Rhythm discrimination in cats: A case study

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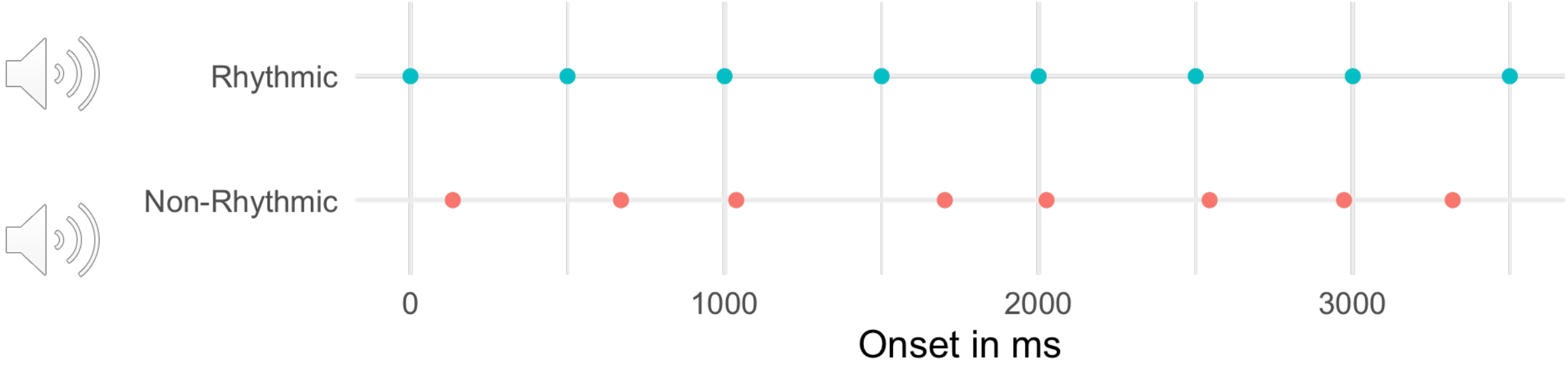
PRESS
PULL
18:02
TIME
FEED
CAT MATE

Experimenal setup

- Three times a day the cat feeder delivers food.
- 30 sec. before food delivery an isochronous rhythm is played next to the feeder.
- Every 30 min. a non-rhythmic 30 sec. decoy sequence is played.
- Can my cat learn to discriminate between rhythmic and non-rhythmic sequences and only show up before food delivery?

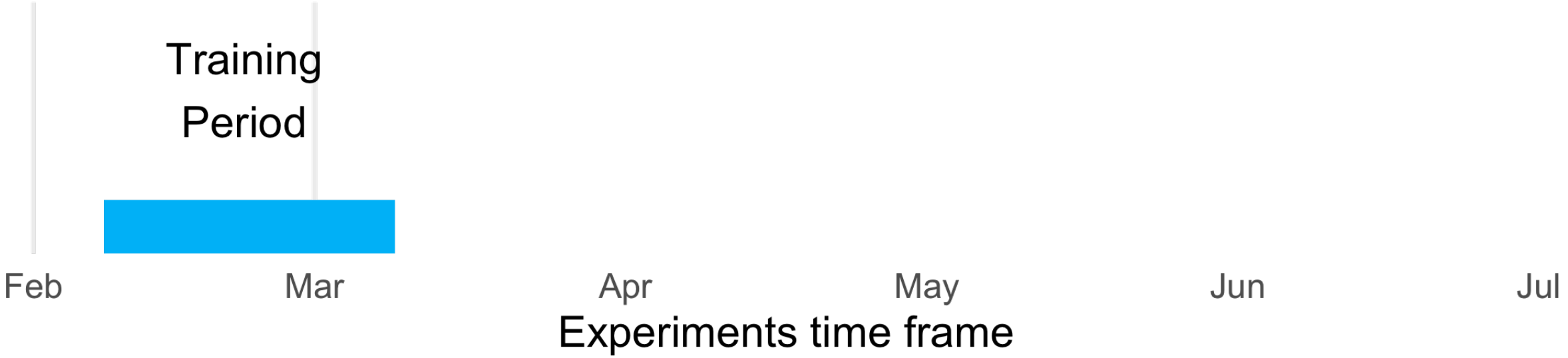
The stimuli

- 60 tones of 20ms, 1760 Hz (A6) Sine waves
- Rhythmic sequences: 500 ms ISI
- Non-rhythmic sequences: 500 ms ISI *on average*.



Training period

- Time frame: 8th of Feb to 9th of March
- Feeding times: 09:30, 13:00, and 19:00
- Decoy times: Between 08:00 and 21:00, every 30 min.



