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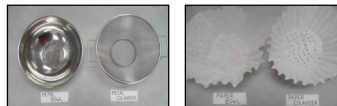
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Do preschoolers understand that objects and substances have specific physical properties that constrain their behavior and functional capabilities? In this study, 4-year-olds judge whether an object with a particular design (concave with holes or without holes) made of a particular material (metal or paper) will serve a specific function (containing water, sand, or gravel). To make accurate predictions, children must coordinate the material and design properties of the containers with the physical characteristics of the to-be-contained substances.



Interviews

• Familiarization

"We have some things to show you today. Go ahead and check them out/ Tenemos algunas cosas para mostrarle. Puedes tocarlos."

• Judgment and Justification

"Here is some (sand, gravel, or water) that I can pour here (indicate container). Let's think; will it make a mess or be okay? How come?/ Esto es algun/a (arena, grava, o agua) que yo puedo echar aquí (indicate). Vamos a pensar. ¿Será bueno o hará un lío? ¿Y por qué?"

• 12 trials per subject (4 containers & 3 substances)



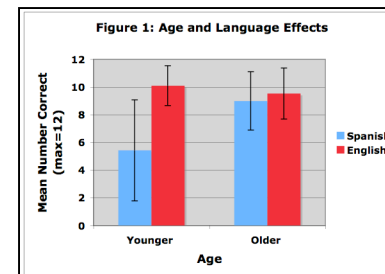
Age and Language Effects

• Main effect of age, favoring older children, $F(1) = 4.43, p < .05$.

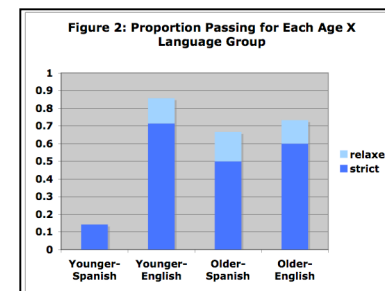
• Main effect of language, favoring Ss who completed the task in English, $F(1) = 12.90, p < .01$.

• Age X Language interaction, with younger Spanish speakers scoring reliably below other groups, $F(1) = 8.13, p < .01$.

• T-tests show all groups performed above chance except for younger Ss who completed the task in Spanish.



• As shown in Figure 2, individual performances mirrored group results.



Explanations after Correct Responses

• Children provided relevant explanations for their correct answers to the "make a mess/be ok" questions.

Younger	.82
Older	.80
Spanish	.65
English	.86
Passed Task	.90
Did Not Pass	.50
Overall	.81

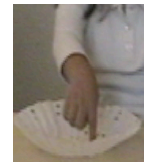


Table 1: Relevant Explanations: Proportion of Trials by Group

• Explanations were coded into 7 non-mutually exclusive categories. Children most often referred to relevant design features of the containers (e.g., holes) or consequences of the pouring action (e.g., the paper will get wet) to justify their forced choice responses.

Examples of Explanations

- OK, because the rocks are big and the holes are small (4;8).
- Hacer reguero porque el agua se cae en el hoyo/ It will make a trickle because the water falls in the hole (4;7).
- Be OK because it's shaped curved up and these (gravel) are hard (4;1).
- No está bien porque va romper porque es fuerte/ It's not ok because it's (the paper bowl) going to break because it's (the gravel) strong (5;2)

Conclusion

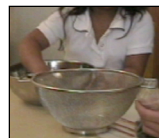
Most 4-year-olds coordinate features of containers and to-be-contained substances to make and justify causal predictions. Explanations reveal attention to design and material properties. Performance differences based on age and language status will be explored in follow-up work. In addition, classroom-based interventions to support children's growing understanding of the relationship between form and function and their use of complex causal language will be designed.

Method

- 42 preschoolers (mean = 4;7, range = 3;11-5;3, 19 girls) from schools serving low SES families
- Almost all dual language learners (DLLs) who chose which language they wished to speak with the bilingual interviewer
- 21 younger (7 spoke Spanish, 14 spoke English) and 21 older (6 Spanish, 15 English)

Acknowledgments

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Results

• Group mean exceeded chance (mean = 8.95, s.d. = 2.64, $t(41) = 7.25, p < .01$)

• 23 individuals passed under a strict criterion (10+/12 correct, $p = .016$)

• 5 more passed under a relaxed criterion (9+/12 correct, $p = .054$)

• Easiest trials: metal bowl & sand (88% correct) and paper bowl & gravel (86%)

• Most difficult trials: paper bowl & water (50%) and paper colander & gravel (60%)