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Memory for delayed intentions in adults with dyslexia

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Talk outline

- Prospective memory (PM)
- Rationale for studying PM in dyslexia
- Evidence
  - Self-report
  - Laboratory-based
  - Naturalistic experiments
- Explaining the nature of PM deficits
- Supporting and improving PM in dyslexia

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The study of memory

- Historically, the study of memory has focused on **retrospective memory**
  - Remembering things that have already occurred
    - e.g., words from a list that has just been presented, doing mental arithmetic, the plot of a film you saw several weeks ago
- Problems with retrospective memory are well documented in dyslexia

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The study of memory contd.

- But the need to **remember** to do things at certain moments or times in the **future** also pervades our lives
  - This is known as **prospective memory** (PM)
  - And, until very recently, has not been explored in dyslexia

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Prospective memory

- Memory for delayed intentions (Winograd, 1988) or “remembering to remember” (Mäntylä, 1994)
- Prospective memory involves
  - **Delaying** the carrying out of an intended action
  - **Remembering** to carry it out at a future time

Prospective memory is pervasive

- Mundane activity
  - e.g., remembering to post a letter in our bag, pay a bill, buy something at the shops, pass on a message
- At work
  - e.g., emailing a colleague, ensuring photocopies done before a meeting, attending the meeting
- Maintaining life itself
  - e.g., remembering to take medication, checking machinery on a regular basis

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Prospective memory is complex

- For prospective memory to function successfully two separate components must work effectively
  - Firstly, we must remember at the appropriate point in the future that we need to do something
    - A **prospective** or **planning** component
  - Secondly, we must also remember what that "something" that needed to be done actually is
    - A **retrospective** component

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Prospective memory use is varied

- Prospective memory tasks can be either
  - **Habitual**
    - Such as remembering to take prescribed medication at the instructed intervals
  - **One-off episodic events**
    - Such as remembering to meet a friend at a particular café at a specific time

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Prospective memory cues differ

- **Event-based**
  - When a particular event (or stimulus) occurs in the surrounding environment
- **Time-based**
  - After a particular duration has elapsed (e.g., in an hour) or at a certain point in time (e.g., pay a bill at some point today)

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Why are PM difficulties important to understand?

- They can have an impact across a range of settings
  - Education
  - Employment
  - Social life
  - Personal life
- Why might we expect dyslexia-related PM problems?

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Early indications: Evidence from children

- Laboratory-based studies have found
  - Problems with organisation (Torgeson, 1977)
  - Problems with planning (Levin, 1990)

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Early indications: Evidence from adults

- More frequent “forgetfulness” reported in a diary study (Smith-Spark, 2000)
- Self-reports of increased errors on Cognitive Failures Questionnaire items (Broadbent et al., 1982) which tap PM (Smith-Spark, Fawcett, Nicolson & Fisk, 2004)
  - CFQ-for-others respondents also rated adults with dyslexia as more disorganised

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Dyslexia and PM: Direct evidence

- Khan (2014) found more problems with memory being self-reported by children with dyslexia
- But some concerns
    - Questionnaire used was designed for adults
    - Broad range of ages, spanning seven school years
    - Age of children with and without dyslexia unreported
        - Needed to gauge chances of independent PM
    - Very little detail on matching of groups or inclusion criteria

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Rationale for studying PM in adults

- Important to understand the cognition of adults with dyslexia in its own right (e.g., McLoughlin, Fitzgibbon & Young, 1994)
- Smith-Spark (2017) identifies consequences of increased difficulties with PM for
    - Education
    - Employment
    - Social and personal life

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In all studies

Groups of adults with and without dyslexia compared in different studies

- Matched for short-form IQ
- Matched for age
- Differed in spelling scores
- Differed in reading scores
- Educational psychologists' reports checked and no evidence of comorbid A(D)HD

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Self-report questionnaires

- Tell us about the typical experience of respondents over minutes, days, weeks or a year
- Two questionnaires used
  - The **Prospective and Retrospective Memory Questionnaire** (PRMQ; Smith, Della Sala, Logie & Maylor, 2000)
  - The **Prospective Memory Questionnaire** (PMQ; Hannon, Adams, Harrington, Fries-Dias & Gibson, 1995)

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PRMQ (Smith et al., 2000)

- Sixteen questions asking about frequency of errors related to
  - Memory type (RM vs. PM)
  - Delay type (short vs. long)
  - Cue type (self-cued vs. environmentally cued)
- Ratings taken from close associates
  - The **Proxy-rating PRMQ** (Crawford et al., 2006) asks the same questions as the PRMQ