Experiment = First Schedule
Condition = random
ISI = 500
Time = 2014-03-10 08.29.35

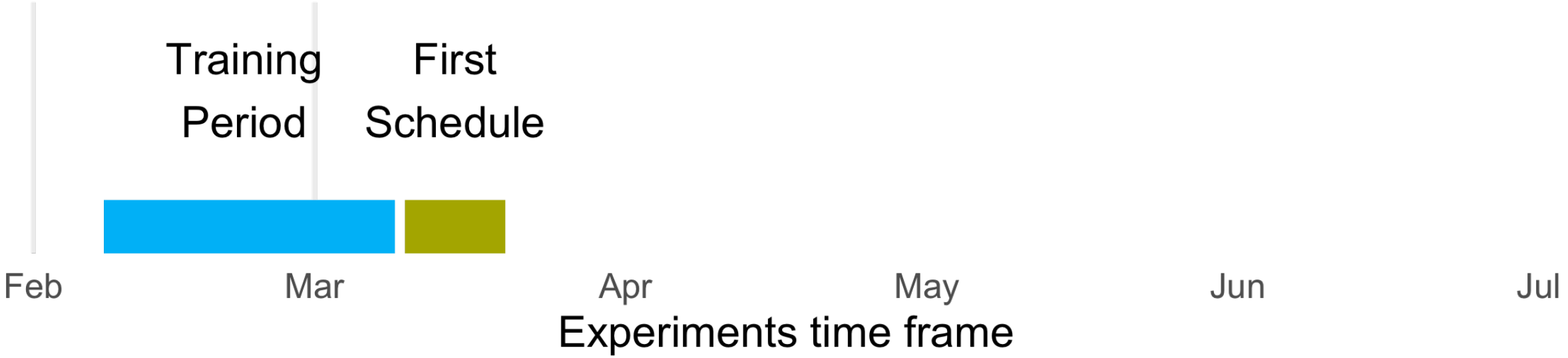
Experiment = First Schedule
Condition = rhythm
ISI = 500
Time = 2014-03-10 09.29.35

Experiment = First Schedule
Condition = rhythm
ISI = 500
Time = 2014-03-11 09.29.29

Experiment = First Schedule
Condition = random
ISI = 500
Time = 2014-03-10 08.59.35
00:03:58
04:41:13

First feeding schedule

- 10th of March to 20th of March
- Feeding times: 09:30, 13:00, and 19:00
- Decoy times: Between 08:00 and 21:00, every 30 min.
- In total, 31 rhythmic and 258 non-rhythmic trials.

