Meta-Prospective Memory Accuracy in Healthy Older Adults and Older Adults with Suspected Mild Cognitive Impairment in a Rural Setting

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Abstract

Objective: This study examined if the relationship between generalized appraisals & task-specific appraisals of one's prospective memory (PM) & actual PM performance (meta-PM accuracy) differed between healthy & suspected mild cognitive impairment (sMCI) older adults.

Method: 50 healthy & 30 sMCI older adults were recruited from a rural community & outpatient neuropsychology clinic. Data collected included self-reported & task-specific appraisals of PM, objective PM performance, & executive functioning (EF).

Results: The sMCI group had lower scores on objective PM tasks (t = 5.13, p<.001) & EF measures related to simple (t = -3.72, p<.001) & complex task-switching (t = 4.82, p<.001). sMCI participants displayed higher task-specific meta-PM inaccuracies (t = -3.72, p < .001), but displayed relatively equivalent generalized meta-PM accuracy (Z = 1.58, p = .11). The sMCI group's task-specific inaccuracies became non-significant compared to the healthy group on the final long-term PM tasks (item 3: t = -1.64, p = .11; item 4: t = -0.66, p = .51) after exposure to metacognitive reflection. Despite lower scores on EF measures & more inaccurate task-specific meta-PM, EF performance did not explain task-specific meta-PM differences between groups beyond neurocognitive status.

Conclusions: sMCI patients may be better assisted by metacognitive calibration strategies, EF protocols, & the implementation of general compensatory memory strategies as targets for early intervention & prevention of neurocognitive decline.

Intro & Method

Prospective Memory (PM): *remembering an intention in the future*

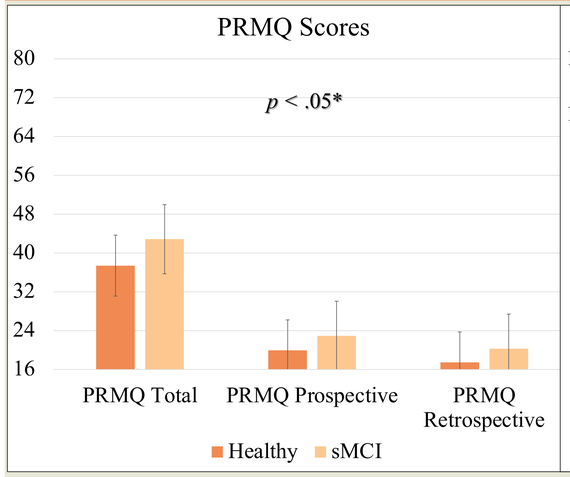
Older adults with MCI are at an increased risk for PM failure
- → Prior literature found no difference in PM performance between those with MCI vs. dementia
- → Findings likely correlated with decreased efficiency of prefrontal cortex (PFC) networks in MCI & dementia
- → Similar PFC networks involved in metacognition, assisting/detracting from appraisals of performance, impacting future behaviors

This study sought to understand the relationship between task-specific & generalized appraisals of PM & actual PM performance (meta-PM accuracy) in healthy older adults & those with sMCI.

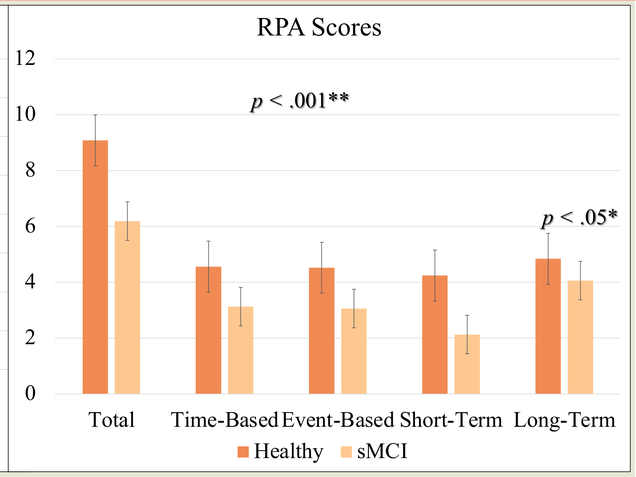
Participants:
- → 50 healthy & 30 sMCI older adults recruited from a rural community & outpatient neuropsychology clinic.
- → Participants were screened into/out of the sMCI group depending on pre-existing MCI diagnosis OR ≤24 performance on MMSE
- → Healthy group was more educated than sMCI group; no other differences existed between group demographics

Measures:
- → MMSE (cognitive screener)
- → PRMQ (self-report PM functioning)
- → RPA (objective PM test)
- → Stroop (inhibition)
- → Trail Making Test Parts A&B (simple set-shifting)
- → WCST (novel problem-solving & complex set-shifting)