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Responses to the PRMQ

- Significantly more memory errors reported by the adults with dyslexia
  - Overall
  - And for both PM and retrospective memory

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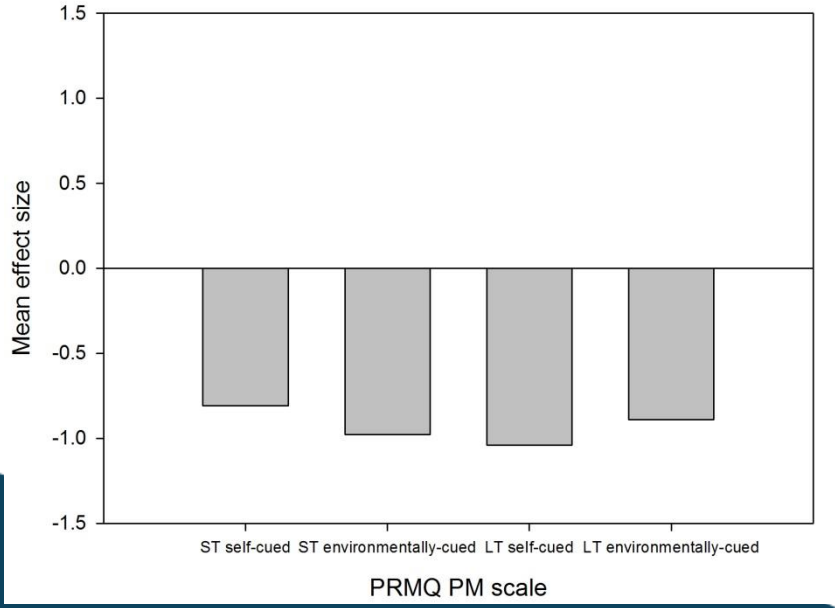
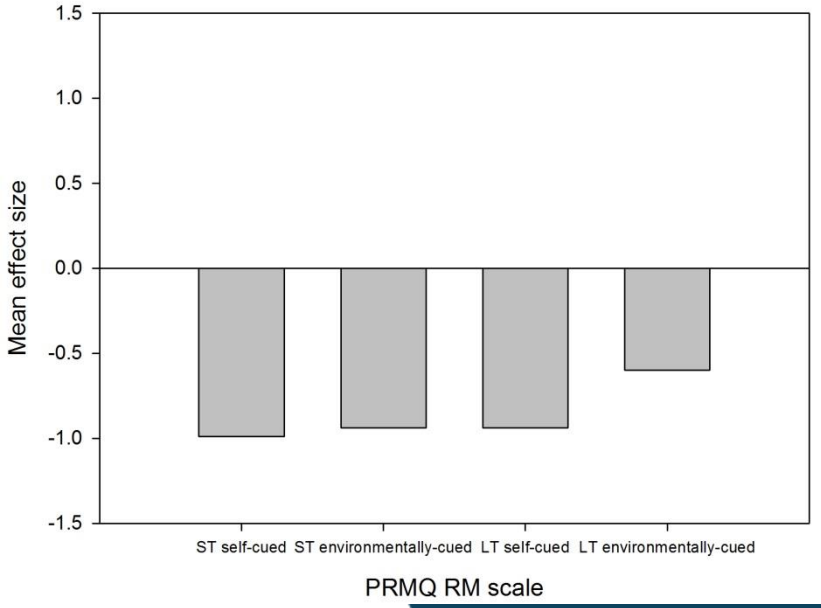
Responses to the PRMQ

- Individual subscales – all significantly lower in dyslexia apart from long-term (LT) environmentally-cued





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Responses to the proxy-rating PRMQ

- Similar patterns of response from both PRMQ respondents and proxy-rating PRMQ respondents
- Proxy-rating respondents also rated adults with dyslexia has having more problems
- Ruling out lowered metacognitive awareness or self-esteem problems as alternative explanations of the differences

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The PMQ (Hannon et al., 1995)

- Fifty-two questions dedicated solely to PM performance
- Four subscales
  - Long-term episodic
  - Short-term habitual
  - Internally-cued
  - Techniques used to assist recall
- Respondents rated frequency of error over the past week, month or year

