

Re-assessing the Give-A-Number Task as a Measure of Cardinal Principle Knowledge

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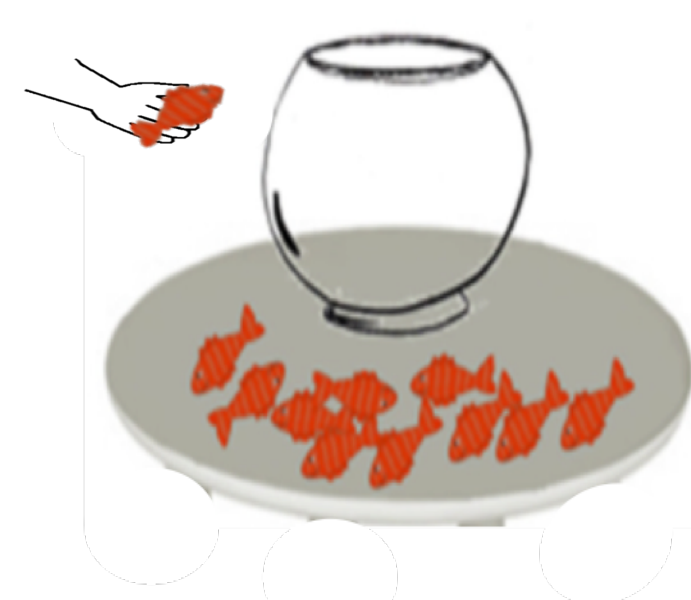
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How do children acquire counting?

Children can recite the count list as early as age 2, but they don't acquire the meaning of counting until ages 3 - 4. Evidence comes from the **Give-A-Number Task (GN)** (Schaeffer et al., 1974; Wynn, 1990)

Can you put 2 fish in the pond?



Can you count to make sure?
Is that N?

✓ N + 1
✗ N - 1 ... up to 6 to 8

Classify into subset-knowers (*1-knowers, 2-knowers, 3-knowers, 4-knowers*) and CP knowers.

But Knower-levels do not tell us *how* children acquire counting

To acquire counting is to acquire Gelman & Gallistel (1978)'s three how-to-count principles.

