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February 2012

LABSI WORKING PAPERS

N. 38/2012

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Mothers, Young Women, and Girls Generating Causes of a Baby Crying

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More Does Not Always Lead to Better: Mothers, Young Women, and Girls Generating Causes of a Baby Crying

How do people generate possible causes for something they have observed? How easily can they uncover the true causes? For example, can an adult tell why a baby is crying? Can a child tell? In our study, we provide preliminary answers to these questions.

It is first important to understand what we mean by a cause. A cause differs from an explanation in that there is only one correct explanation for a given phenomenon (Brewer, Chinn & Samarapungavan, 1998; Lombrozo, 2007), whereas there may be several causes for an event. For our purposes, we take a cause to be a hypothesis about a single event. This is in contrast to previous work on hypothesis generation (Thomas, Dougherty, Sprenger, & Harbison, 2008), where researchers assumed that a hypothesis can refer to a number of events. For example, we asked participants to generate causes of a baby crying, instead of asking the participants to generate a unifying hypothesis that explains a set of symptoms, such as a baby crying and also having fever.

We based our investigation of how well adults and children generate causes on previous work that examined how people generate hypotheses more generally. In particular, we used the results of two studies that only tested adults. First, based on computer simulations and experiments with human participants, Thomas et al. (2008) concluded that people are overall able to generate hypotheses with the highest a priori probability of being true, even though they do not generate many hypotheses. Second, in a book chapter, Byrnes (2005) discussed an unpublished study in which he investigated how well adults could generate causes of a baby crying every night. Byrnes asked 15 mothers and 15 women who were not mothers, finding that, even though mothers generated significantly more causes than nonmothers, they were equally likely to generate the a priori most likely causes.

These results fit with those of studies in adult human reasoning where it has been found that having a larger set of alternatives does not always improve performance (Gettys, Pliske, Manning, & Casey, 1986; Johnson & Raab, 2003) or, as it has been said, “more does not always lead to

better"—it depends on the particular reasoning problem (Gigerenzer, Todd, & the ABC Research Group, 1999).

In this article, "more" refers both to more possible causes of a baby crying and to more experience with babies, and "better" refers to the ability to uncover the a priori most likely cause(s) of a baby crying. We investigated whether more means better by testing the ability of mothers, young women who were not mothers (hereafter, young women), and girls to generate causes of a baby crying. Based on the research described above, we hypothesized that (1) mothers would generate more causes than young women, and young women, in turn, would generate more causes than girls, and (2) in both scenarios, all three groups of participants would generate the a priori most likely causes.

Method

Participants

The experiment involved 87 participants: 37 girls in the third and fourth grade (M_{age} = 8.2 years, SD = 1.6) from a primary school in Livorno,[1] Italy, 30 young women (M_{age} = 18.1, SD = 0.3) from a high school in Livorno,[2] and 20 mothers (M_{age} = 39.7, SD = 4.1), recruited among the parents of the participating girls. All the participants were born in Italy and belonged to various social classes.

Design and Procedure

Each experimental session consisted of two trials in which the participants were presented with two different scenarios. In the first scenario, the experimenter described the following situation: "Imagine that in the room next to ours, a baby is crying."[3] Then she asked the participants: "Why do you think the baby is crying? Tell me as many causes as you can think of for a baby to cry." In the second scenario, the experimenter presented this situation: "Imagine there is a baby crying because she has a bellyache. Why do you think the baby has a bellyache? Tell me as

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[3] An anecdote: One of the girls, 7 years old, without waiting for the question, looked at the experimenter in alarm and said, "We should bring the baby to the hospital!" And the experimenter asked, "Already?" to which the girl, thoughtful, replied, "No, maybe it would be better to wait for lunch time; usually there is less queue…"

many causes as you can think of for a baby to have a bellyache." This second scenario, though very similar to the first one, was on a different level of specificity, because it asked participants to generate causes that were, a subgroup of the causes generated in the first scenario.

In both trials the experimenter wrote down all the causes the participants were able to generate on a piece of paper. When participants could not generate any more causes, the experimenter asked them to indicate, among the generated causes, the cause they considered most likely. To motivate participants to generate as many causes as possible, they were told that, for each age group, the three participants generating the three highest overall number of causes would be awarded with bookshop vouchers of 45, 25, and 15 euros, respectively. All the participants were interviewed individually and all the sessions were audio-recorded. Participants took on average 20 min to complete the interview, including reading the instructions.

