What did you find out from the research activities at Bright Sparks?

Multisensory learning project

The aim of the multisensory learning project is to explore and identify the best sensory modality(s) for learning across childhood. For example, do children learn best with tactile, visual or auditory information, or a combination of the different senses, and how does this change with development?

What we did

In the ‘Alien Beanbods’ study, we examined 4- to 10-year-old children’s ability to learn where different families of Alien Beanbods (beanbag toys) live, using a fun categorisation game.

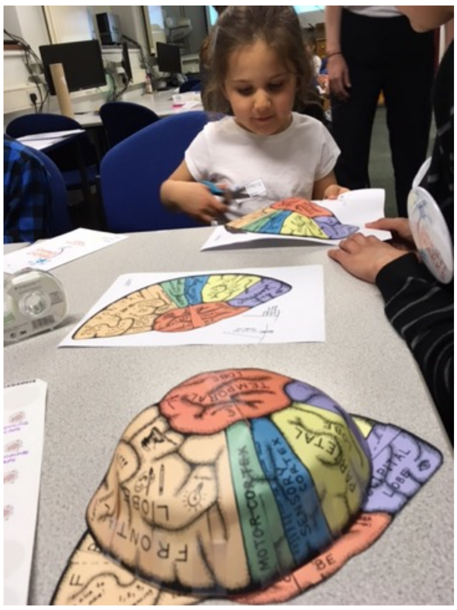
The child was shown different Alien Beanbods, each with a particular home spaceship, and asked to guess where they live using different sensory cues. The researcher then revealed the correct spaceship, so the child could learn the categorisation rule as the game progressed. The study investigated whether presenting children with multisensory cues (both tactile and visual information about family membership) on the task facilitated learning more than unisensory cues (tactile or visual information alone).

What we found

In previous studies, we have found that when information is presented in two sensory modalities it facilitates learning to a greater extent than with one modality on its own. We are continuing to collect data for the Alien Beanbods study with many other primary school age children, so sadly we don’t have any findings to share with you just yet! Results will be available soon on our website: http://cbcd.bbk.ac.uk/research/multisensory-learning-project/home.

Thank you for taking part in this study. We hope you had a lot of fun!

Imagination

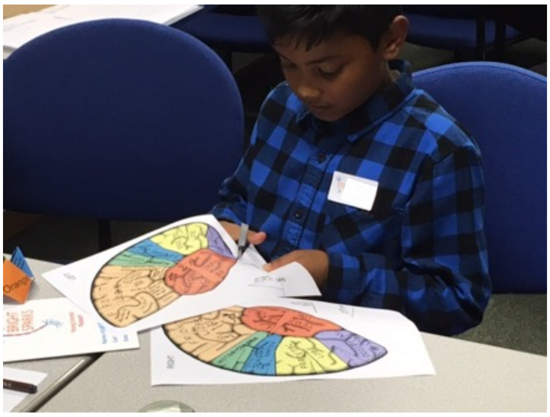


Our research is trying to understand how our environment, and particularly noise, can affect children’s creativity. We focused on “divergent thinking”, the ability to come up with lots of original ideas from a single starting point. Research on adults has shown that coffee-shop levels of moderate noise can help divergent thinking and we are interested in whether the same effect can be seen in children, in the context of classroom noise.

What we did

We asked children to come up with as many unusual uses as they could think of for an everyday household object. They answered for one object in silence and a second object with recorded background noise. The noise was classroom babble, movement from chairs or tables etc, played at 65dB (quieter than children are generally exposed to at school). In a second game, children were asked to think of possible consequences of an unusual imaginary situation. Finally, children played some computer games, which required them to focus their attention on specific objects, memorize numbers, or repeat back visual sequences.

What we found
Preliminary results did not reveal an overall effect of noise on divergent thinking – the number of ideas children came up with was not different in silence or noise. However, digging a bit deeper, it did seem that the impact of noise varied from one child to the other, depending on how well they were able to focus in our attention tasks. Broadly, those with the highest and lowest levels of attention focus performed better in silence, whereas those with average levels performed better in noise. It also seems that high memory was associated with better performance in noise, compared to silence. This is because working under noise may require to keep a lot of information in mind at the same time. We are now gathering a bigger sample of children to look more into these findings, as well as looking at whether the result applies equally to children of different ages.



Spatial Language and Categorisation

What we did
The aim of this research is to investigate whether spatial language can aid spatial representation in children. Specifically, we are interested in spatial categorisation; the ability to recognise when an object is "above," "behind" or "under" another. We are looking to further our understanding of how spatial categories advance and whether language can be used as a tool for children's spatial processing.

What we did
In this study, we tested 5-year-old participants on their ability to distinguish different spatial relations (e.g. whether an object was above vs. below another) and their spatial language comprehension and production. We also conducted a spatial language training game to investigate whether an increased knowledge of spatial terms aided performance in distinguishing spatial categories.