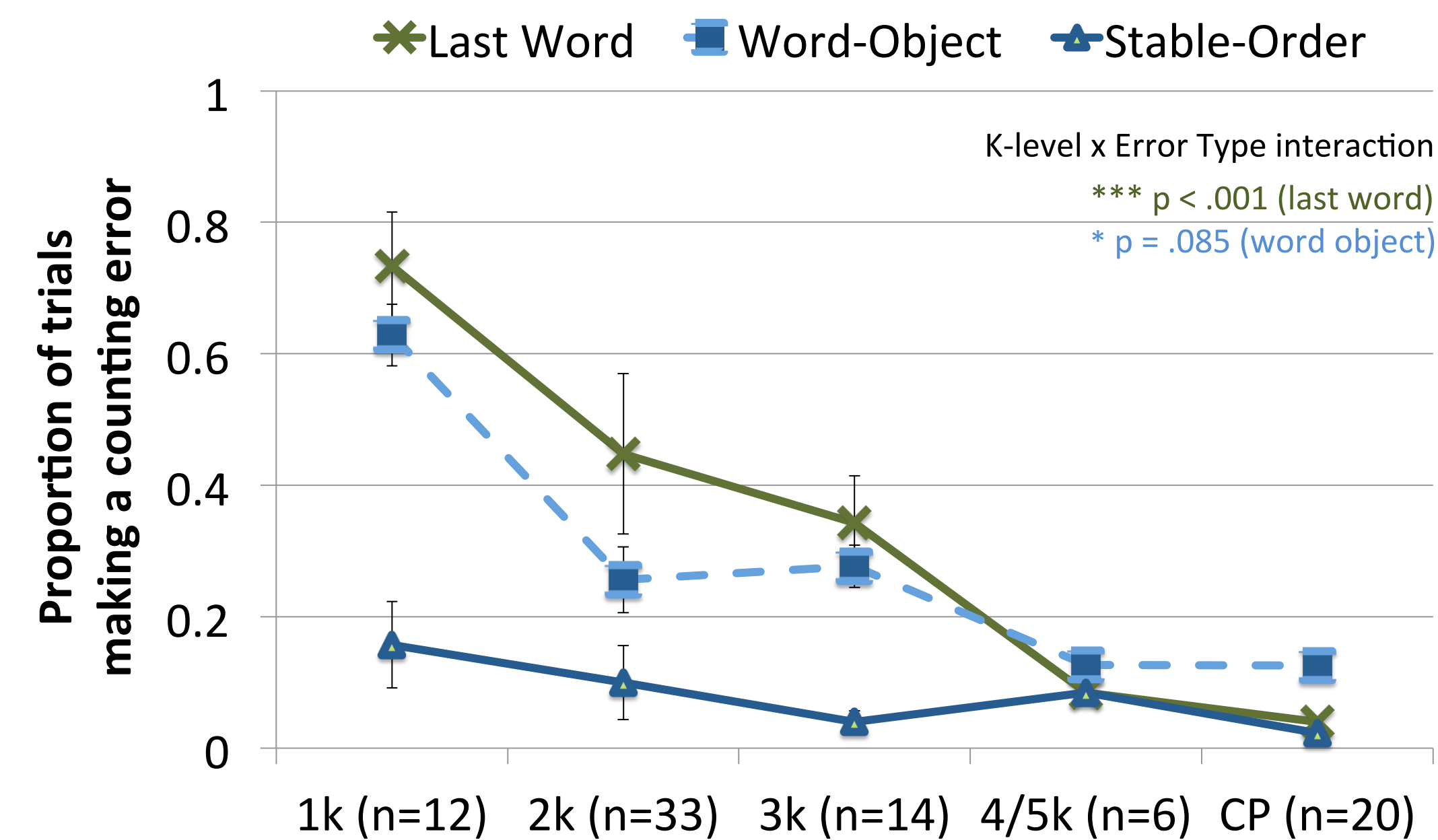
Rationale: A **quantitative analysis** of children's counting behavior on GN can reveal *what* children learn about counting at each knower-level

Study method: We coded children's counting errors on GN. On each trial, after E asked "Can you count to make sure?", we binary-coded whether children followed each of the 3 principles:

Principles	Examples of errors
Stable-Order	one two three four six
Word-Object	one two three one two three four five six
Last Word understanding	E asked for 2 fish. Is that two? No If a child says no, counts as understanding 'last word'. Yes!

