FUNCTIONAL AND SHAPE INFLUENCES ON GENERALIZATION OF OBJECT CATEGORIES: A COMPARISON BETWEEN NORMALLY DEVELOPING CHILDREN AND CHILDREN WITH DOWN SYNDROME

Thibaut Jean-Pierre (U. de Poitiers)

Comblain Annick (U. de Liège)

Delcourt Sandrine (U. de Liège)

Novel object: a name, perceptual and functional properties

A moupa

A moupa ?

A moupa ?

Context

- What does it mean to learn a novel word for an artifact, e.g. moupa? At least,
  - Learn the word phonology
  - Construct a mental representation of the referent (i.e., the artifact) including perceptual and functional properties.
  - Associate the word with the representation
  - Generalize the novel word to novel referents.

Shape-based or function-based generalization?

- Old issue
- Two views:
  - For Smith and Colleagues, young children tend to generalize new concepts (and thus novel words) on the basis of perceptual similarity (⇔ with adults). Only later, conceptual influences (i.e., about function).
  - Other authors (Kemler Nelson, Bloom, Diesendruck): even young children generalize novel words on the basis of concepts rather than shape.

Perceptual or conceptual, when?

- perceptually-based generalization: arbitrary relation between the object structure and its function.
- Conceptually-based: when the designer' intention is made clear
- However:
  - Is this explanation the entire story ?
  - No study of the role of various kinds of perceptual transformations
  - Especially, do children generalize on the basis of parts or of the overall shape?

Generalization ?

- In many cases, generalizing a novel word correctly is
  - to use it to for objects that have the same functional affordance as the training object but that might differ perceptually,
  - or to reject objects that CANNOT fulfill the function but that might be similar to the training object.

Key points

- Test children's, DS and MA-matched, ability to implement a taught function on a training stimulus, as a function of the training context.
- Generalization: perceptually-based or conceptually-(functionally) based?
- => assess how both groups categorize the transfer items as a function of the perceptual transformation performed on the items.

Key points (2)

- DS children generalization capacities
  - Are they as efficient as MA-matched children in mapping structure on function ?
  - What is the influence of context on this mapping (i.e., training with pictures vs; training with real objects)?
  - DS children are supposed to have poor abstraction or generalization capacities. However, what does it mean in the present context?
  - How do they deal with structurally transformed but functional stimuli ?

Methods

Participants

- Fifty normally developing children (MA matched): mean MA = 4 (range 3-5;9); mean chronological age =11;7 (7;9 to 16;7).
- Fifty DS children: mean MA: 4 (range 3 to 5;8); chronological age= 4;3 (3;1 to 5;3).

(Matched with three subtests of the K ABC)

