

The BLOCS study in more detail

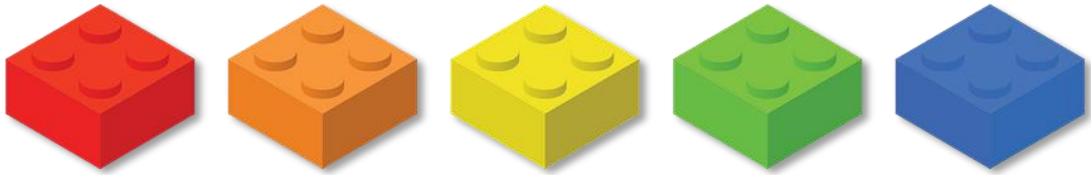
Our research aimed to better understand the role of children's mathematics and spatial reasoning skills when they play with block construction toys such as LEGO®.

■ ■ Background information about children's maths and spatial skills ■ ■ ■ ■

Spatial reasoning involves perceiving the location and properties of objects and the distances between them. We use spatial reasoning skills to visualise and manipulate the objects that are around us during day-to-day tasks, from packing a bag to navigating a busy supermarket. Spatial reasoning skills are important for children's development because children need to reason spatially in many aspects of their lives. Examples include comparing shapes, learning about anatomy in a science lesson, gesturing and exploring with other children in the playground, knowing whether they will fit in a hiding place, and map-reading.



Maths skills are important for children's development. We use maths skills in daily life, for example, using money and getting to an appointment on time, and many career paths require strong maths abilities.



Research has shown that children's spatial reasoning skills are strongly related to their maths skills. This means that children who are better at spatial reasoning tend to be better at maths. This is because maths draws heavily on spatial skills. The ability to visualise and manipulate objects in space helps children to solve geometry problems. In addition, spatial reasoning is important for children's numeracy skills, such as understanding how symbols are arranged in equations, solving missing-number equations by mentally rearranging the locations of the numbers, and solving addition problems by imagining two sets of dots coming together.



Mental rotation

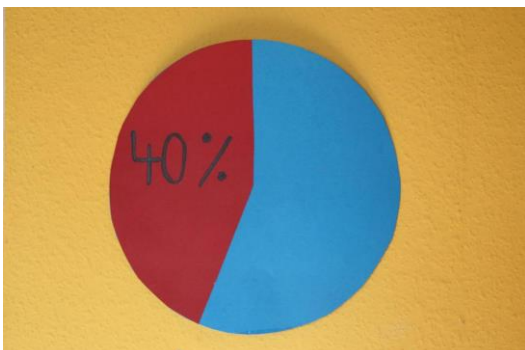
$$7 + _ = 15$$

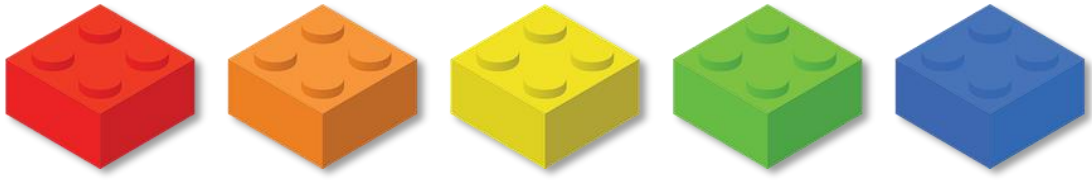
becomes...

$$15 - 7 = _$$

■ ■ The role of spatial and maths skills in block construction ■ ■ ■ ■ ■ ■ ■ ■ ■ ■

Studies have shown that children's block construction skills and maths skills are related, meaning that children who are more skilled with toys such as Lego tend to be better at maths activities. However, until our study it was unclear why these skills are related. Children's spatial skills might explain this. In this research we aimed to investigate which spatial skills explain the link between children's maths and Lego construction abilities.