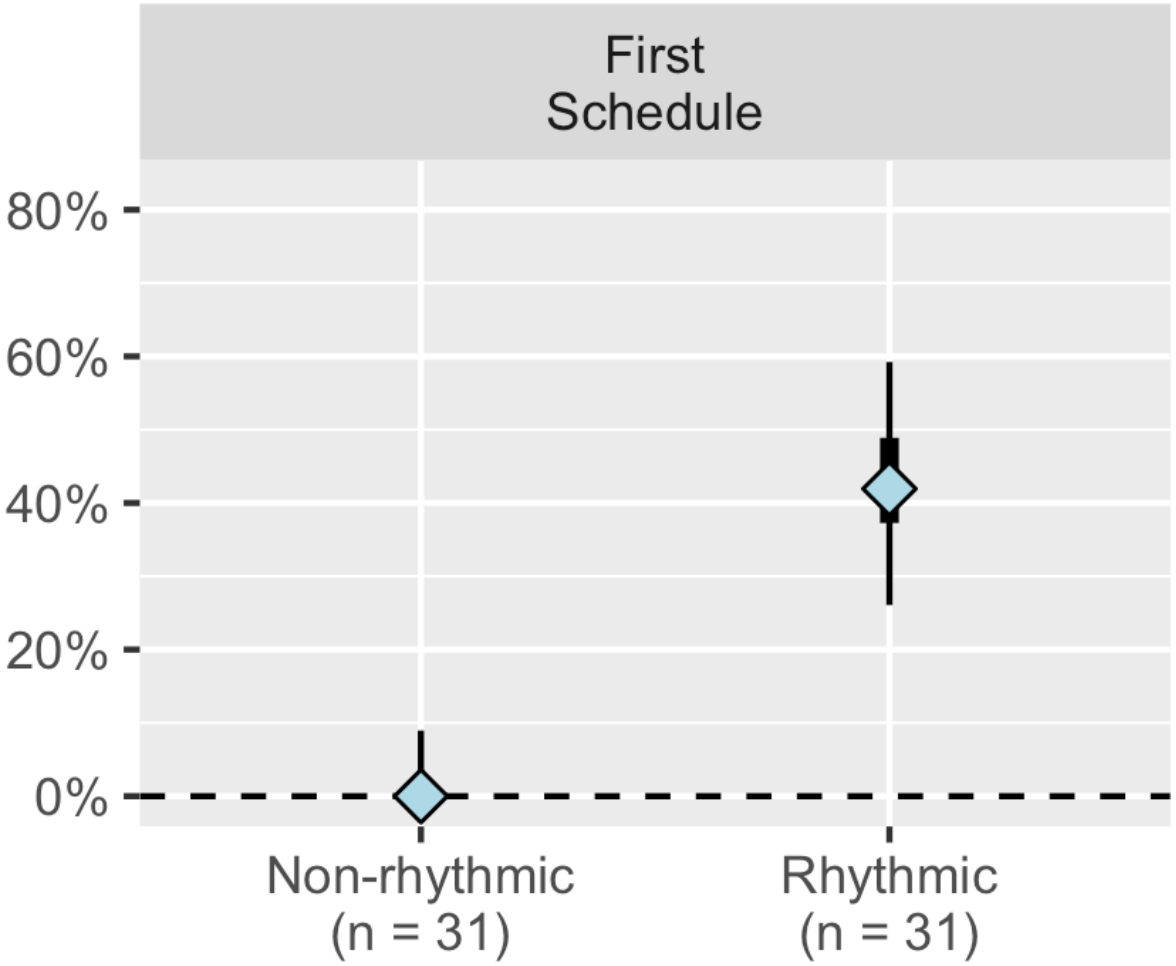


Statistical analysis

- Main statistic: Proportion (%) of correct appearances
- Compare rhythmic feeding times with pre-feeding non-rhythmic decoys
- Statistical model: Binomial, uniform prior

$$n_{correct} \sim \text{Binomial}(n_{trials}, p_{correct})$$
$$p_{correct} \sim \text{Uniform}(0, 1)$$

Proportion of correct appearances

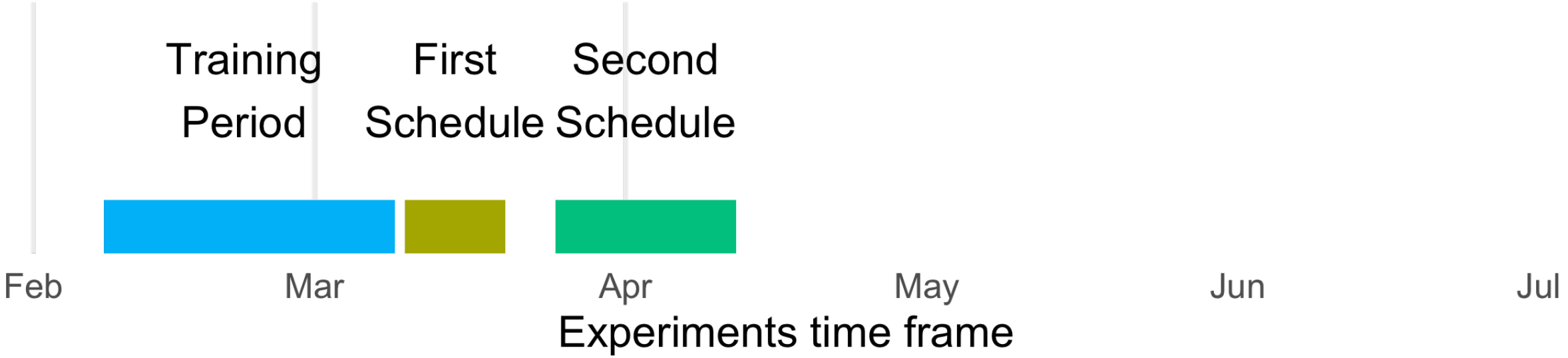


The ♦s show the % of appearances in the data. The lines show 50% and 95% probability intervals.

