



Executive Functioning and Children with Speech, Language and Communication Needs

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Background

- This workshop will focus on children with speech, language and communication needs, often known as specific language impairment (SLI). SLI is a developmental disorder marked by language delays that are out of line with a person's other abilities and have no obvious cause.
- SLI has an estimated prevalence of 3-6% (Hulme & Snowling, 2009).



Plan for the Workshop

- The focus of this session is ‘executive functioning’, so we will first consider what this is and how it can be measured.
- Next, I will outline the results of a recently completed study into executive functioning in children with SLI.
- Finally, we will consider what we can do in the classroom for children with SLI who have executive functioning difficulties.

What is executive functioning?

- Executive functioning (EF) refers to high-level goal-directed behaviour, which encompasses skills in strategic *planning*, flexibility of thought and action (*switching*), *inhibition* of inappropriate responses, generation of new responses (*fluency*), and concurrent remembering and processing (*working memory*).

“...processes that control and regulate thought and action” .

(Friedman et al., 2006, p. 172)

Areas of executive functioning

Executive skills can be considered in five broad areas:

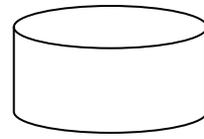
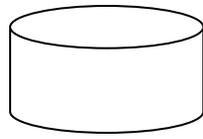
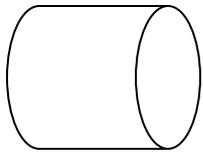
- *Executive-loaded working memory (working memory tasks involving concurrent processing and storage, e.g. complex span).*
- *Fluency (generate new exemplars in response to instructions e.g. name 'animals', uses of objects).*
- *Inhibition (inhibit an unhelpful yet readily available response).*
- *Planning (strategic planning and problem-solving).*
- *Switching (swap flexibly between strategies or tasks as appropriate in response to feedback).*

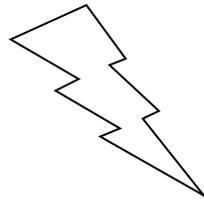
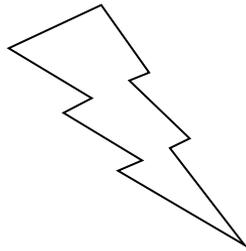
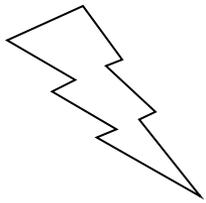
What are executive tasks like?

- We will try one now called 'reading span'
- It will be presented on slides
- You will need a piece of paper and a pen to write some answers down
- This is a measure of executive-loaded working memory
- You are welcome to try it in groups or pairs but it is usually done individually

Executive-loaded working memory: non-verbal

- **Odd one out test** (Henry, 2001)
- No standardised test available





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Inhibition: non-verbal

Build up familiar response first:

Show finger = copy finger

Show fist = copy fist

n = 20 trials



Now alter instruction: Inhibition trials:

Show finger = show fist

Show fist = show finger

n = 20 trials



Score total errors

Fluency: verbal

- Letter fluency

Name as many words as you can that begin with the letter “S” in one minute

- Category fluency

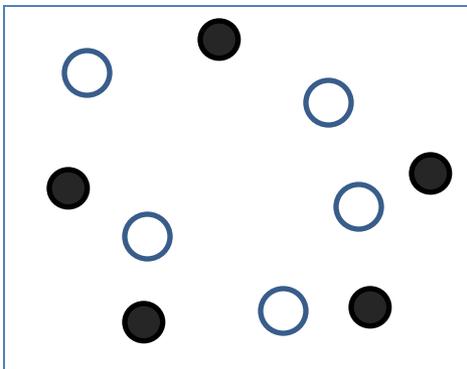
Name as many animals as you can in one minute

What are fluency tasks like?

- We will try a fluency task now
- You will need a pen and paper again
- I will give you around one minute
- Write down as many types of ... FOODS ... as you can think of.