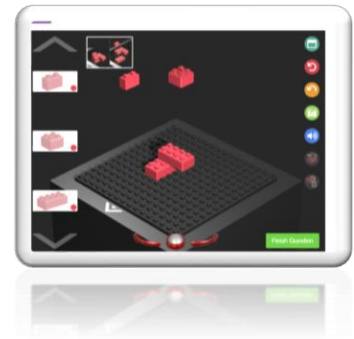




■ ■ The role of digital technology in maths and spatial skills ■ ■ ■ ■ ■ ■ ■ ■ ■ ■



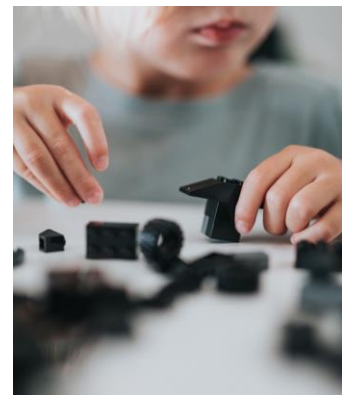
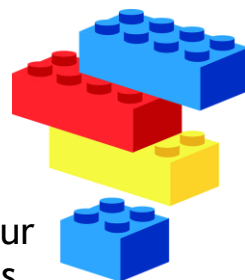
Some popular video games like Minecraft and Lego Worlds involve block construction activities and so, like Lego, these games might be relevant for children's maths and spatial skills.

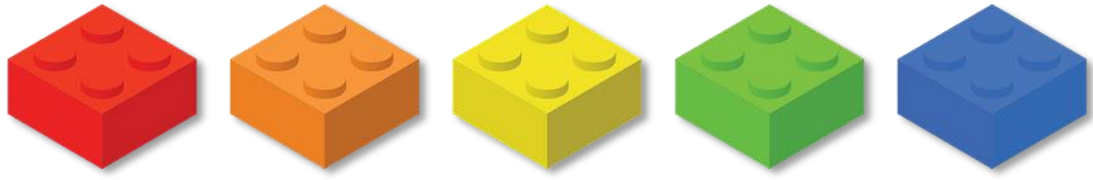


We created a digital Lego construction task so we could investigate whether digital block construction skills link to maths skills, and if so, whether spatial skills explain this link.

■ ■ Why was it important to do this research? ■ ■ ■ ■ ■ ■ ■ ■ ■ ■

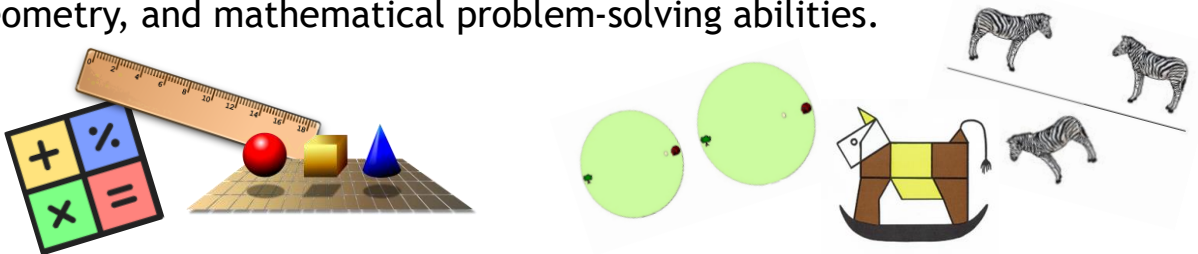
Our findings have educational implications. Research shows that children's spatial skills can be improved with training. Spatial training programmes often lead to improvements in maths skills too, because of the link between children's spatial reasoning and their maths skills. If Lego construction taps into the same spatial skills as in maths, then construction toys such as Lego could be used in spatial training programmes aimed at improving children's spatial and maths skills. Our research will also tell us whether this training is best targeted at Lego or digital block construction activities.



