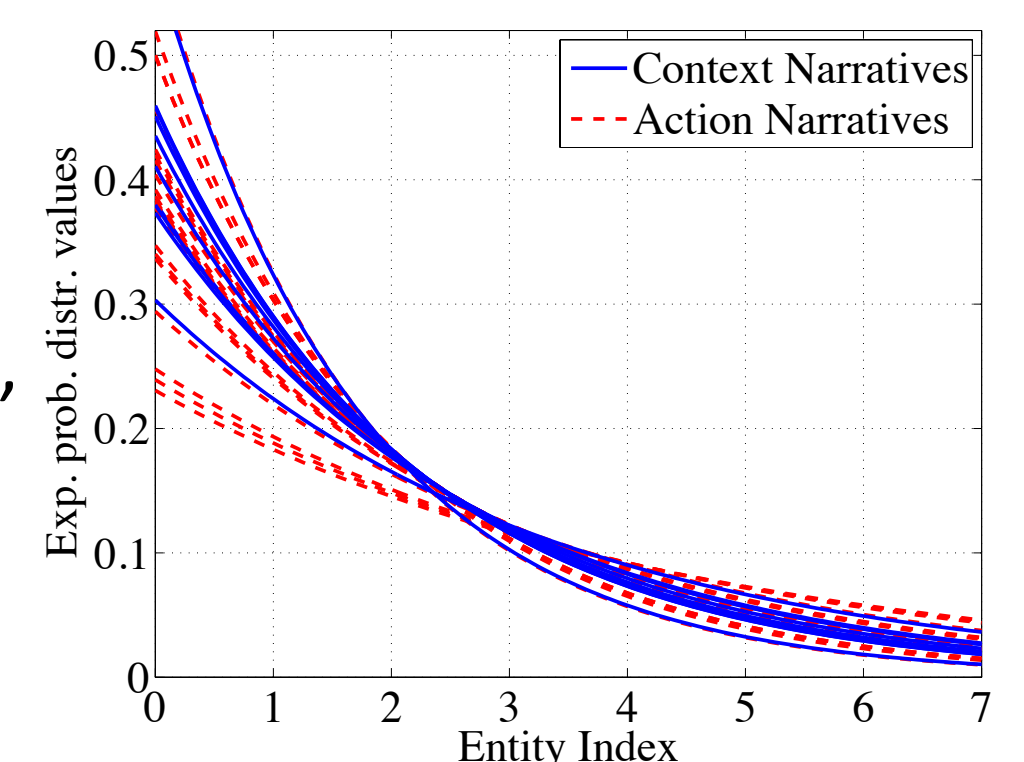
- **Entity counts** (baseline)
  - # unique entities
  - % entities with frequency larger than 0.05-0.2
  - Larger values for action narratives.



- **Entities:** Co-referent noun-phrases representing main characters, ideas, etc.