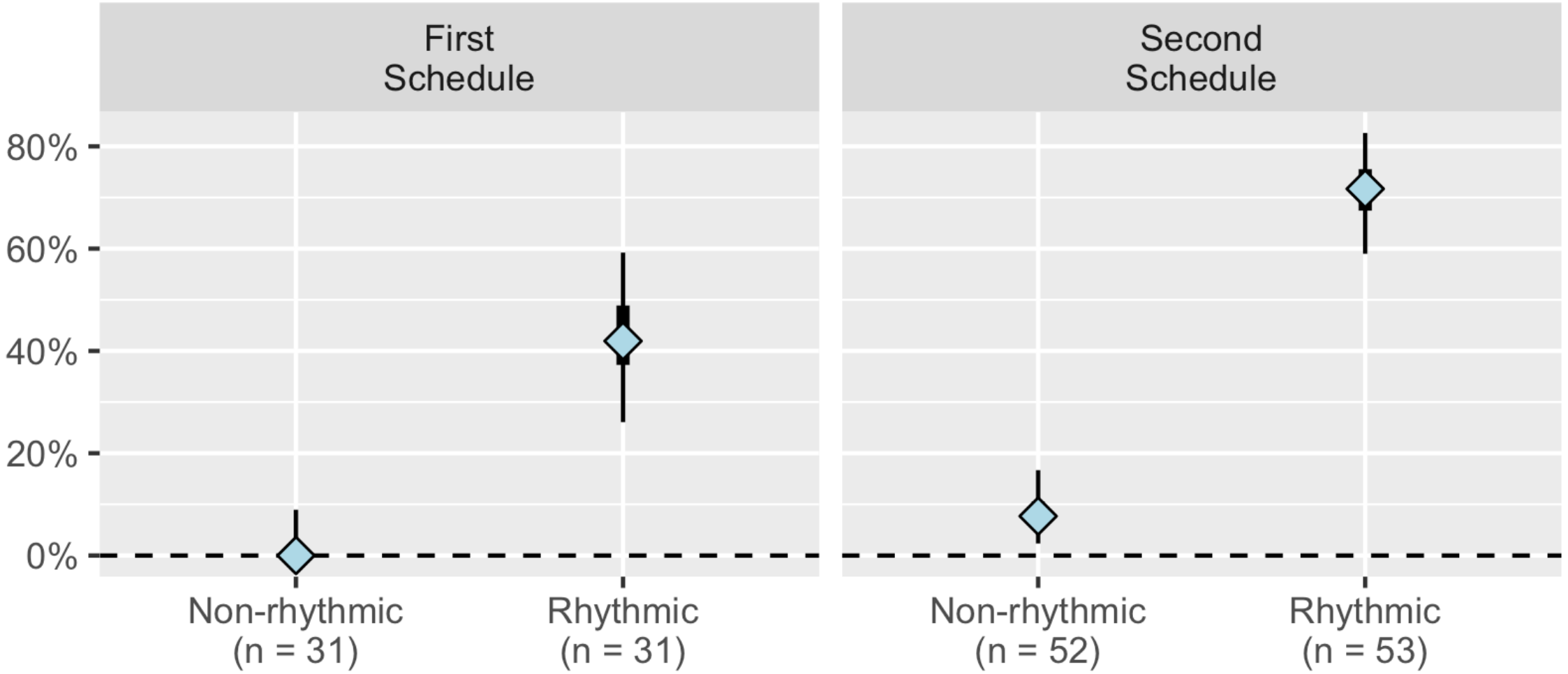
Maybe she just learned the feeding times?

Second feeding schedule

- 25th of March to 12th of April
- Feeding times: ~~09:30~~ 09:00, ~~13:00~~ 13:30, and ~~19:00~~ 18:00
- Decoy times: Between 08:00 and 21:00, every 30 min.
- In total, 53 rhythmic and 426 non-rhythmic trials.



