Memory for delayed intentions in adults with dyslexia

Dr Jamie Smith-Spark
London South Bank University
Acknowledgements

Thanks to Dr Adam Zięcik and Dr Chris Sterling for discussions concerning the ideas expressed in this talk. We are very grateful to the participants, both those with dyslexia and those without, who gave their time to take part in this research.
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
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
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.
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

Become what you want to be
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

Become what you want to be
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
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)
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?
Early indications: Evidence from children

• Laboratory-based studies have found
  • Problems with organisation (Torgeson, 1977)
  • Problems with planning (Levin, 1990)
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
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
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
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
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)
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
Responses to the PRMQ

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

- Individual subscales – all significantly lower in dyslexia apart from long-term (LT) environmentally-cued
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 as having more problems
- Ruling out lowered metacognitive awareness or self-esteem problems as alternative explanations of the differences
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
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
Laboratory-based research

- Consisting of two strands
  - Clinical test
    - The Memory for Intentions test (Raskin, Buckheit & Sharrod, 2010)
  - Computerised TBPM tasks
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
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 ($p = .570$)
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 ($p = .883$)
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
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 ($p = .337$)
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?
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 ($p = .003$)

Become what you want to be
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 ($p = .032$)
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.
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
Naturalistic EBPM results #2

- Importance of the task
  - No difference between participant groups ($p = .768$)
- Thinking about the task
  - No difference between participant groups ($p = .085$)
Naturalistic EBPM results #3

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

Support

• Electronic devices
• Recognition of problems in this area in support plans for education and work
Improving PM in dyslexia

Ways to improve PM

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

Become what you want to be
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
Publications on this research


Become what you want to be
Thank you for your attention!

Dr Jamie Smith-Spark,
Division of Psychology,
School of Applied Sciences,
London South Bank University
smithspj@lsbu.ac.uk