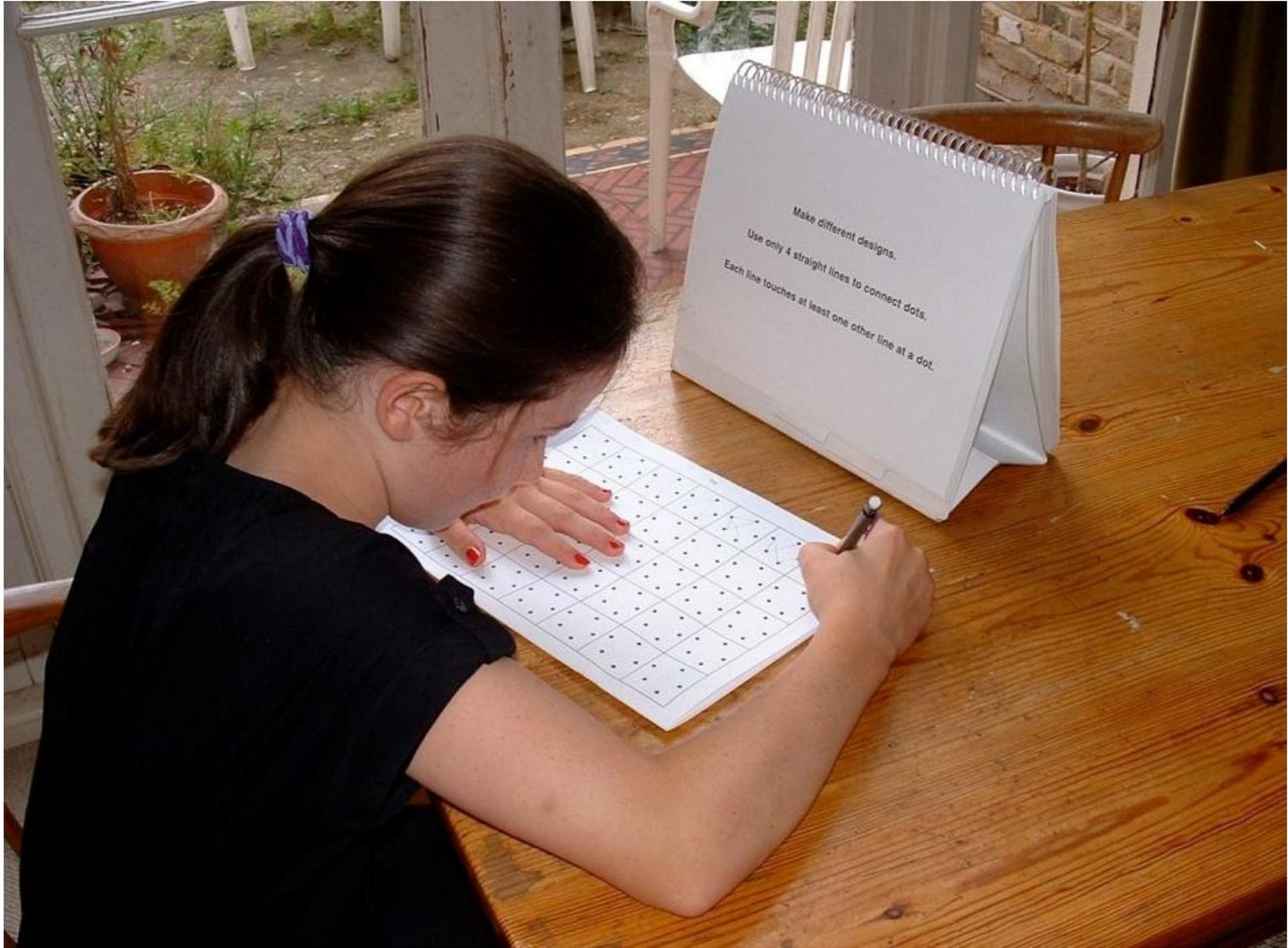
Fluency: non-verbal

“Make different ‘four-line’ designs by connecting the empty dots with straight lines”



Part one: filled dots only (not shown here)

Part two: connect empty dots (shown here)