Results

We compared the two scenarios and analyzed the results with respect to group differences on three outcomes: (1) the number of causes generated; (2) the likelihoods of the generated causes, including the cause indicated as the "most likely one"; and (3) the order in which the causes were generated. To assess the likelihoods of the generated causes, we asked 17 experts—5 pediatricians and 12 nurses currently working with children aged 0–18 months—to rank the causes. Aggregating their opinions by grouping together causes recognized as having the same likelihood, we were able to individuate five different levels of likelihood for the first scenario (the baby-crying scenario) and four levels of likelihood for the second scenario (the bellyache scenario). Table 1 shows all the generated causes grouped into sets by likelihood level, together with the percentage of participants who generated them.

Even though the order in which the causes were generated was not one of our initial research questions, we realized when running the experiment that the participants were often producing what they later thought of as the most likely cause quite early in the generation process. We decided then to also look at the relationship between the order in which the causes were

generated and their likelihood, both objectively and subjectively.

In our analysis, we considered only the plausible causes. Causes such as "the baby is crying because she fell when playing soccer with a friend" (one of the girls, 7 years old) or "the baby has a bellyache because she drank too much Coca Cola (another girl, 6 years old, who added: "It happens to me, sometimes"), were excluded.[4] Moreover, even though girls in both scenarios generated, on average, more implausible causes than the young women did, and young women, in turn, more than the mothers did, the difference was not significant in either scenario.

Number of Causes

As expected, we found that in the baby-crying scenario mothers produced more causes than young women ($M_{mothers}$ = 8.6, SD = 2.5; M_{young_women} = 7.5, SD = 1.8), and young women, in turn, produced more causes than girls (M_{girls} = 6.5, SD = 2.8), $F(2,86) = 5.11$, $p = .008$ (Figure 1a). In the bellyache scenario, on the other hand, we found no significant differences between groups in terms of number of generated causes (Figure 1b). This result could be interpreted as a floor effect: Due to the higher specificity of the question, fewer causes, overall, were generated.

Likelihood of the Generated Causes

For simplicity, to assess likelihood we focused on the causes belonging to Sets 1 and 2 (Table 1), the most likely and second most likely causes. In the baby-crying scenario, all groups generated a similar number of causes belonging to these two sets (Figure 2a). In the bellyache scenario (Figure 2b), similarly, we found no effect of group on the number of causes generated belonging to the most likely set. Girls generated fewer causes belonging to the second most likely set (M_{girls} = .5, SD = .7) than young women (M_{young_women} = 1.3, SD = .7) and mothers ($M_{mothers}$ = 1.5, SD = .7), $F(2,86) = 18.1$, $p < .001$.

Likelihoods of the Most Likely Causes

In the baby-crying scenario, girls were best at correctly identifying the most likely cause from those they had generated (girls: 49%; young women: 20%; mothers: 30%; $F(2,86) = 3.25$, $p = .044$). A possible explanation is that for mothers and young women, who produced more causes

[4] Referring to the baby, the experimenter used the Italian word *neonato,* that clearly indicates a newborn in the first year of life.

than girls, it was harder to identify the most likely ones. On the other hand, in the bellyache scenario, there was not much difference between the groups and the percentages of accuracy were much higher than in the other scenario (girls: 56%; young women: 61%; mothers: 63%), probably because the number of generated causes was similar for all the groups, and overall lower than in the first scenario.

Order in Which Causes Were Generated

In the baby-crying scenario, only 30% of the participants generated as first one of the most likely causes among those they generated, with no significant differences between groups (girls: 38%; mothers: 35%; young women: 17%). Among the first three causes generated, young women produced fewer of the most likely causes (M_{young_women} = .5, *SD* = .4) than girls (M_{girls} = .9, *SD* = .8) and mothers ($M_{mothers}$ = 1, *SD* = .6), $F(2,86) = 3.28$, $p = .42$. After the third cause was produced, only young women produced more of the most likely causes than before (M_{young_women} = 1.2, *SD* = .9), whereas girls and mothers generated about the same number of most likely causes (M_{girls} = .8, *SD* = .8; $M_{mothers}$ = .9, *SD* = .9).