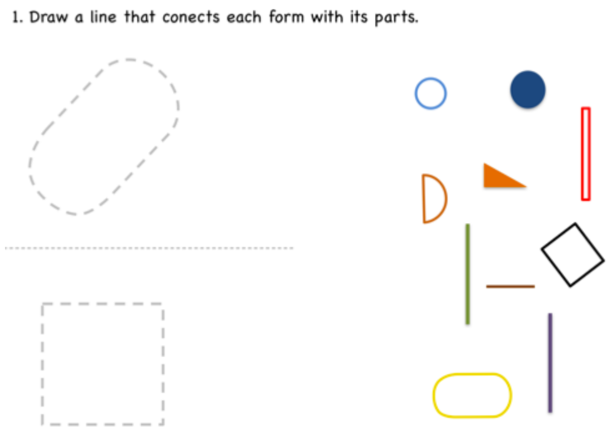
What we found
We are continuing to collect data with other primary school children so do not have an answer as to whether language influences spatial categorisation just yet! With our analyses we aim to compare participants that received the spatial language training game and those that did not on their ability to categorise spatial relations.

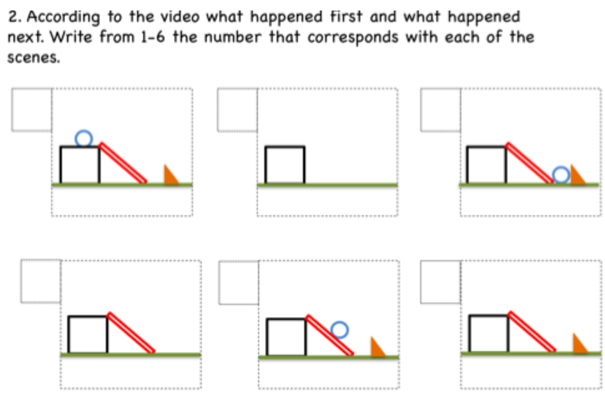
Curiosity

It is commonly understood that curiosity leads humans and other species to explore the world we live in. This drive prompts individuals to search for knowledge and learn new things. Thus, a strong relationship between curiosity and learning is assumed by common knowledge. Consequently, behavioural and neuroimaging studies have tried to clarify the mechanisms underlying this relation. For example, research in adults suggests that the answers to questions, which elicit a state of high curiosity, are more likely to be remembered by adults. This study will aim to investigate the effects of curiosity on learning, by assessing the learning outcomes of children after a curiosity prime.

What we did

Children watched a 5 min video of a person performing a science experiment followed by age appropriate information. This information was about how to draw a chicken and how build a ramp. Then they answered a worksheet that measures their ability to remember the information given on the video.





What we found

Preliminary analysis suggests that children with higher IQ had higher scores in the first part of the worksheets, that measures their ability to remember the shapes and colours presented on the video. While older children had higher scores in the second part of the worksheet, that measures their ability to remember the logical sequence of building a ramp. There was no association between children exposed to the curiosity experience and their ability to answer the worksheets.

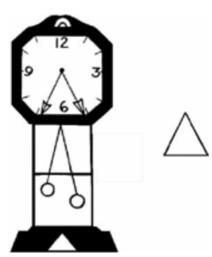
In order to understand how curiosity has an impact on learning, interesting research questions have arisen. For example, how much time should curiosity be aroused in order to have an effect on learning? What measures allow us to test comprehension and long-term memory? What is the effect that science experiments have on attention, memory and motivation?

Field Independence and maths

My previous research has found that children who score higher on tasks where they need to focus on a detail without being distracted by its context, also perform better on maths and science tasks. This is important because maths and science activities often need information to be taken out of its context; for example, to solve maths word problems, you first need to identify and focus on the relevant information from the ‘story’ context it’s been placed within. My next research project will look at children’s looking patterns when they complete the tasks, to see whether there is a relationship between performance and what children are focussing on during the task.

What we did

The children completed 30 maths questions – 10 number questions, 10 angle questions, and 10 graph questions. They had to decide whether the information they were given was true or false. They also completed a shape game, where they looked for a triangle or house shape that had been hidden in a picture. This task measures their ability to find a particular shape (triangle or house) without being distracted by the whole picture.



What we found
Children who were better at finding the triangle or house shape in the picture, tended to be quicker at answering the maths questions. Also, in general, children who were better at finding the triangle or house shape, achieved a higher score in the maths questions involving graphs.

This suggests that the ability to focus on a detail whilst ignoring the context may be more important in some types of maths activities than others. I am excited about looking into these relationships further next year using eye-tracking technology!

Using hand gestures to learn science

We use hand gestures along with speech to convey meaning. These hand gestures may also be a useful learning tool in science learning. Adults who are taught with and use specific gestures, related to the science topic that they are learning, perform better than adults who have been taught about the same concept using physical objects only. The study looks at this relationship with children.