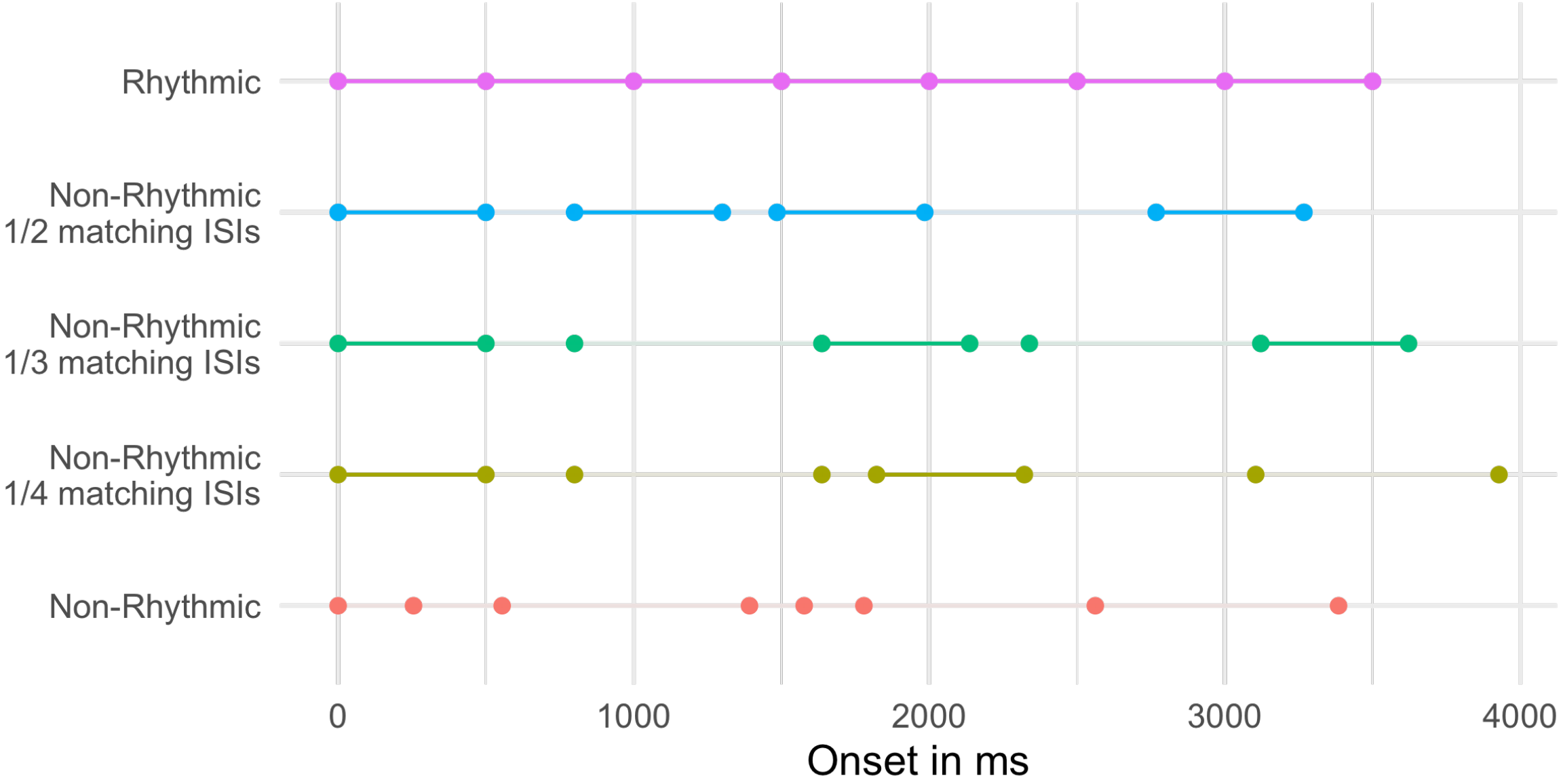
Proportion of correct appearances



The ♦s show the % of appearances in the data. The lines show 50% and 95% probability intervals.

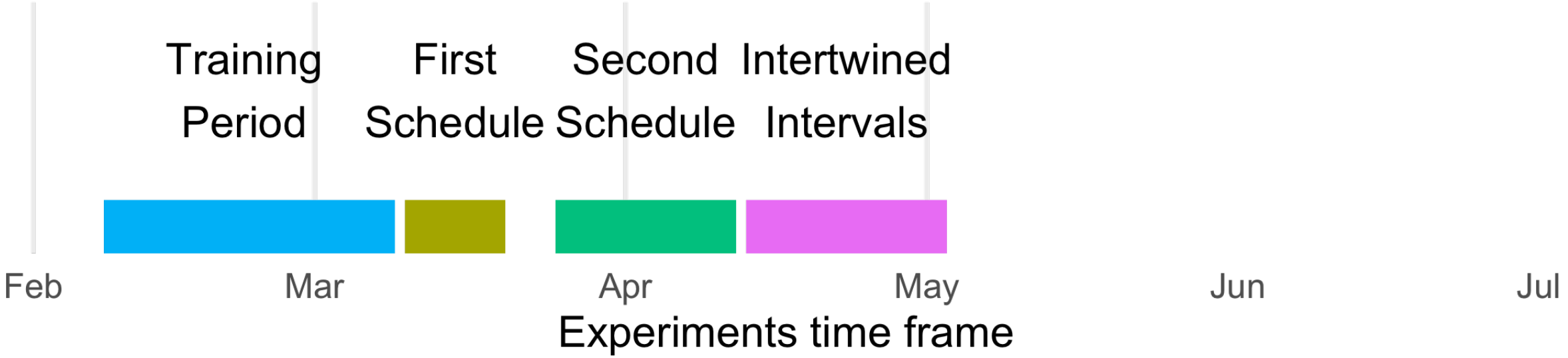
She hasn’t learned the feeding times.
But maybe she’s learned the intervals?