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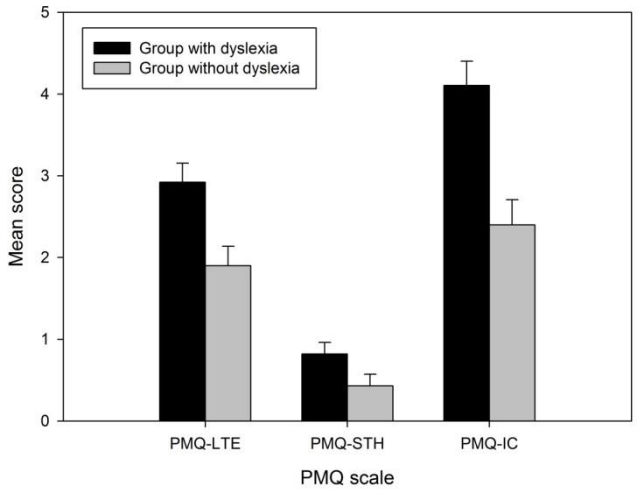
Responses to the PMQ

- The group with dyslexia self-reported more frequent **overall** problems with their PM
  - And identified problems with **long-term episodic** and **self-initiated PM**
- No difference self-reported for short-term habitual PM



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Laboratory-based research

- Consisting of two strands
  - Clinical test
    - The Memory for Intentions test (Raskin, Buckheit & Sharrod, 2010)
  - Computerised TBPM tasks

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Memory for Intentions Test (MIST; Raskin et al., 2010)

- Eight PM tasks which varied in
  - The type of cue for a response (time or event)
  - The delay between receiving a PM task instruction and the task to be performed (two minutes or 15 minutes)
  - The type of response required (verbal or action)
- Participants carried out a 30-minute word search puzzle
  - They had to remember to break out from this ongoing activity to perform the PM tasks

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Results from the MIST

- The adults with dyslexia had lower PM accuracy overall (p = .044)
- No difference in recognising the PM instructions correctly when given a retrospective recognition test after testing (p = .310)
  - PM instructions successfully encoded and retained
  - No interactions between participant group and either delay interval (p = .107) or response type (p = .570)

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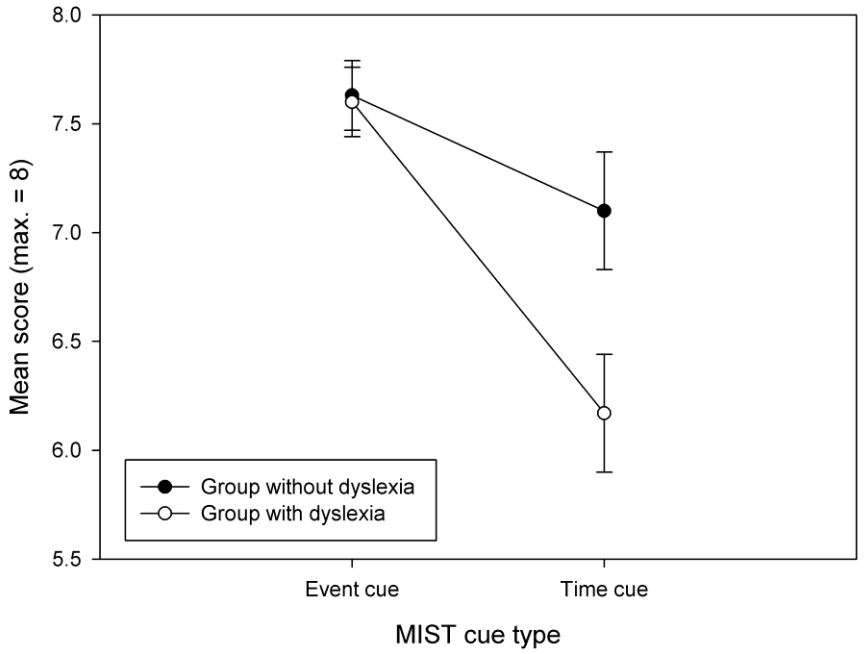
MIST: Group x cue type interaction (*p* = .027)

- Compared with adults without dyslexia, the adults with dyslexia were less accurate with time cues (*p* = .019)
  - But performed at the same level with event cues (*p* = .883)



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Computerised tasks: Time-based PM

- Living-dead decisions to celebrity faces
- Press a key on a computer positioned behind them every three minutes of a 14-minute task
- Smith-Spark et al. also varied the cognitive load associated with the ongoing task
  - Phonological – remember last four living-dead decisions
  - Spatial – position on screen of last four highlighted celebrity faces

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Time-based PM: Results

- The group with dyslexia
  - were significantly less accurate overall in their PM responses (p = .006)
  - made fewer clock checks to guide their performance (p = .049)
- No differential effect was found of increased working memory load on the PM performance of the group with dyslexia (p = .337)

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Bridging the gap between lab and everyday life

- The PMQ and MIST measures were taken from the same participants
  - Lowered PM both observed and subjectively reported in the same individuals with dyslexia
- Can PM deficits be observed under naturalistic and semi-naturalistic tasks?
  - Reducing the gap between the laboratory and everyday life even further?