Materials

Learning object /
Old test item

Two functions (theories): drawing and shells

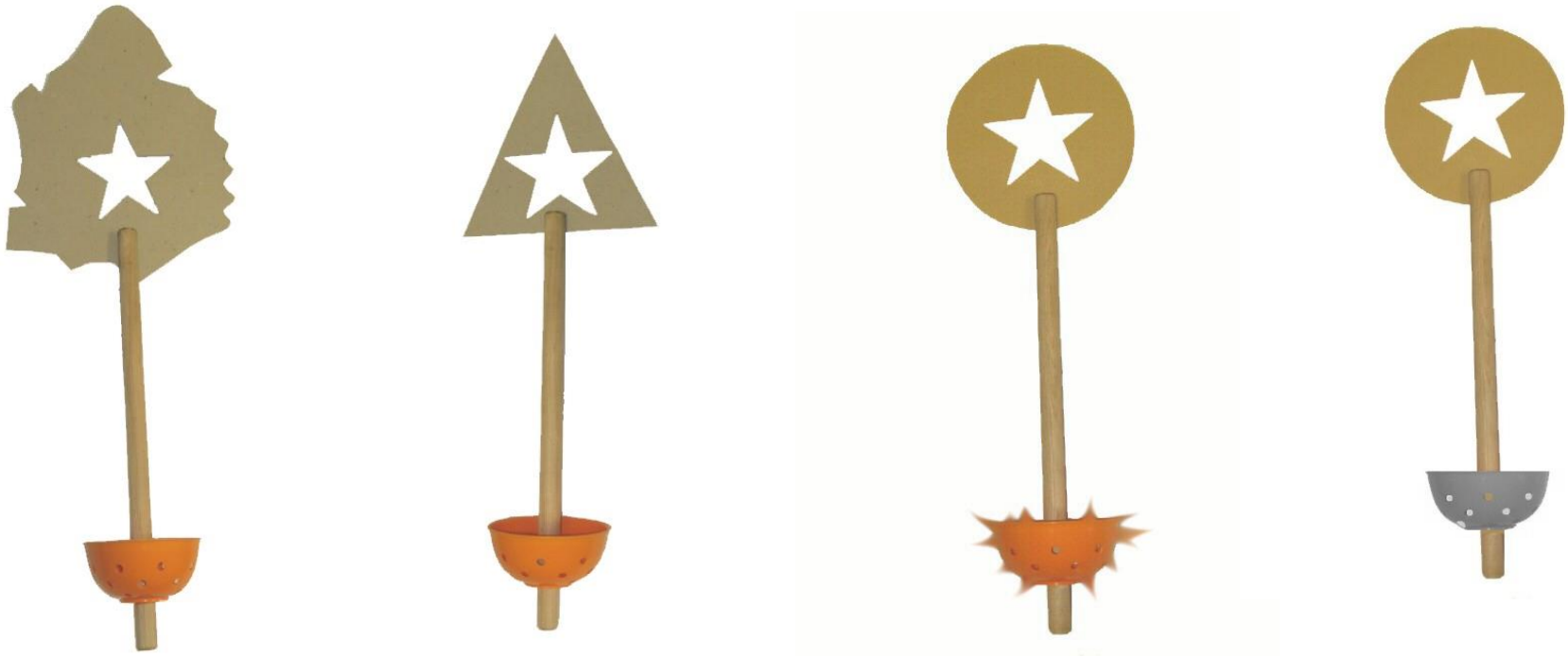
1. draw with the star
2. Filter shells buried in the sand with the container

Materials: test items

Test item inconsistent with both theories

One part test items consistent with one function; no transformation of the functional part

Complete test items that are consistent with both functions, but with a transformed part



Functional test items consistent with one theory and perceptually modified

Functional test items consistent with one theory and perceptually transformed: “larger transformation”

Dysfunctional test items: to be rejected

Procedure

- **<u>Training phase (structure-function + novel name)</u>**
  - One function was taught about the novel object and a novel name was given, “moupa”.
  - Participants were randomly assigned to one function.
  - Participants in both functions saw the same learning object and were given the same description of its parts (before the function was explained).