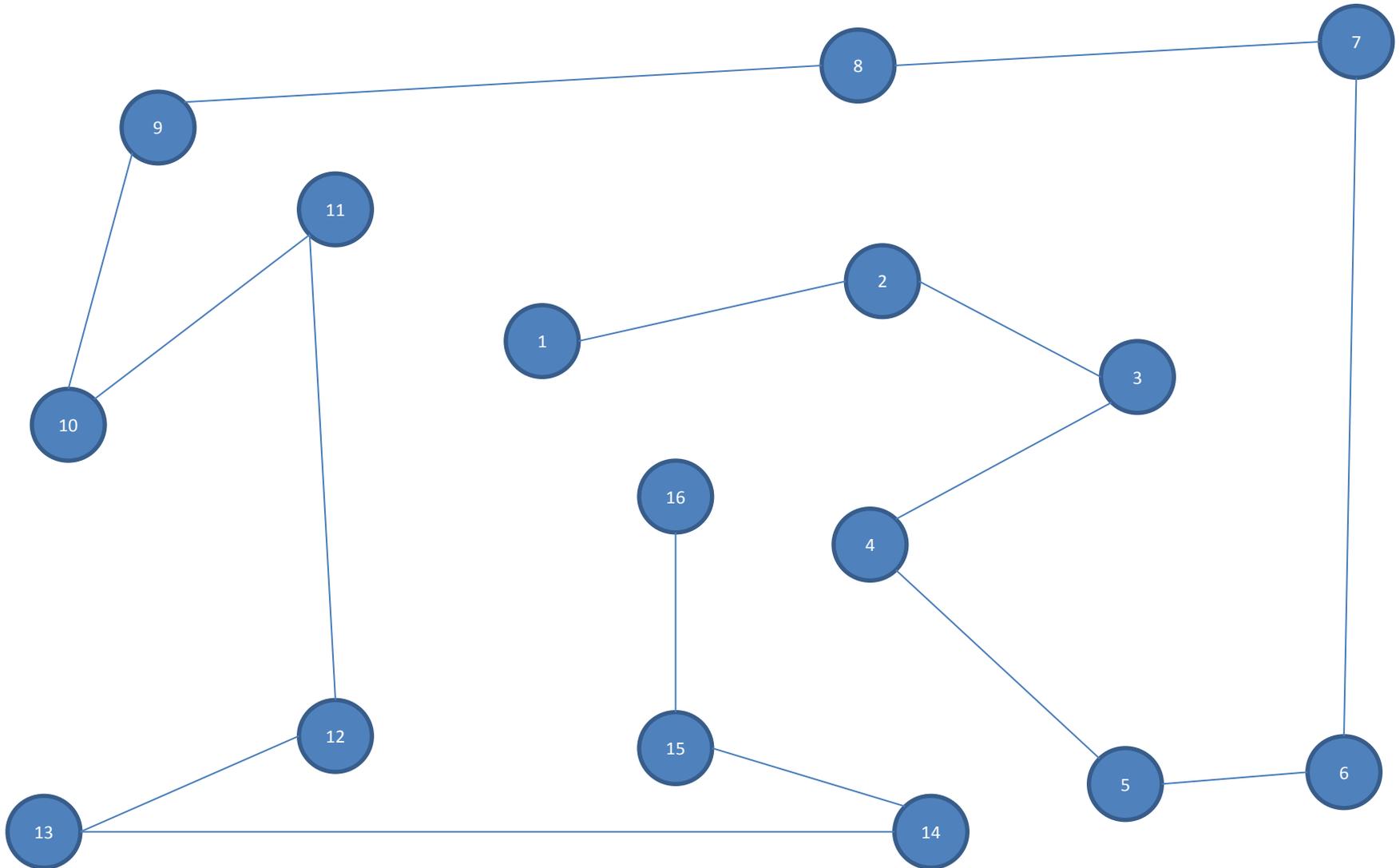


Make different designs.
Use only 4 straight lines to connect dots.
Each line touches at least one other line at a dot.

