Contextual References as a Mechanism to Support Time-Based Prospective Memory in Autistic Adults

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Introduction

- In everyday life, we often need to 'remember-to-remember' to do tasks or activities in the future. This is known as prospective memory (PM).[1]
- Time-based prospective memory (TBPM) is remembering to perform a future intended action, at an appropriate time. An example of TBPM is to turn off the oven after an hour or attend a medical appointment next week at a specific time and day.
- PM tasks can often occur while we are doing something unrelated **(ongoing task)**. The combined demands on cognitive processes places a lot of demands on self-directed remembering because we often don't get reminded if we forget to do something (omission error) or that we have already done it (commission error). For instance, whether we have already taken medication for the day.[1]
- Crucially, PM is an essential skills for autonomous living and everyday functioning.
- TBPM is especially very demanding on cognitive skills, such as executive function, organising information and time monitoring. It can be difficult for people who experience selective cognitive difficulties, especially in older age.[1,2]
- A growing body of research suggests that both autistic children and adults experience difficulties with prospective memory (PM). Many autistic people have difficulties remembering to carry out specific actions at the appropriate time (TBPM).[3]
- Research in the general population has investigated ways to improve PM. Simply giving individuals an idea of the context in which a future task (PM event) will occur, has been shown to improve PM accuracy.[4]
- To date no studies have explored the extent to which such techniques can improve TBPM difficulties for autistic people.
- We investigated how contextual references can support autistic people in TBPM tasks.
- We hypothesized that **correct contextual cues** (congruent) would improve TBPM responses to a greater extent for autistic people compared to **false** (incongruent) or **no** (neutral) contextual information.

Methods

Participants

- 62 autistic (AS, n=38) and non-autistic (NT, n=24) were matched on age, gender, IQ ***(Table 1)***
- Participants were recruited from the Autism Research Group database of participants for whom IQ and diagnostic data (ADOS scores and diagnostic confirmation) were available.

Table 1. Participant characteristics

Measure	AS (n=38) Mean (SD)	NT (n=24) Mean (SD)	Statistics	Sig. (*p*)
Gender (F:M)	14:24	13:11	χ^2 (1) 1.80	*n.s.*
Age (years)	44.41(15.52)	48.95 (17.02)	*t* (60) 1.08	*n.s.*
IQ FSIQ [a]	120.64 (14.90)	115.41 (10.40)	*t* (60) -1.38	*n.s.*
VCI [a]	118.60 (11.78)	112.27 (10.36)	*t* (60) 1.94	*n.s.*
PRI [a]	118.40 (16.06)	111.86 (13.43)	*t* (60) 1.50	*n.s.*

Notes: a. FSIQ is full-scale IQ; VCI is verbal comprehension index; PRI is perceptual reasoning Index. IQ scores as measured by WAIS-IV and WASI-II converted to WAIS-IV comparative scores.

Materials

- Participants completed counterbalanced blocks of words (120 trials) and pictures (120 trials) (counterbalanced), presented for 2000-4000ms.
- The task was designed in PsychoPy and administered online via Pavlovia.com.

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Procedures

- Participants were randomly assigned to either **(i) No Context + False Context** condition or to the **(ii) No Context + Correct Context** condition (counterbalanced). ***(Figure 1)***
- Each task duration was 6 minutes. After each task, **Free recall** questions checked **retrospective memory** for task instructions. **Metacognitive** questions probed **postdiction** of PM accuracy and ongoing task performance.
- Ongoing task instructions were to use keyboard responses to **sort words**[5] **and pictures**[6] as 'foods' (press F) or 'non-foods' (press O).
- Participants were told to also remember to **check the time** during the ongoing task (press Z to show on-screen timer, starting at 00:00).
- For the TBPM task, participants had to remember to **press SPACE when the clock showed 3 minutes elapsed time (03:00)**.
- In the **Correct Context** and **False Context** conditions, participants were given information (cue) that the target time would likely appear in Block 2. The cue was either correct (Correct Context) or incorrect (False Context). ***(Figure 2)***

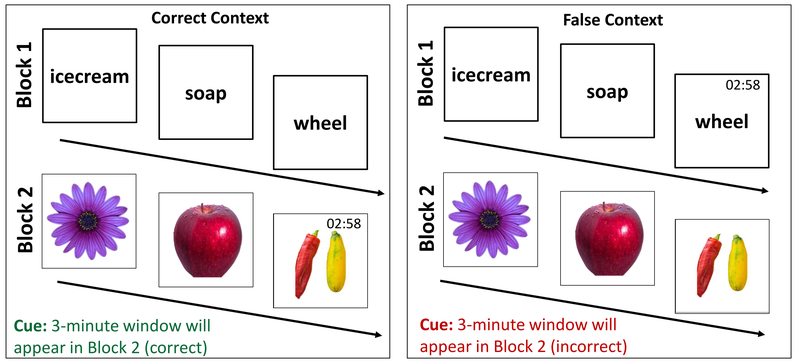

Figure 1. **Trial schema for Correct Context (left) and False Context (right) conditions**

