The role of count lists in the acquisition of numerals

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A central question in the literature on the development of natural number concepts is the role of count lists in this process. In this paper we compared two different theoretical perspectives on this question: Carey's cultural construction hypothesis (count lists provide the requisite placeholder structure for children to infer the relative relations between number words and acquire numbers beyond the limits of parallel individuation) and Spelke's language combinatorics hypothesis (the human combinatorial capacity enables children to learn higher number words as denoting set sizes composed of smaller ones (e.g., "five" is "three" and "two"). In order to test these competing hypotheses we did three studies in Yudja (approximately 294 people; Brazil). Yudja children are not exposed to count lists before school-age (neither in Yudja nor in Brazilian Portuguese, which is the second language taught at school but not spoken inside the community). Furthermore, number words are highly compositional: numbers from five to twenty (higher number) are formed by combining the word for hand or toes and number words from one to four. If verbal count lists were unnecessary (contra Carey's hypothesis), we would expect pre-schooling children to be able to learn higher number words using the process of building sets of sets using linguistic cues as predicted by Spelke's proposal. While almost all Yudja children are monolingual, they eventually hear adults use numbers greater than 5 in Brazilian Portuguese in the community (again, not in a count list form). Once at school, children are exposed not only to Yudja count lists, but also to Brazilian Portuguese ones.

Studies 20 adults (control) and 28 children, ten not enrolled in school (4 to 7 years-old; M=6.0; Stdev=0.47; 4F) and eighteen enrolled in school (8 to 13 years-old; M=9.3; Stdev=1.33; 9F) participated in three tasks in Yudja and Brazilian Portuguese (all based on Wynn 1992): the recitation task (participants had to count objects that were lined up on a table), the give-a-number task (children were asked to put N objects in a paper box. Each number on a given list was tested twice, and the order of the numbers was randomized) and the point-to-x task (participants saw a pair of pictures (**2**) and had to point to the one that corresponded to the number asked. This task served as reliability check of Give-a-Number.

Results The recitation task has shown that pre-schooling children could recite a count list up to 5 in Yudja. Results in Brazilian Portuguese are not clear cut: most children could not count beyond five but a few children could count at least to 5 in BP. Our results have shown that schooling clearly affected children's numerical abilities and development from subset to CP-knowers. In the recitation task, non-schooled children's performance was centered in low numbers (0-5) both for Yudja and Brazilian Portuguese; schooled children presented a better performance on higher numbers. Thus, once presented to number words in a systematic and ordered fashion (count lists) children managed to evolve from subset knowers to CP knowers in both languages. Besides, morphological transparency of the logic of counting of the number words in Yudja did not facilitate the process of children becoming CP-knowers in Yudja. Our data from Give N task and Point to x task have shown that despite the fact that pre-schooled children presented a better

performance in Yudja in comparison to Brazilian Portuguese in low range numbers and despite the fact that they are presented with both count lists (Yudja and Brazilian Portuguese) simultaneously at school, they become CP-knowers in Brazilian Portuguese before they do in Yudja.

Summary Supporting Carey's hypothesis, our results suggest that a verbal count list is necessary for a child to be able to transition from a subset knower stage to a CP-knower stage and that morphological transparency of the logic of counting does not facilitate the process of developing number knowledge in the early stages of acquisition of those words.