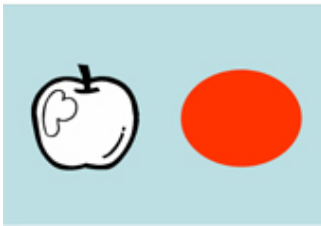


# How Red Apples Mark a Cognitive Leap Forward



Alternating between object attributes is no simple task. Kids and adults succeed by using different cognitive strategies.



**Children aged about four suddenly become capable of recognising that an object can be described differently depending on how it is viewed. This apparently simple skill requires cognitive changes that are not far enough advanced until then.**

A project carried out by the Department of Psychology at the University of Salzburg with support from the Austrian Science Fund FWF reached this finding. The research could also contribute to an improved understanding of developmental disorders such as autism and attention impairment.

Children aged under four are good at classifying objects, meaning that they can cope with a complex world. They effortlessly sort objects such as red apples by colour or shape. However once it has been described as an apple, the classification seems to be final. It is neither necessary nor possible to see it as red. Understanding that an object can be two things at the same time calls for a major cognitive leap forward.

## **RED but not APPLE**

Research by a team led by Dr. Daniela Kloo and Prof. Josef Perner at the Department of Psychology at the University of Salzburg has shown that this developmental jump takes place at about four years of age. As Dr. Kloo was able to determine through experiments with playing cards, beyond this age children are able to describe an object in more than one way, for instance as an apple and a red object.

The question for Dr. Kloo was whether younger children are at all capable of discriminating between simultaneously perceived object properties. The answer: "By making a simple change to the experimental situation we were able to show that three-year-olds do actually use the categories red and apple at the same time - but only if the two attributes do not belong to the same object. When we used cards with, for instance, a red circle or a colourless apple, the three-year-olds were able to sort the red circle by colour and the apple by shape. This provided us with an elegant proof that children in this age group are capable of discriminating between sets, but that object-set-shifting is difficult for them."

Dividing attributes into two objects does not have the same effect on adults. It does not make sorting much easier for them - evidence that this form of cognitive activity has become fundamentally different by adulthood.

## **Obstacle for Adults**

However other research has already demonstrated that changing existing ways of viewing objects always demands a cognitive effort. Adult experimental subjects were required to alternate between sorting, say, red apples by colour or shape. They made scarcely any errors, but reacted more slowly whenever the sorting criterion was switched. "It appears that a set shift is always a big obstacle for our cognitive system. We get better with practice, but it always takes an effort", Dr. Kloo explained.

In Dr. Kloo's opinion the results indicate that the conditions for forms of behaviour such as empathy, respect and tolerance are created at about the age of four. The insights gained with the help of FWF research money thus not only shed new light on the neuropsychological changes that occur during human development but also point to potential treatments for developmental disorders such as autism and attention impairment.

Source: University of Salzburg

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