A counting error analysis approach

85 children between ages 2;10 and 4;2 were tested on GN

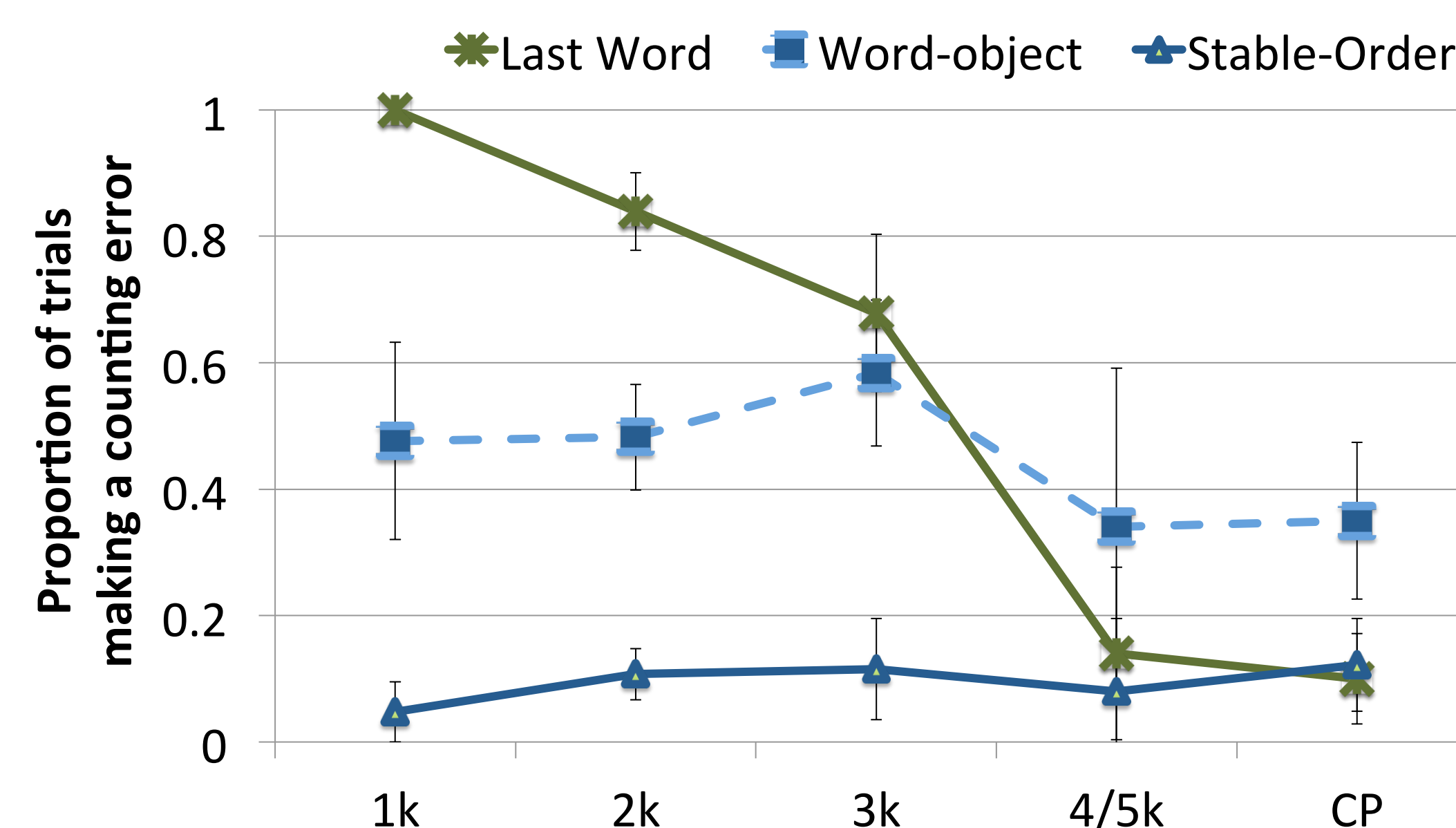


- Development of word-object and last word from 1k to 3k
- Children received different number of trials – could we be overestimating? (more known trials for 3k than 1k)
- What errors do children make on unknown number trials?

Normalized data: Analysis of N + 1

	Correct on N + 1	Total Number of N + 1 Trials
1-knowers	52.8%	92
2-knowers	31.5%	37
3-knowers	24.3%	18
4/5-knowers	28.6%	7

On incorrect N + 1 trials (CP: 5 - 8)



- Early knowledge of stable count list from 1K
- Consistent vulnerability in word-object through CP
- Sudden development of 'Last Word' principle at 4k

Discussion

- ✧ GN provides richer data than just 'knower-level': Children's counting errors provide a rich source of information about acquisition of counting (see also Gelman & Gallistel, 1978; Fuson, 1988)
- ✧ The most marked change in counting is the relatively abrupt development of "last word as cardinality" between 3-knowers and 4/5k & CP-knowers

Open questions:

- ✧ Previous studies show that Subset can respond with last word when asked 'how many' (Sarnecka & Carey, 2008) but the current study shows that they fail to understand the significance of last word on GN (see also LeCorre et al., 2006)
 - Why is last word understanding difficult?
 - Can we train kids to become CP-knowers by highlighting meaning of the last word?
 - ✧ 4-knowers' errors resemble CP-knowers' -- What do 4-knowers know about number word meanings?
 - ✧ Recent studies show limits in CP-knowers' understanding of cardinality.
 - They don't always generate larger sets (> 10) correctly (Barclay, Cheung, & Shusterman, 2017)
 - They don't know when last word does not apply (i.e., when counting is incorrect) (Cheung, et al., 2017 SRCD poster)
- May not fully understand cardinality

Acknowledgements & References

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