In the bellyache scenario, a higher percentage of participants (49%) generated as first a cause belonging to the most likely set, with a strong difference between mothers (90%), young women (50%), and girls (27%). Among the first three causes generated, mothers produced more causes belonging to the most likely set ($M_{mothers}$ = 1.3, *SD* = .7) than young women (M_{young_women} = 1.2, *SD* = .9) and girls (M_{girls} = .8, *SD* = .8), $F(2,86) = 3.89$, $p = .24$. Among the subsequently generated causes, a similar number belonged to the most likely set (M_{girls} = .4, *SD* = .7; M_{young_women} = .6, *SD* = .5; $M_{mothers}$ = .3, *SD* = .3). In this scenario we have a lower number of causes belonging to the most likely set, probably because here only a few causes beyond the first three were generated ($M_{bellyache}$ = 1.3, *SD* = .6, vs. $M_{baby\text{-}crying}$ = 4.7, *SD* = 2.3).

Order in Which Causes Indicated As Most Likely Were Generated

We found no differences between the groups regarding the order in which the most likely cause was generated: In the baby-crying scenario it was most often the second or third cause

generated (on average 2.4); in the bellyache scenario it was the first or second (on average 1.5).

Discussion

In this paper we investigated how many causes girls, young women, and mothers could generate in two scenarios involving a hypothetical crying baby. We wanted to test whether girls were as good as young women and mothers in generating the a priori most likely causes.

As expected from previous work on hypothesis generation that tested only adults, we found that mothers were able to generate more causes than young women, and young women, in turn, generated more causes than girls in both scenarios, even though the difference was not significant in the bellyache scenario, possibly due to a floor effect. Nevertheless, surprisingly, all the groups provided the same number of most likely causes in both scenarios, confirming and extending the general findings from Byrnes (2005). Moreover, we found no difference in the ability of the participants to identify the most likely cause among those generated. In fact, girls were even more accurate than the other two groups in the baby-crying scenario.

All participants generated the most likely causes early in their generation process, and this order effect was even stronger if we consider what participants considered the most likely cause. Thus, we can conclude that overall the process of generating alternative causes is not very fruitful after the third cause has been generated, for all the age groups considered. This is consistent with the results of the study Johnson and Raab (2003) conducted on the option-generation process. Indeed, they found that the serial position of a generated option was inversely related to its quality, and an increase in the number of generated options did not increase their quality. We suggest then that a *take-the-first* strategy could be potentially as successful in generating causes as it is in generating options: To find the most likely cause of an event, choose one of the initial causes generated, rather than exhaustively generating all possible causes.

We do not dare overgeneralize these results, saying that experienced adults are not better than children in generating the most likely causes, but we can definitely say that, in some scenarios, knowing “more” does not give any advantage. A direction for future work should be to test

participants on different scenarios and environments, to determine whether and when our results are generalizable.

Acknowledgements

We would like to thank all students from Fondazione Sacro Cuore and Liceo Scientifico "F. Enriques" of Livorno, Italy, who participated in our study, as well as Simona Preti, who helped in the organization. We would also like to thank Eleonora Gilli e Francesca Ricci for helping us running experiments.

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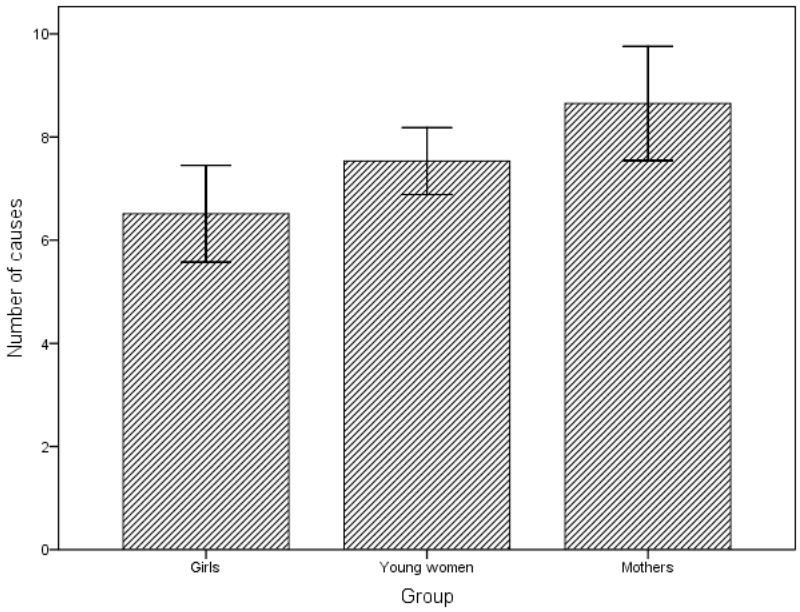
Table 1