Procedure

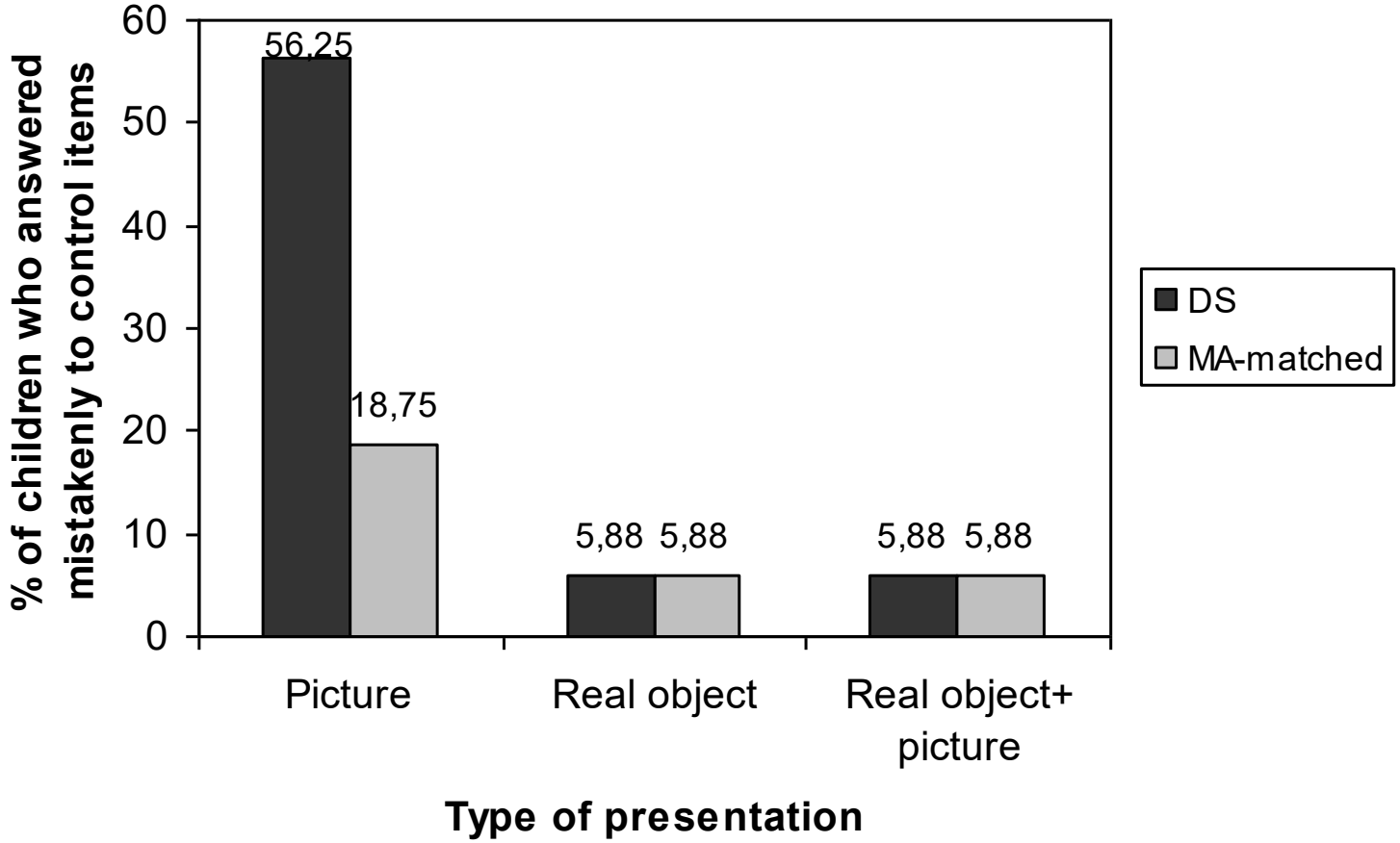
- **Training phase**: Three conditions:
  - "picture condition": the function was taught through verbal descriptions of a picture of the training object.
  - Real object condition: demonstration with a real 3D object
  - Real object + picture.
- **Transfer Phase**
  - Test items were displayed one by one.
  - S. had to say whether it was a "moupa" or not.

Condition		Type of presentation		
		Pictures	Real object	Real object + Pictures
Groups	DS	N = 16	N = 17	N = 17
	MA-Matched	N = 16	N = 17	N = 17

No significant difference in MA between groups

Results

- First analysis: proportion of children who understood the task as a function of condition.
  - Accept the training object and reject the item inconsistent with both theories.