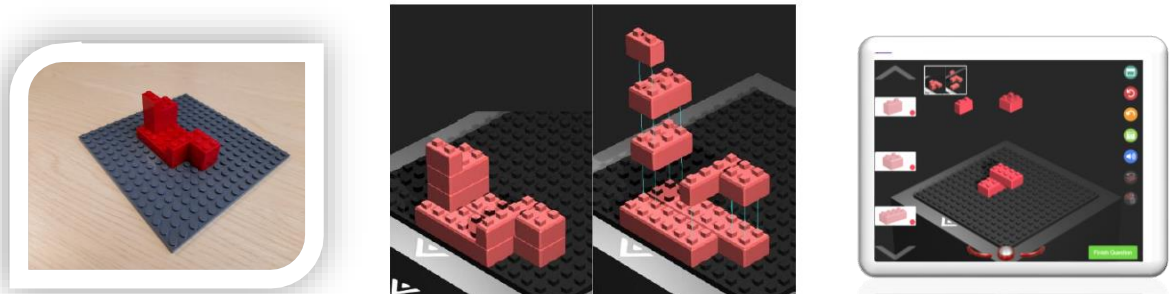


How we carried out the study

Children completed tasks that assessed their spatial skills, maths performance, and Lego construction ability. We assessed spatial skills that are known to be important for maths and Lego building, such as mental rotation, disembedding and scaling. For maths, we assessed numeracy, geometry, and mathematical problem-solving abilities.

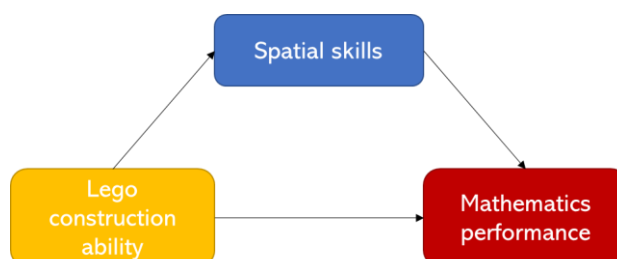


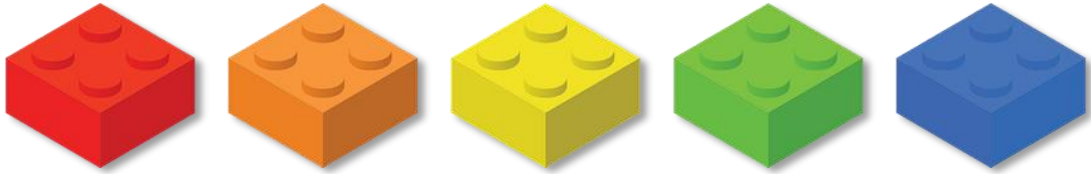
To assess Lego and digital block construction skills, we asked children to follow instructional diagrams to build a series of models as accurately as they could. Some children were given sets of Lego bricks to build the models while others completed this task on the digital game. All children attempted the same set of models.



Our findings

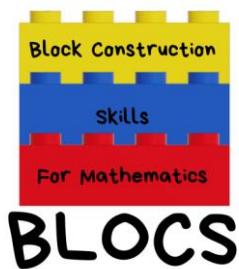
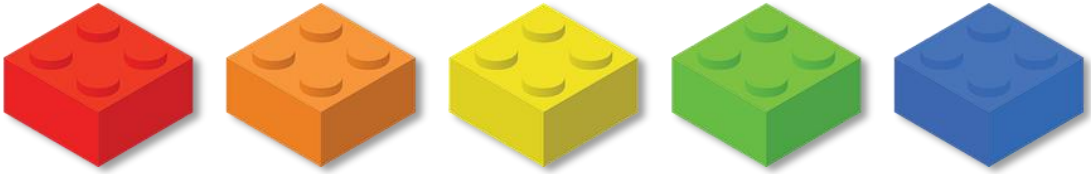
Excitingly, we found that children's spatial skills explained a substantial part of the relation between their block construction skills and maths skills. This was the case for both types of Lego, digital and physical.





Thank you for reading about our research.

A special thank you to the children who participated in this study, to their parents who signed them up, and to schools for accommodating us.



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