Intertwined intervals

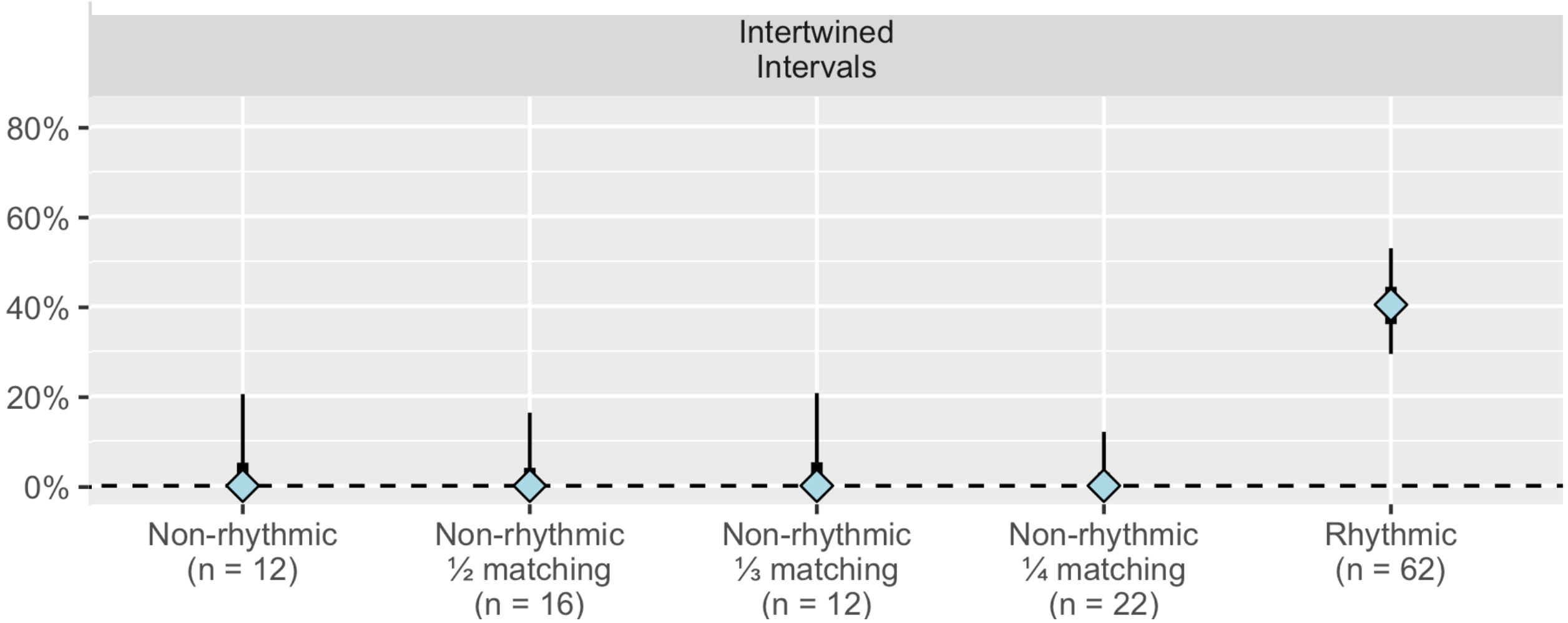


Intertwined intervals

- 13th of April to 3rd of May
- Feeding times: 09:00, 13:30, and 18:00
- Decoy times: Between 08:00 and 21:00, every 30 min.
- In total, 62 rhythmic and 500 non-rhythmic trials.



Proportion of correct appearances

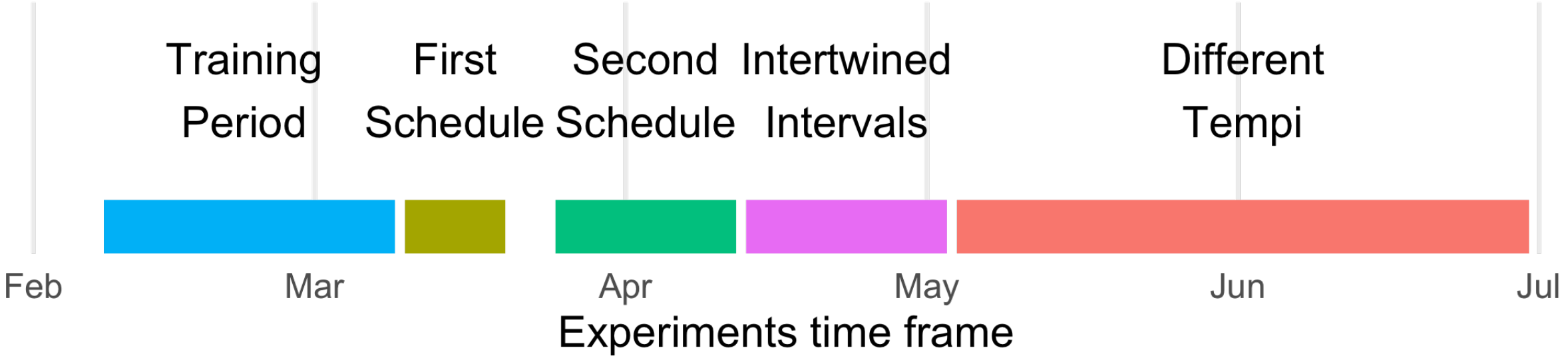


The ♦s show the % of appearances in the data. The lines show 50% and 95% probability intervals.