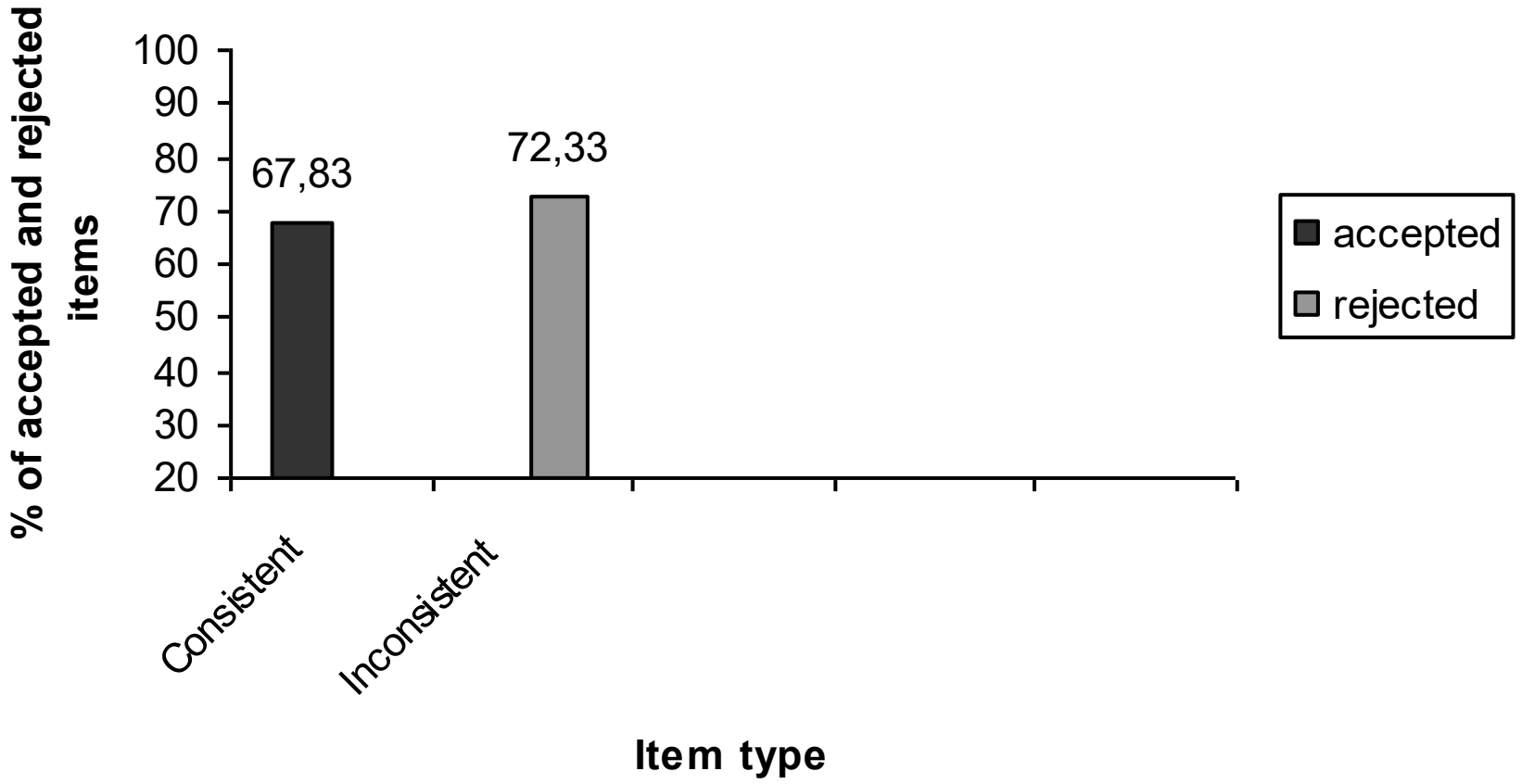
Percentage of errors for control items as a function of group (DS and MA-matched) and of type of presentation (Picture, Real object, Real + Picture).

One-part test items

items consistent with one function

One part test items: results

- Did children associate the function of an object with the relevant part and do they generalize on the basis of this association (⇔ contrast with other studies)?
- Analyses: on participants who understood the task
  - No difference between groups, or between type of presentation (Picture, real, etc.).
  - Both types of stimuli were correctly classified (i.e., significantly different from 50%)