Percentages of Participants Who Generated Each Cause, in the First and Second Scenario, With the Causes Grouped by Level of Likelihood (Set)

Set	Cause	% Girls	% Young women	% Mothers
		Baby-crying scenario		
1	Wants to be held	10.8	6.7	0
	Bellyache	8	50	40
	Colic	2.8	30	20
	Wants contact	0	3.3	15
	Wants mother	78.4	36.7	25
	Wants to snuggle	21.5	10	35
2	Hunger	91.8	96.7	90
	Loneliness	30	56.7	35
	Needs new diaper	32.6	36.7	40
	Pain	11.1	33.3	30
	Sleepy	67.5	26.7	45
3	Wants attention	7.9	30	15
	Digestion	0	10	5
	Sickness	5.6	30	20
	Thirsty	29.5	16.7	10
	Needs to turn over	0	3.3	20
4	Light	5.6	6.7	15
	Noise	27.2	46.7	15
	Uncomfortable clothes	0	3.3	5
	Waking up	8	33.3	50
5	Pacifier	32.6	10	20
	Ears	0	3.3	15
	Fear	16.4	36.7	20
	Feels cold	8	3.3	35
	Teething	2.6	16.7	15
	Is bothered by someone	11	10	0
	Suffocation	0	3.3	0
	Fever	5.3	6.7	5
	Vomiting	0	3.3	0
	Wants something	8.2	13.3	20
		Bellyache scenario		
1	Colic	5.4	70	100
	Intestinal trouble	5.4	10	30
	Sickness	18.9	40	10
	Temperature	29.4	0	0
2	Digestion	11	16.7	15
	Hunger	21.8	30	20
	Virus	11.1	13.3	15
3	Constipated	16.2	10	25
	Feels cold	16.4	10	0
	Too much food	53.7	30	10
4	Intolerance	0	13.3	15
	New alimentation	0	3.3	0
	Inappropriate food	16.2	3.3	0
	Tense	0	0	10

Figure 1. Number of causes generated by group in (A) the baby-crying scenario and (B) the bellyache scenario. Whiskers indicate standard errors.