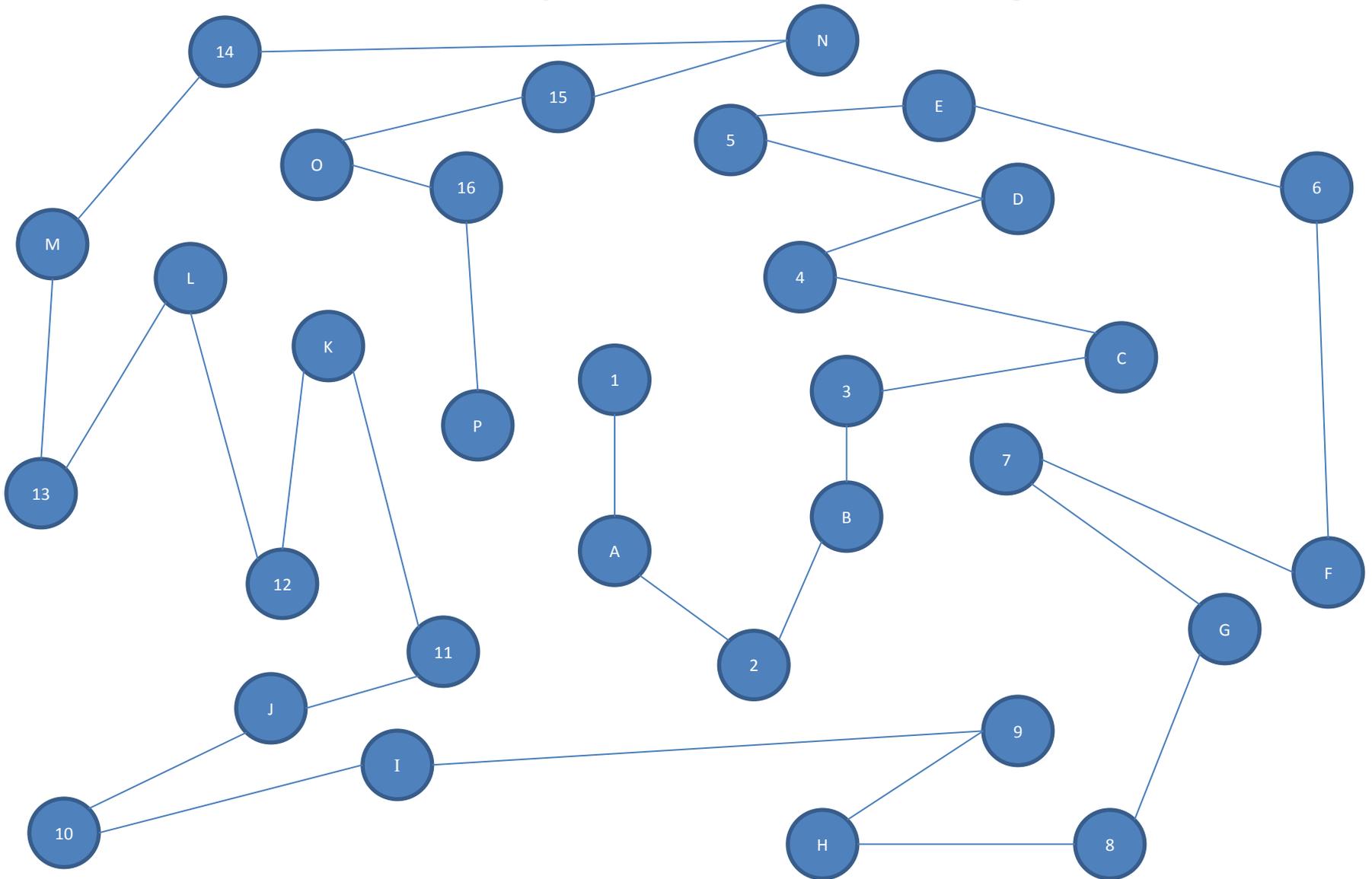
Switching: verbal

- Trail Making Test requires participants to draw lines between letters and numbers alternately in sequence (for example 1 to A to 2 to B to 3 to C to 4 to D, etc.)
- “Switching cost” was total time taken for combined letter/number switching, minus the sum of the time taken for number and letter sequencing component skills.

Example: Number sequencing



Example: Switching



Our Study

- Now we will look at the study we carried out with a sample of children and teenagers with SLI
- This was designed to be the most comprehensive study to date on executive functioning in children with SLI
- We also compared executive tasks that required language skills with tasks that *did not* require language skills
- Would there be difficulties?

Hypotheses

- **Hypothesis (1): General EF difficulties.** Children with SLI have difficulties with EF on at least some tasks in both verbal and non-verbal domains. This would suggest a broad difficulty with EF tasks, regardless of whether language-related or not.
- **Hypothesis (2): Language specific EF difficulties.** Children with SLI have difficulties with EF, but these are confined to measures that tap the verbal domain. This would suggest EF difficulties reflect problems with language skills.

