



The way of presenting the learning situation could have a significant impact for autistic children.

How can autistic individuals

learn optimally?

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Learning relies on the ability to organize information and form concepts, allowing what is learned in one context to be generalized to a new situation. Literature is still unclear on how and how well autistic individuals

can learn. Very often, due in particular to challenges in terms of executive functions (e.g., planning, organization) and sensitivity to sensory overload, we tend to believe that children with autism require significant support

from the outset to learn. However, perhaps we should wonder whether autistic individuals have advantages in some situations depending on how information is presented. There are indications that the learning mechanisms of autistic children differ from those of neurotypical children. Perception, which is more oriented towards local processing and marked by an ability to systematically extract regularities (patterns), could play a greater role in the learning of new information in autistic people. Indeed, the observation of interests of autistic children and their spontaneous and sometimes exceptional learning in certain domains (e.g., hyperlexia, arithmetic), combined with the accounts of autistic people and the results of research which suggest that implicit learning in autism would be entirely possible, suggest that the way of presenting the learning situation could have a significant impact for autistic children. This is what a research team attempted to study, whose work was published in the *Journal of Experimental Psychology* in the fall of 2021.

Our team wanted to clarify the factors influencing learning in autistic children by studying the impact of two of the important components of a learning situation, in this case **(1) the intensity of the feedback** given to the child and **(2) how to present the material** to be learned.

A total of 54 autistic and 52 neurotypical children (6 – 14 years-old) participated in two learning situations. Each learning situation featured an ice cream counter where the children had to learn to distinguish the preference of their customers; some would prefer vanilla ice cream and others chocolate. The "customers" were characters from Mr. Potato Head who varied by the presence or absence of certain characteristics (glasses,

mustache, bowtie, hat). The children could not memorize "by heart" the choice for each character. Indeed, although each character had a preference, no one always chose the same flavour; on occasion, he would select the alternate flavour. The children therefore had to learn the clues suggesting belonging to one or the other of the categories (those who prefer vanilla vs. chocolate).

What is the impact of the intensity of the feedback given to the child?

In typical development, feedback received from an external source (parent, teacher, peers) plays an important role in learning. Depending on the feedback received, sometimes in the form of reinforcement that serves as source of motivation, the child updates his learning. In the first series of situations proposed in the study, the children had to try an answer (vanilla or chocolate) for each of the characters presented. Thanks to the feedback received after each of the trials, the children could gradually learn to distinguish the two groups of customers. The authors wanted to verify whether simple, informative (right/wrong answer) or more intense feedback (adding visual and sound animation as a reinforcement when the child had the correct answer) had the same impact in autistic and non-autistic children (Figure 1).

Results? Autistic children **did not benefit from an increase in feedback**, while it benefited neurotypical children. Indeed, neurotypical children showed better outcome when they learned with higher intensity feedback. On the other hand, for autistic children, the addition of a visual and sound animation did not improve learning, their performance being similar in the two tasks.



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Figure 1 from the original article (Situations with low (b) or higher feedback intensity (c)).

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What is the impact of the way of presenting the learning material?

Learning can also occur without feedback, observing instead the elements of our environment (people, objects, events). One can learn by gradually identifying the recurrences between the different components. As part of the second series of learning situations, the children observed different characters who already had their cones in their hands. By observing the different characters, the child could identify which characteristics were associated with each group of clients. The question of interest: Do the modalities of material presentation have an impact on the quality of learning? One situation offered an *isolated* presentation in which a single

customer with his cone was presented on the screen, one after the other. The second situation proposed a rather *simultaneous* presentation in which several customers were visible at the same time. The children could manipulate and organize the different examples (each on a small card) on a large board (Figure 2).

Results? Autistic children showed better learning when they had **access to several customers at once** (simultaneous condition) compared to the presentation of customers in isolation (one example at a time). The way of presenting the material did not have an impact for typical children, who learned similarly regardless of the mode of presentation. In a so-called *simultaneous* learning situation, autistic children showed similar results to typical children.

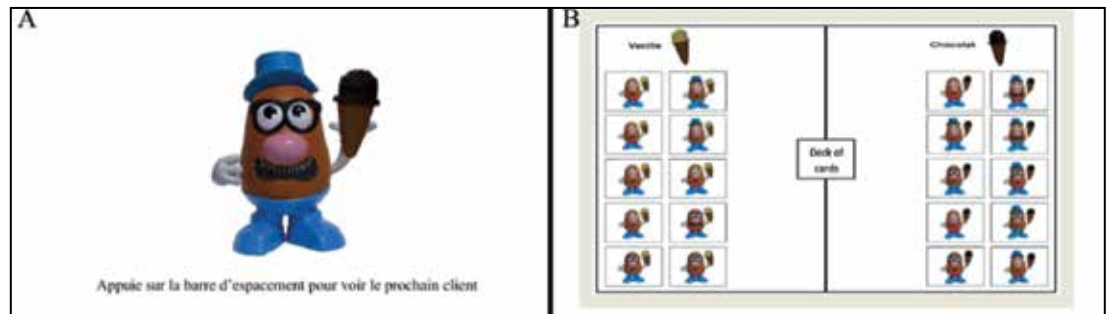


Figure 2 from the original article (Situations with isolated (a) or simultaneous (b) presentation)

What is the take-home message?

The study findings support a growing literature that suggests autistic children can learn implicitly, and sometimes at a level of complexity comparable to typical children. Different proposals can be drawn from the results of this research:

1. Autistic children don't seem to benefit as much from an increase in feedback if it doesn't provide additional information to solve the task. Autistic children even seem rather helped by **feedback that is inherent in the task itself**.
2. In some contexts, autistic children may find it easier to learn if they are presented with **all the relevant information simultaneously** in a learning situation, rather than presented one item at a time as is often the case. Autistic children benefit when they can be presented with **multiple examples of the concept** being taught (e.g., multiple examples of words with the same sound, expressions of joy, multiplications). **Access to a wide range of information** seems to make it easier for the autistic child to detect regularities in the learning

material (i.e., see similarities and differences) and to identify correspondences more easily between different elements that share certain common characteristics (e.g., a letter and its pronunciation).

3. Children's learning was better when they had the opportunity to observe, manipulate, move, classify, and group learning material. The **manipulation of the learning material** would facilitate the observation of the recurrences between the elements and allow feedback inherent to the task (i.e., in the task itself). In addition, when **information is presented in a structured way** (e.g., in a matrix or a table), the necessary information is presented together, simultaneously and remains accessible throughout the learning process. Each component has its place and the links with the other components/examples is more readily observable.

In short, it will be interesting to see how these different proposals can be implemented in the educational strategies developed for autistic children, whether these strategies target functional, socio-emotional, or academic learning. 🌸

Original article:
Nader, A. M., Tullo, D., Bouchard, V., Degré-Pelletier, J., Bertone, A., Dawson, M., & Soulières, I. (2021). Category learning in autism: Are some situations better than others?. *Journal of Experimental Psychology: General*.