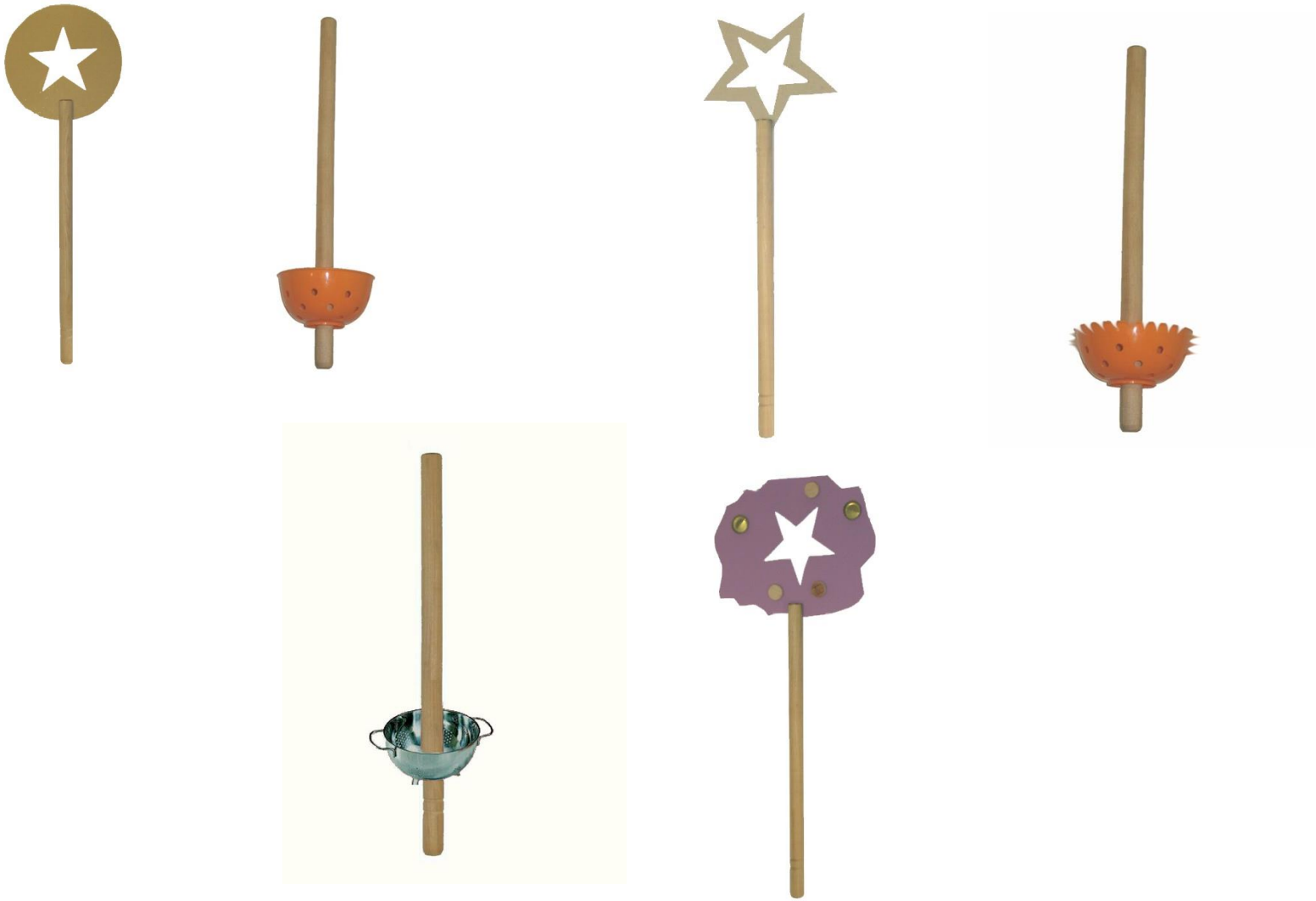

% of accepted and rejected items
100
90
80
70
60
50
40
30
20
67,83
72,33
Consistent
Inconsistent
Item type
accepted
rejected