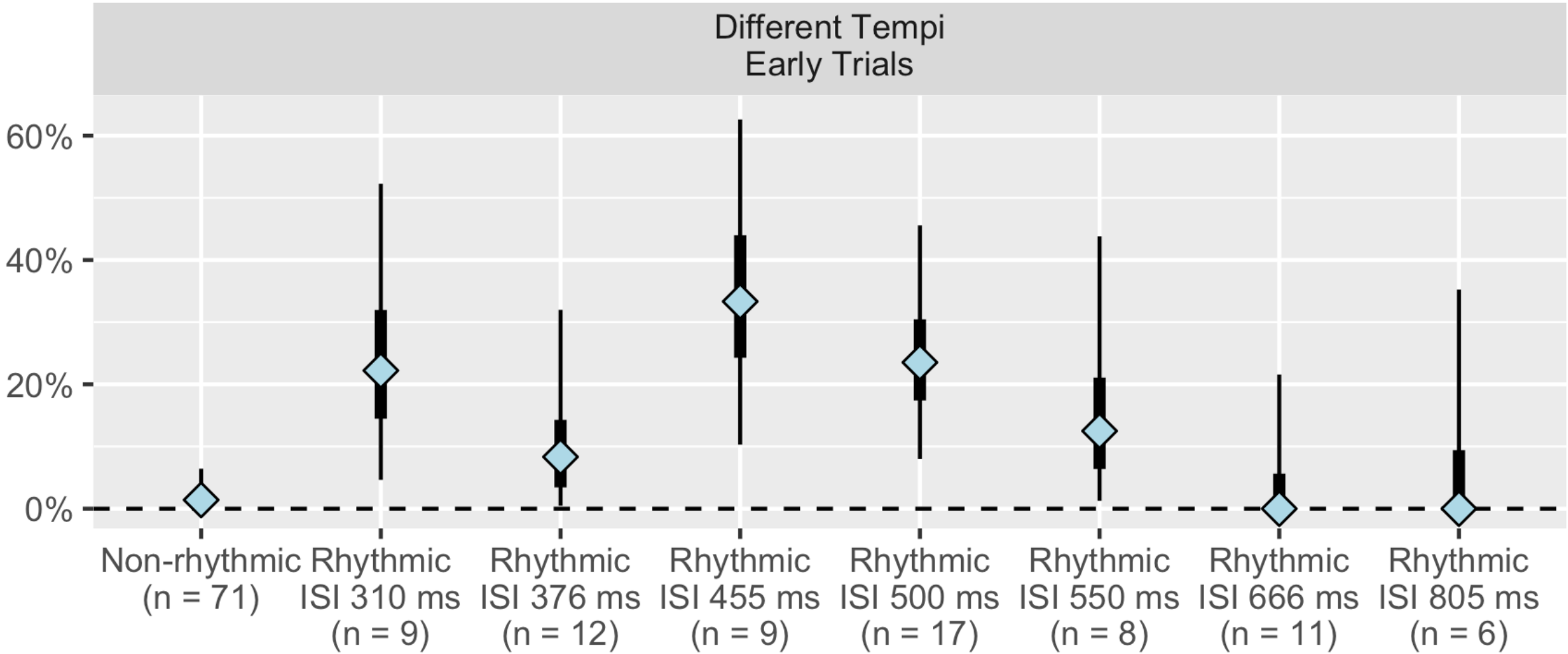
Maybe she's learned to discriminate the specific tempo but not the rhythm?

Different tempi

- 4th of May to 30th of June
- Feeding times: 09:30, 12:30, and 19:00
- Decoy times: Between 08:00 and 21:00, every 30 min.
- In total, 158 rhythmic and 1283 non-rhythmic trials.