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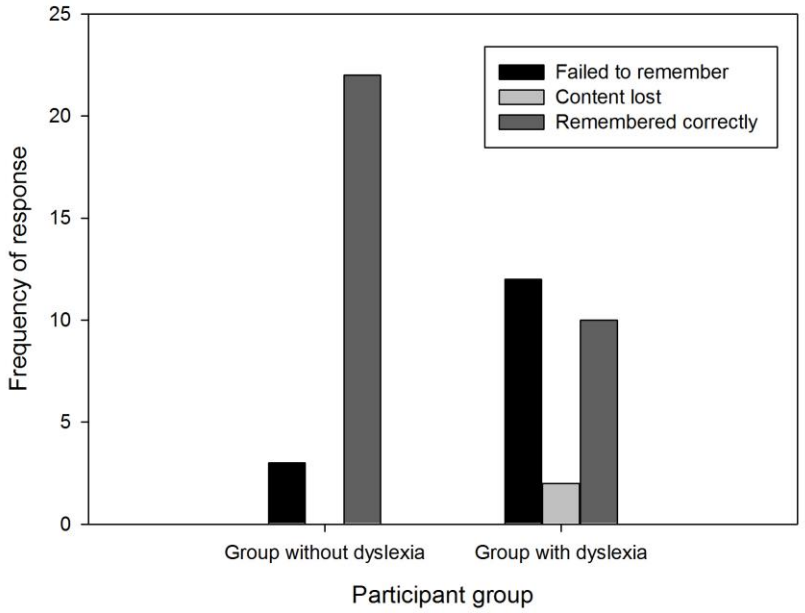
TBPM task with a 40-minute delay

- The participants were asked to remind the experimenter to save a file 40 minutes later as, if they did not, the data would be lost
- The group with dyslexia much less likely to remind the experimenter to save the file (p = .003)



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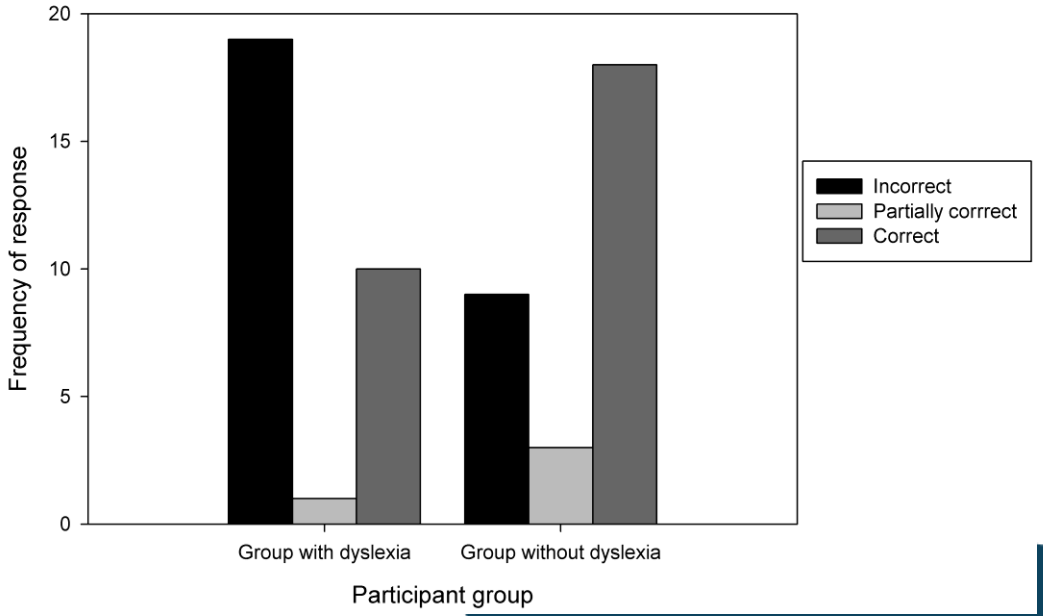
MIST: 24-hour delayed PM

- Participants were asked to leave a phone message for the experimenter 24 hours after a laboratory session
- Significant group x response association (p = .032)



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Naturalistic EBPM

- Participants asked to place a missed call in response to a text to be sent to them a week later
- After having the opportunity to make their responses, the participants were asked
  - How important it was to complete the task
  - How many times they had thought of the task in the intervening week
  - Whether or not they had remembered the task instructions