Samples

Children with **typical development (n = 88)**

- A BAS II Matrices T-score of at least 40
- A verbal IQ score of at least 85
- No marked discrepancy between verbal and non-verbal IQ
- No scores of seven or below on any of four CELF-4 subtests
- No statement of educational needs

Children with **Low language functioning LLF (n = 31)**

- A BAS II Matrices T-score of at least 30
- Scaled scores of seven or below on one or two CELF-4 UK subtests

Children with **SLI (n = 41)**

- A BAS II Matrices T-score of at least 40
- Scaled scores of seven or below on three or four CELF-4 UK subtests
- Being in receipt of specialist speech and language therapy support
- No other known developmental disorder such as autism or ADHD

Results

- Children with SLI and LLF showed significant difficulties on six of the 10 EF measures:
 - ❑ verbal and non-verbal executive-loaded working memory
 - ❑ verbal and non-verbal fluency
 - ❑ non-verbal inhibition
 - ❑ non-verbal planning.
- The SLI and LLF groups obtained significantly *poorer* scores on these six measures than typical children, *even when the effects of age and non-verbal IQ* had been taken into account.

Results

- Even in more stringent analyses, when verbal IQ was taken into account *as well as* age and non-verbal IQ, children with SLI and LLF still had difficulties on five of the 10 EF measures:
 - verbal and non-verbal executive-loaded working memory
 - verbal fluency
 - non-verbal inhibition
 - non-verbal planning

How many children with SLI had difficulties with EF?

- Between 15 and 76% of the EF scores for children with SLI were 1 SD below the mean of the typical children; and up to a quarter were below 2 SD of the mean.
- The numbers of children with SLI who had performance on EF tasks below 1 SD of the mean were as follows:
 - 29% had difficulties on 1/2 tasks
 - 29% had difficulties on 3/4 tasks
 - 24% had difficulties on 5/6 tasks
 - 12% had difficulties on 7/8 tasks
 - 5% obtained typical scores on all EF tasks

Summary of findings

- Children with SLI showed difficulties with executive-loaded working memory, fluency, planning and inhibition on both verbal and non-verbal tasks.
- *Findings supported hypothesis (1) that individuals with SLI have broad executive difficulties that are not restricted to the language domain.*
- These difficulties were widespread and quite severe in some cases.

Research into Practice

- Interventions
 - Working memory training/intervention programmes
- Compensation
 - Greater awareness of executive difficulties when planning classroom activities



Some ideas to reduce executive loads

General principle: It is always easier for a child to work and learn using materials that are highly familiar and well-known.

- Start with a discussion of the classroom activity topic in circle time or in smaller groups. Repeated exposure to ideas and instructions reduces executive loads.
- Set up the task based on *highly familiar materials* for children with executive difficulties – novelty is always more demanding.
 - e.g. If you know that a child has executive difficulties, ask him/her to carry out a learning activity based around a hobby (e.g. Football)

Some ideas to reduce executive loads

General principle: Highly structured and clearly organised tasks, and those with 'back-up' are always easier for children with executive functioning difficulties.

- Written, step-by-step instructions in simple language can be placed centrally *and* handed out individually, to reduce working memory/executive loads for individual children.
- Ensure all tasks are highly structured and clearly presented.
- Flashcards with common vocabulary/spellings or multiplication tables/number bonds needed for the activity can be placed on the child's desk (key-rings can be useful). Again, reduces executive loads by providing some of the 'tools for the job'.

Worked Example

Task: “Write a story about **one thing** that you did in the summer holidays”

Familiarity:

- ✓ Topic is chosen to be highly familiar for the child
- ✓ Teacher can also discuss the task in circle time, she can give her own example story, ideally with pictures, to increase familiarity with task requirements.

Structure:

- ✓ Keep to just ONE THING/EVENT only.
- ✓ Provide a detailed, step-by-step written task structure with visual hints.
- ✓ Ask children to tick items off the list as they do them to reduce place-loss errors.

Worked Example – “Write a story about **one thing** that you did in the summer holidays”

- Here is an example of a step-by-step written task structure with visual hints and tick-boxes that the child can mark.
- The teacher is expecting one sentence to correspond with each question posed below.

- Where did you go? 
- How did you get there? 
- What was the weather like? 
- What did you do? 
- Who were you with? 
- Did you enjoy yourself? 

Worked Example – “Write a story about **one thing** that you did in the summer holidays”

- For children who need additional help, this planning sheet could even include enough space after each question for the child to insert his or her answers.
- This will be easier than producing one ‘flowing’ paragraph of text on a separate piece of paper.

Further reduces executive load by: (1) removing the extra demands associated with structuring a paragraph of written text; and (2) avoiding the requirement to switch attention between two separate pieces of paper.



Small Group Exercise

- Think of one learning activity or everyday activity that is challenging for someone with SLCN
- Try to think of ways to reduce executive loads on this activity by increasing familiarity and/or restructuring the task