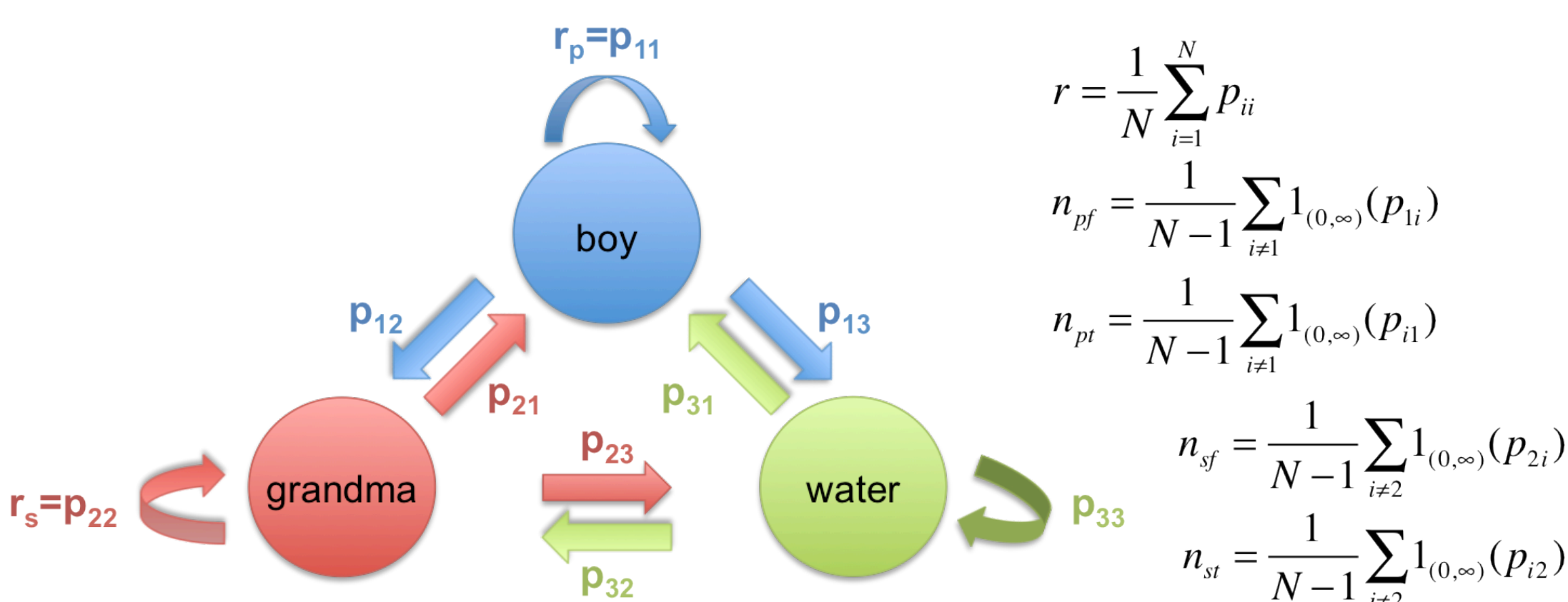
### Entity frequency distribution

- Decreasing shape of entity frequency distribution.
- Shape and scale parameters of exponential, Pareto distributions.
- Steep curve implies few important but commonly repeated entities.



### Entity transitions

- Narrative entities <-> states
- Sentence evolution <-> transitions } Markov Chain  $P = [p_{ij}]$
- Less transitioning in action narratives between entities.
- Most frequent entities dominate the plot in action narratives.

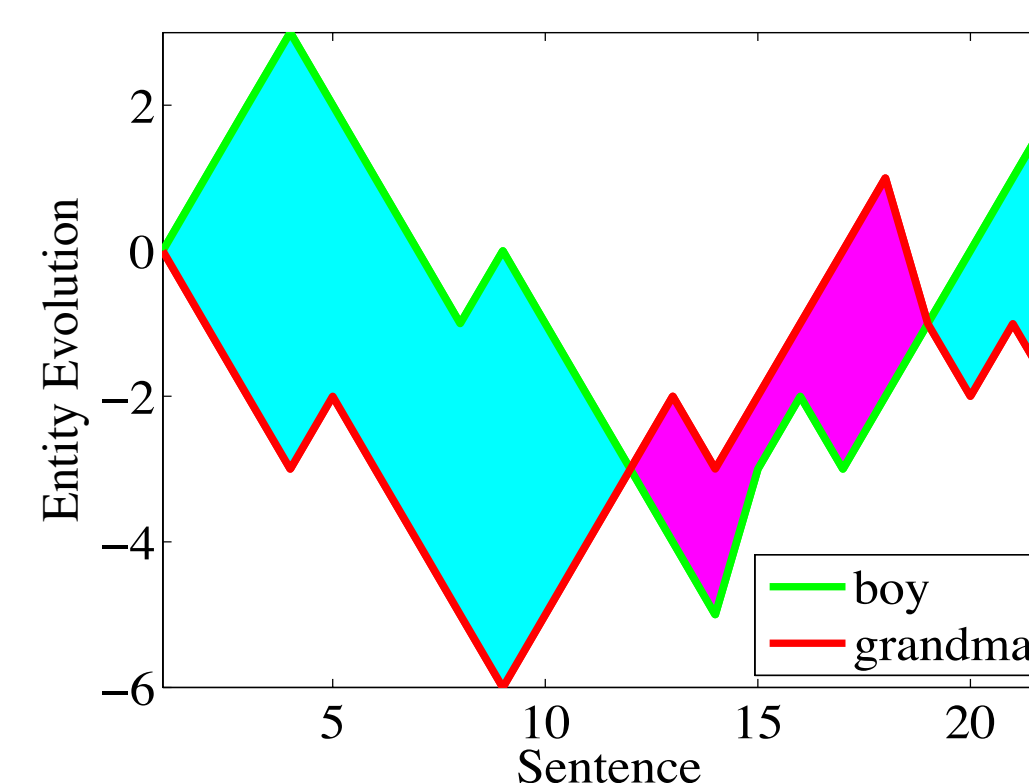


### Entity evolution and interaction

- $\{X_{nk}\}$  :  $n^{\text{th}}$  entity sequence at  $k^{\text{th}}$  step
- $X_{nk} = X_{n,k-1} \pm 1$  if entity  $n$  exists (or not) in sentence  $k$
- Directional distances of sequences (larger in action narratives)

$$d_{nm} = E_{k \in S_h} (X_{nk} - X_{mk}), S_h = \{k : X_{nk} > X_{mk}\}$$

$$d_{mn} = E_{k \in S_l} (X_{mk} - X_{nk}), S_l = \{k : X_{nk} < X_{mk}\}$$



## RESULTS

- **Rachel ECA Interaction Corpus:** 11 children, 4 stories each
- Classification of context, action and context/action narratives
- Fisher Discriminant Ratio + Linear Discriminant Analysis
- K-NN classifier

Feature Group	Unweighted Accuracy (%)
Entity Count	52.27
Entity Frequency Distribution	36.51
Entity Transitions	59.85
Entity Evolution/Interaction	44.70
Entity Count + Frequency Distribution	51.52
Entity Count + Transitions	61.36
Entity Count + Evolution/Interaction	62.88

## CONCLUSIONS AND FUTURE WORK

### Conclusions

- Story structure differs for context and action narratives.
- **Evolution** and **interaction** of entities affect story structure.
- **Action** narratives tend to focus on **few dominant entities**.

### Future Work

- Agents for **personalized scaffolding** for children with ASD.
- **Semantic** and **syntactic** evolution of entities.
- Conditioning on more detailed **parental stimuli**.