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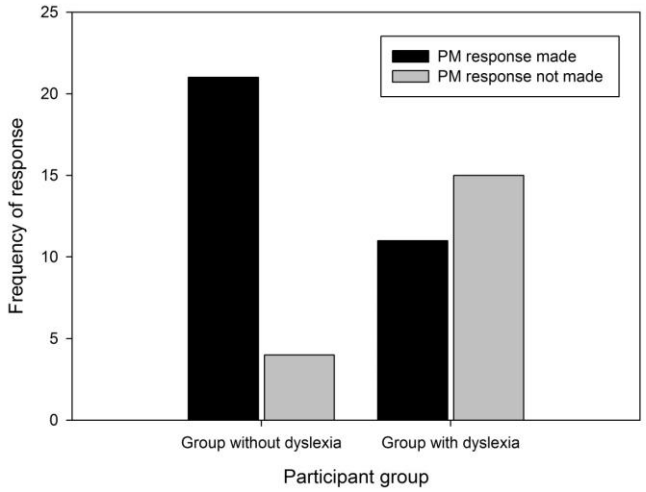
Naturalistic EBPM results #1

- Significant group x response association (p = .039)
  - Adults with dyslexia more likely not to perform the PM response
  - Adults without dyslexia more likely to perform the PM task



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Naturalistic EBPM results #2

- Importance of the task
  - No difference between participant groups (p = .768)
- Thinking about the task
  - No difference between participant groups (p = .085)

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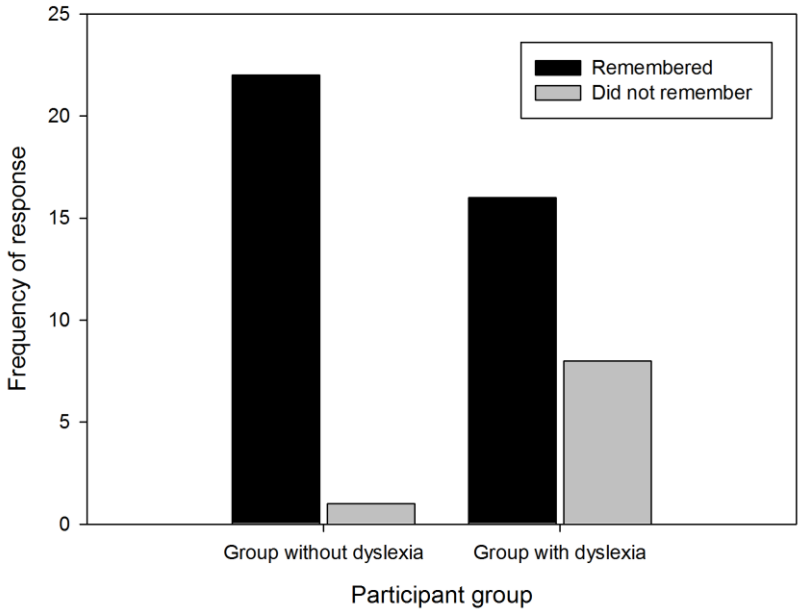
Naturalistic EBPM results #3

- Remembering the task instructions
  - Fewer adults with dyslexia reported remembering the task instructions (p = .023)



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The pattern of PM deficits in dyslexia

- PM is most likely to be affected by dyslexia when
  - Cues are time-based
  - When PM tasks are episodic, not repeated/habitual
  - When delays are longer between intention formation and intention execution
  - When performance has to be self-initiated rather than being offloaded to external objects

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Three possible explanations for PM problems in dyslexia

- Retrospective memory
  - Worse long-term memory
- Prospective component
  - Problems with executive functions
- Time perception
  - Difficulties with perceiving durations accurately

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Supporting PM in dyslexia

Support

- Electronic devices
- Recognition of problems in this area in support plans for education and work

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Improving PM in dyslexia

Ways to improve PM

- Conversion of TBPM to EBPM task demands
- Reduction of delay between intention formation and intention execution

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Strategies to improve PM

- **Intention implementation** (e.g., Gollwitzer, 1999)
  - Form If-then plans to specify the how, when, and where of an intention being acted upon
- **Visualisation**
  - Episodic future thinking to project oneself into one's personally experienced future
- **Repetition of instructions**
  - Repeated-encoding to strengthen memory traces

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Conclusions

- Evidence for PM problems in adults with dyslexia from a range of sources
  - Laboratory tasks
  - More naturalistic measures
  - Self-report questionnaires
- These difficulties should be recognised and supported when making reasonable adjustments

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Publications on this research

Smith-Spark, J. H., Zięcik, A. P., & Sterling, C. (2017a). Adults with developmental dyslexia show selective impairments in time-based and self-initiated prospective memory: Self-report and clinical evidence. *Research in Developmental Disabilities*, *62,* 247-258.

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Thank you for your attention!

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