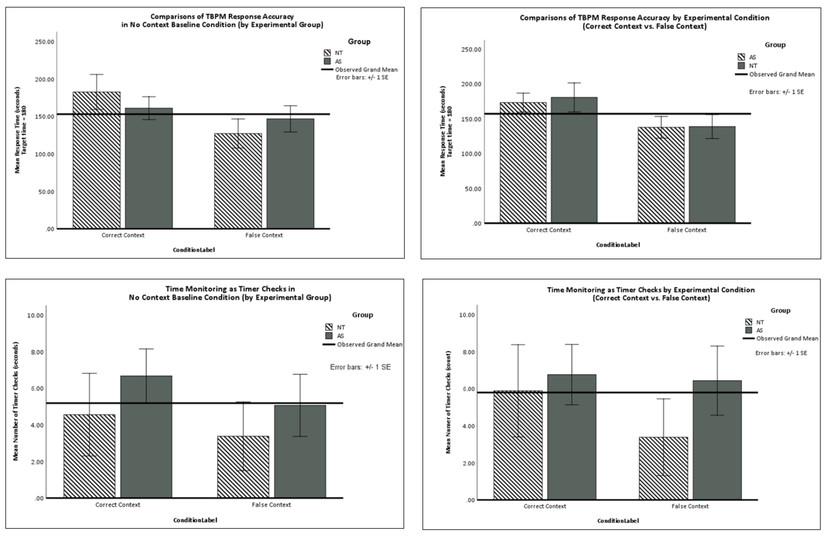

Figure 2. **Group TBPM accuracy and Time monitoring (No Context: Correct Context: False Context)**

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Analysis Plan

- **The outcome variables of interest were:**
  - i. Ongoing task proportion of accurate responses (words/pictures as food/non-food)
  - ii. Ongoing task accuracy response times (RT) (word/pictures)
  - iii. Time monitoring as number of clock checks
  - iv. TBPM response time (RT)
  - v. TBPM response accuracy as absolute difference from PM target time (3:00)
  - vi. Number of TBPM responses to assess commission and omission errors

Results

Preliminary analysis (2 (Group) x 3 (context) ANOVA) are reported for **TBPM accuracy** and **time monitoring** in contrast to **ongoing task costs** (RT and accuracy trade-off).

- **Ongoing:** AS and NT adults performed equally well at ~92% accuracy (sd .07%; *p*>.05);
- Costs were greater for AS (840ms, sd 1.83) than NT (745ms, sd 1.50) **(*F*(1,55) 5.27, *p*<.03, η_p^2 .09)**.
- **AS adults were more vigilant in time monitoring** (5.97 checks, sd 8.06), than NT (3.78 checks, sd 3.12).
- **No Context (baseline):** The average TBPM RT for both groups was ~150s (sd 70.32) (target: 180s) (*p*>.05)
- Both groups made similar Commission Errors (.11, sd .32) and Omission Errors (.50, sd.85) (*p*>.05)
- **Correct Context vs False Context:** A significant **Condition** effect was observed in the experimental conditions for timing of TBPM responses **(*F*(1,55) 5.18, *p*<.03, η_p^2 .09)**.
- NT made more accurate TBPM responses **(*t*(20) -2.24, *p*<.05)** and more Clock Checks **(*t*(20) -2.24, *p*<.05)** in the Correct Context than in False Context condition.
- **AS adults consistently monitored time frequently, regardless of contextual cues.** TBPM responses were marginally more accurate (~25%) in Correct Context than No/False Context **(*t*(28) 2.58, *p*=.02, *d*=.48).** ***(Figure 2)***

Conclusions

- We evaluated contextual information as a potential strategy to support autistic adults with everyday prospective memory in time-based events (TBPM).
- Preliminary findings indicate that the use of targeted contextual information may help to ameliorate TBPM difficulties for autistic adults.
- We observed TBPM accuracy improvements in Correct vs. No / False Context conditions.
- In addition, AS adults were more vigilant in time monitoring (i.e., more clock checks).
- This might suggest important group differences in the reliance on external supportive strategies (e.g., more clock checks) as well as contextual information, rather than reliance on strategically self-monitoring one's internal memory.
- Further analysis is underway with potentially promising implications for the use of novel strategies to support TBPM and facilitate the autonomy of autistic adults in everyday life.

References

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