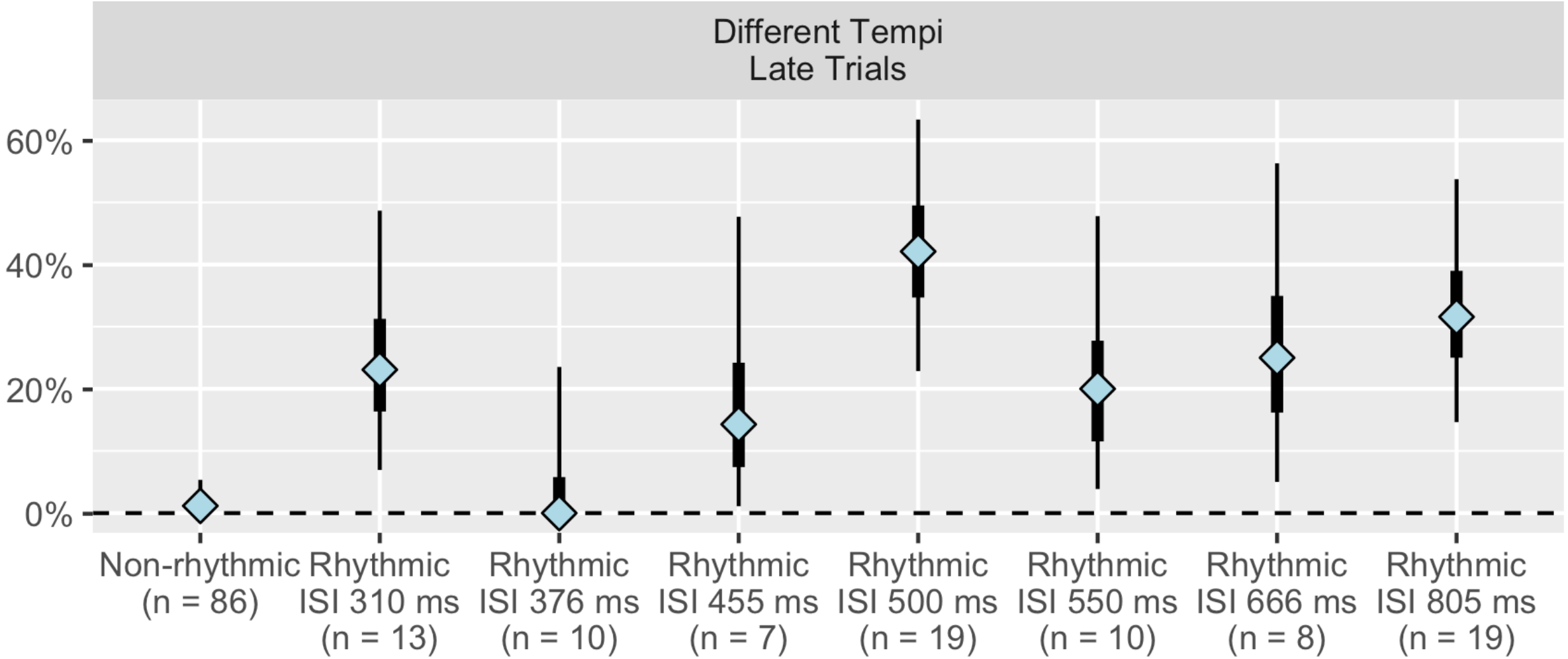


Proportion of correct appearances



The ♦s show the % of appearances in the data. The lines show 50% and 95% probability intervals.

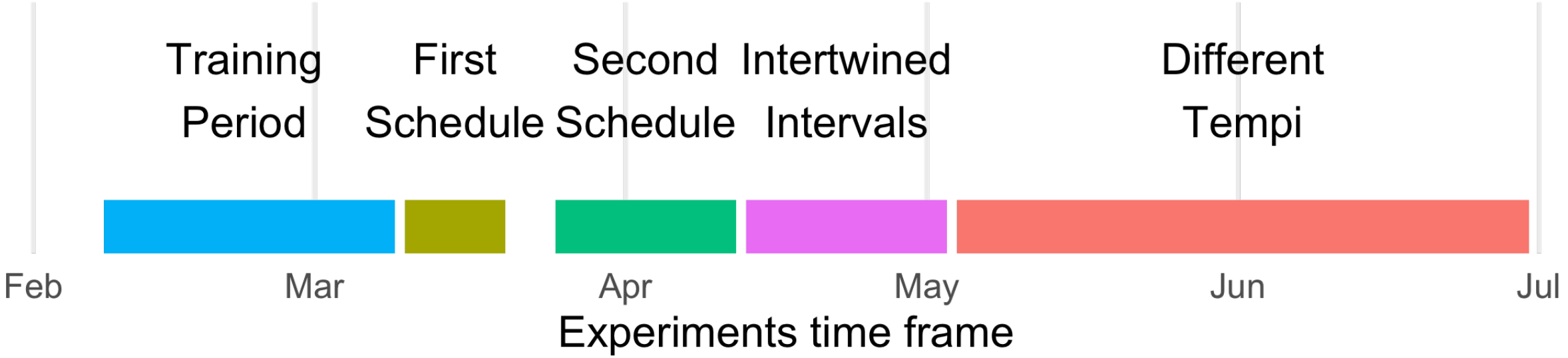
Proportion of correct appearances



The ♦s show the % of appearances in the data. The lines show 50% and 95% probability intervals.

In conclusion

- Cats can discriminate between rhythmic and non-rhythmic sequences, that are otherwise very similar.
- Cats are so-so at generalizing to other tempi.
- At least, this applies to my cat.



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