



# Integrating sound and image!

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Have you ever noticed how much easier it is to understand what someone is saying when you are able to see their lips move as they speak? The reason for this phenomenon is that our brain can add up two simultaneous sources of information (stimuli) coming from two different senses, in order to improve overall perception. In our example, the voice is perceived by your hearing and the movement of the lips by your vision, with the two together facilitating your perception of speech. This is called multisensory integration, or MSI. MSI allows information from several sensory inputs to be integrated into a coherent whole, resulting in more rapid and efficient processing of this information.

If the stimuli are not perfectly synchronized, for example in the case of a lag between sound and image in a video, integration does not happen and our perception is confused. It is this same phenomenon that allows us to recognize the food that we eat: by adding up information from smell, texture, and taste, we can distinguish between hundreds of different foods. MSI is therefore crucial for many things, since we are constantly receiving multiple stimuli from our environment: sounds, images, sensations... If this integration does not happen perfectly, the perception of our environment can become confusing and disruptive.

## Autism in all senses

Some autistic people avoid loud noises, certain textures or certain smells. On the contrary, others seek out specific stimulation or sensory experiences. Research has shown that 69 to 95% of autistic people have sensory or perceptive specificities, and this criterion now appears in autism diagnostic tools.

Research suggests that autistic people do not integrate multisensory information in the same way that neurotypical people do. An overload of information could be partially responsible for particular sensory behaviours and social challenges experienced by some autistics. However, studies on this topic have generally used rather complex stimuli, for instance involving language or emotions, but no study to date had used a very simple non-social task to evaluate multisensory integration in autistic adolescents and adults. Hence, previous results did not tell us if

differences really came from altered MSI, or if the tasks used were simply challenging for autistic people.

## Testing MSI simply

This is why a recent study decided to use the simplest existing task to compare MSI between a group of 20 autistic and 20 neurotypical adolescents and adults. Participants were seated at a computer screen with headphones on. For each trial, they were presented with either an auditory stimulus (a *bip* in the headphones), a visual stimulus (a *flash* of light on the screen), an audio-visual stimulus (both simultaneously, *bip* and *flash*), or no stimulus at all. Every time a stimulus appeared, they had to press a button as fast as possible, and their reaction time was measured. There were a total of 256 trials!

When multisensory integration happens normally, participants press the button faster for the combined *bip* and *flash* condition than if they only see the *flash*, or only hear the *bip*. We can then compare participant reaction times between these three conditions to find out if they successfully integrate multisensory information, which allows them to react faster.

## What did we discover?

The authors found that the autistic group did not press the button faster when presented with the two stimuli at the same time, whereas this condition helped neurotypical participants. In other words, autistic people do not benefit as much from the facilitation brought by the presence of two stimuli instead of one, even when a very simple and non-social task is used. These results suggest that the integration of audiovisual information is altered in autistic adolescents and adults.

If multiple stimuli are perceived as distinct pieces of information instead of an integrated whole, one can imagine how a busy environment can quickly become overwhelming. These findings could partially explain some of the signs present in autistic people related to communication and social interaction. The understanding of mechanisms that underlie observable signs of autism could lead to better adaptations of autistic people's environment to their sensory characteristics and better targets for intervention strategies. 🌟

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### Original paper:

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