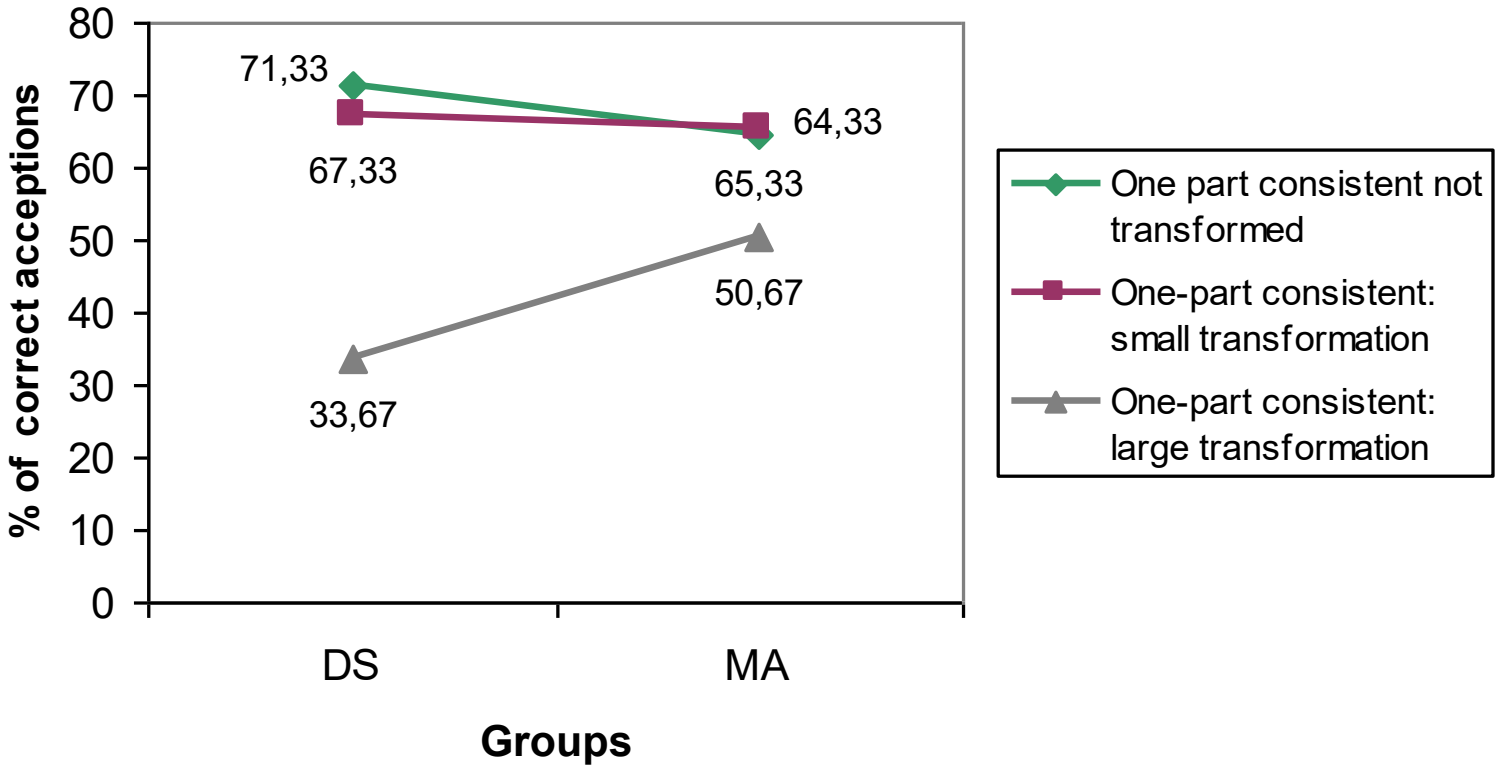
Results: transformed items

- Complete but transformed items: No difference between groups and between conditions (86% correct, overall).

- One-part test items:
  - comparison between untransformed one-part items, small transformations one-part items and large transformation one-part items.
  - Group x type of item interaction.

One-part test items : not transformed, small transformations and large transformation




80
70
60
50
40
30
20
10
0
% of correct acceptions
71,33
67,33
65,33
64,33
50,67
33,67
DS
MA
Groups
One part consistent not transformed
One-part consistent: small transformation
One-part consistent: large transformation

One-part dysfunctional items (to be rejected)

- Anova group x presentation:
  - Main effect of group, with DS < MA-matched : DS accepted more dysfunctional items (similar to the functional part) (71% vs 87%).

Discussion

- Do DS children and MA-matched learn and generalize a novel-name-function-object-structure relation in the same way?
- The answer is negative for both questions.
  - They were less able learn the association between structure and function in a less « real » context, such as the « picture » context.
  - They were more influenced by the perceptual similarity between the training object (or the functional part of the training object) and the transfer objects, in two ways:
    - They reject more often the large-transformation functional one-part items
    - They accept more dysfunctional objects

- In fact, DS children behaved like younger children who associate a novel name on the basis of function but also fail to do so for very dissimilar stimuli (see Gelaes & Thibaut, in press).
- This might explain why their lexicon tend to remain rather poor.
- Implications for everyday training procedures.