A



B

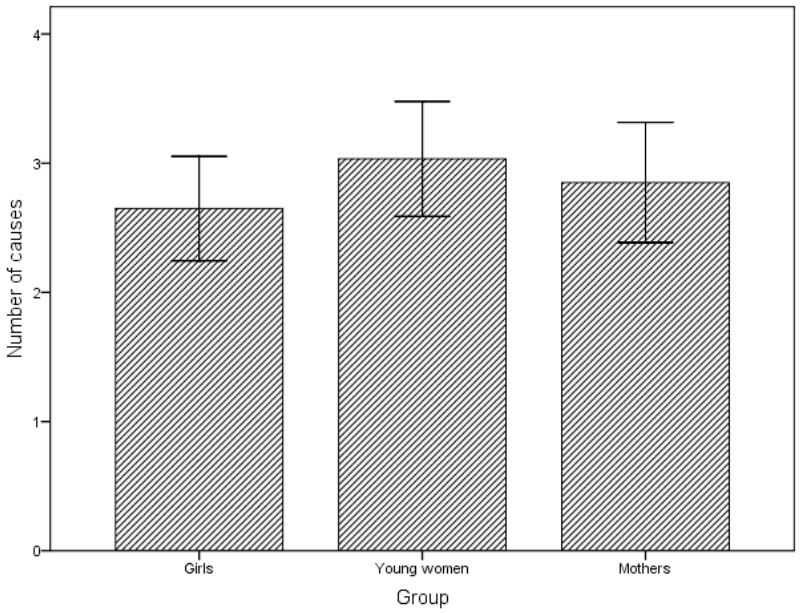
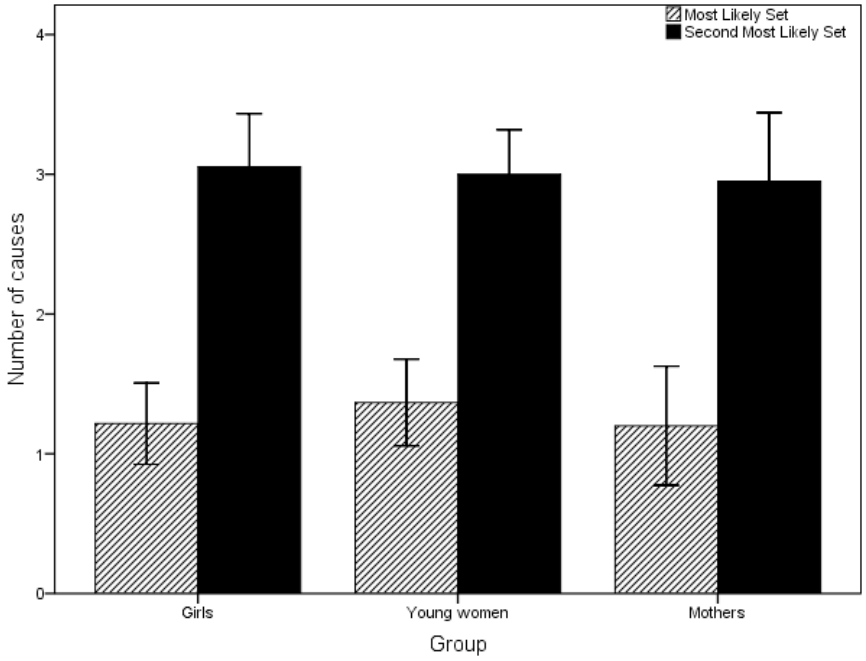


Figure 2. Number of causes generated by group in (A) the baby-crying scenario and (B) the bellyache scenario belonging to the most likely and the second most likely set of causes. Whiskers indicating standard error.

A



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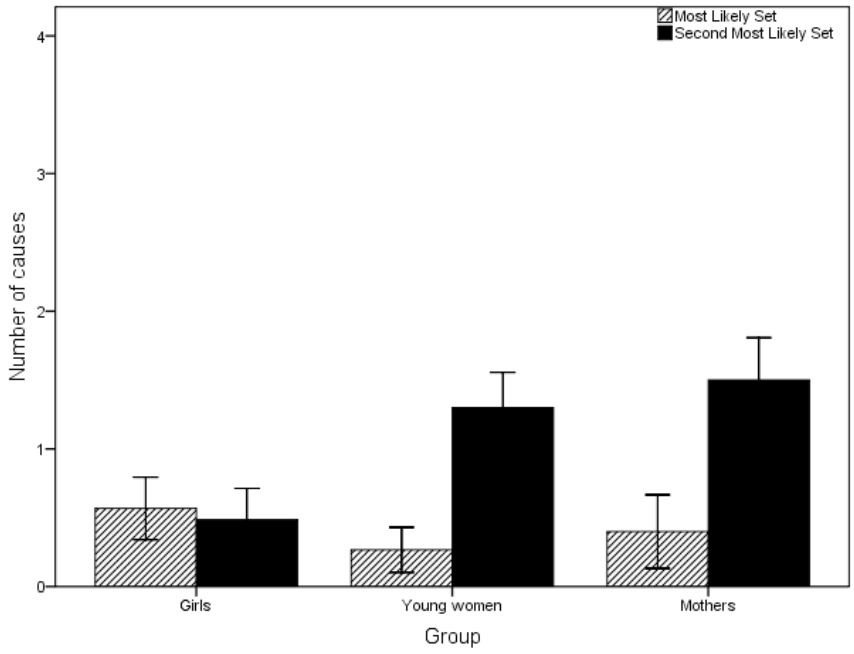

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ISSN 1825-8131 (ONLINE VERSION) 1825-8123 (PRINT VERSION)

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