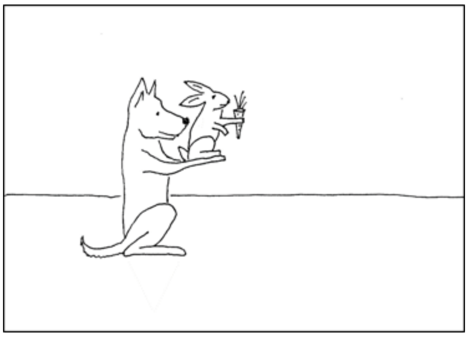
What we did
Half of the children we worked with (the gesture group) were taught a brief, one-to-one lesson about magnetism in which the researcher used hand gestures to explain the topic. The children in this group then also used the hand gestures themselves to answer a series of questions and also completed a short written assessment of understanding. The other children (the object group) followed the same procedure, except they were taught with and used real magnets to answer the questions. They also completed a written assessment afterwards.

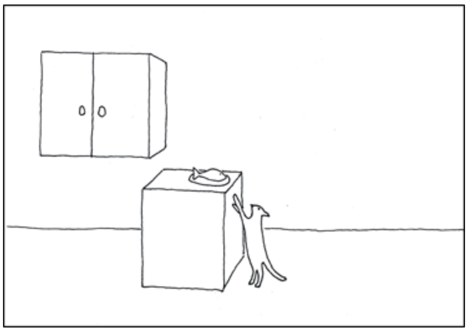
What we found
Preliminary analysis of the results suggests that the children in the gesture group appear to have performed slightly better on the written assessment than the magnet group. However, we now need to collect data from a larger sample to confirm this finding.

Analogies

The aim of the study was to see if we could help children see analogies more easily by playing a simple card game. The ability to see analogies is thought to be a key process underlying many aspects of learning. Understanding how to help children identify analogies has many potential benefits in terms of supporting a wide range of children's development, from acquiring language, to understanding complex concepts within the classroom.

What we did
The children first played a card game where they arranged images into different groups. Once they had completed the card game, they then worked through a set of analogy problems where the aim was to match an object in one image with an object in a different image. To answer the analogy problems correctly, they had to be able to see how the two images are analogous to each other. The aim was to induce an effect known as 'priming' – a phenomenon where exposure to a particular stimulus, such as the word 'cat' for example, partially activates memories within the brain of related objects such as a 'dog', allowing comprehension of what is being primed to happen more rapidly. The aim of the card sorting game was to prime the children to see how the images in the analogy problems were analogous to each other.





What we found
The results were very interesting. Children's performance in one set of analogy problems increased by 50% after they had played the card sorting game with the priming cards first. On average, children who were not primed scored approximately 5 out of 10 in the analogy problems, compared with a score of approximately 7.5 out of 10 if they had been primed. The results indicated that by using the card game to focus children's attention in a certain way, they were more able to see how the two images were analogous to each other which allowed them to solve the problems with more ease. In future work, we will be looking at how to make the priming effect work with more precision (the effect did not work with all the problems we used, so this is an area to investigate) and how to extend the process to more applied aspects of learning such as language development and classroom learning.

Rotating Animals

For over 50 years scientists have been trying to find the link between spatial ability and maths. Spatial ability is the understanding of a space and the ability to view objects in that space differently in your mind. A link has been found in both typically developing children and adults but no work has been conducted on the autistic population. The aim of this study was to find out whether children diagnosed with Autism Spectrum Disorder had the same link between their spatial ability and maths and compare their scores with typically developing children.

The typically developing children were recruited from Bright Sparks while the children with Autism were recruited from a special needs school.

What we did
All the children were asked to take a quick maths test that measures their general maths ability - things like addition, subtraction, multiplication and division. The children were then asked to play some games on a computer that cleverly tested them on more maths-related abilities and their spatial ability. The first game was a 'Dot Game' that asked children to determine what side of the screen had the most dots. The second game, the 'Animal Game' tested whether the child could mentally rotate animals in their head to match them with other animals on the screen. The children enjoyed all the activities, especially the animal game!

What we found
The results so far has shown that there is no link between a child's spatial ability and their maths scores, in both typically developing children and autistic children! This result was not what we expected, so we need to explore this further. The sample size is still growing so the more participants that we recruit, the clearer the results could be!

Learning and Motivation

Children often struggle to verbally express what they have learnt but does that mean that no learning takes place? In this project, we hope to make a contribution to our knowledge about the ways in which children learn at different stages before verbal report and with different levels of awareness and focus. We also seek to identify patterns of motivation and effective support to motivate learning. Is internal reward as effective as external?

What we did

In this study, 5-6 year old children played two computer games. In one game children got to explore and learn hidden probabilities assigned to different familiar cartoons and were motivated to learn either by simply seeing the characters dance or also collecting coins. In the second game children were tested on their ability to ignore conflicting irrelevant information when matching keyboard keys.

What we found

We are still collecting more data to measure learning based on preferences and tapping speed but in our upcoming analysis we will look at the different learning strategies for the two motivation conditions in the first game and whether this links to attentional and behavioural responses in the second one. We are hoping that this could reveal subtle but key differences in learning strategies and motivation.