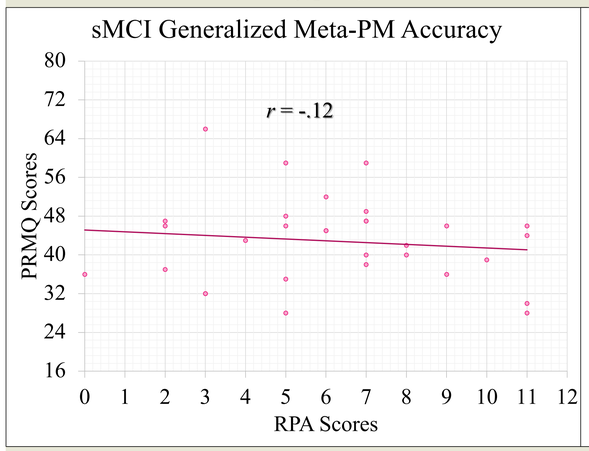
Results

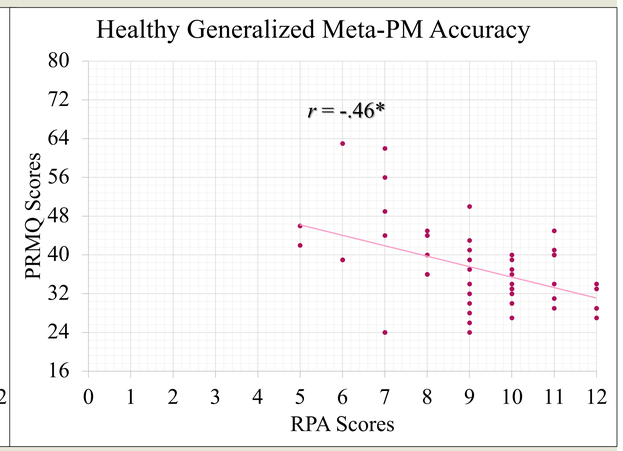


The sMCI group reported more PM complaints than the healthy group.



The healthy group outperformed the sMCI group on all objective measures of PM.





There were no significant differences in generalized meta-PM accuracy between groups.

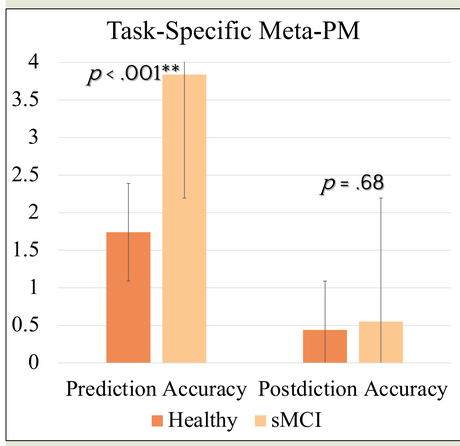


Table 7
Summary of Hierarchical Regression Analysis for Group Status and Executive Function Measures Predicting Task-Specific Meta-PM Accuracy

Variable	b	t	sr^2	R^2	Δ R^2
Step 1				.16	.16
Group Status (b_1)	2.10	3.89**	.16		
Step 2				.16	.00
Group Status	2.10	3.38**	.12		
WCST Total Errors (b_2)	0.00	-0.001	.00		
Step 2				.16	.00
Group Status	2.05	3.74**	.15		
Stroop Interference (b_2)	-0.02	-0.51	.00		
Step 2				.18	.01
Group Status	1.82	3.11*	.10		
Trails B Raw Time (b_2)	0.01	1.18	.01		

Note: * denotes p < .05; ** denotes p < .001; all b estimates are unstandardized.

The sMCI group had significantly lower task-specific accuracy of their PM performance; EF performance did not explain significant difference in task-specific meta-PM accuracy.

Conclusion & Implications

Conclusions:

Confirmation of previous literature: healthy older adults out-performed older adults with sMCI on PM tasks

Extension of the literature: we provided an introduction of the concept of meta-PM accuracy
- → No significant differences in generalized perceptions of PM functioning compared to actual performance.
- → sMCI older adults were significantly more *over-confident* in task-specific meta-PM
- → Both groups calibrated task-specific meta-PM with postdictions of performance, indicating reflection of performance increased accuracy of task-specific appraisals

Performance on EF measures was not explanatory of task-specific meta-PM differences between groups:
- → sMCI performance was significantly worse for set-shifting
- → Inhibition not significantly different between groups
- → Post-hoc analyses determined groups were adequately sized to detect a medium effect for hierarchical regression

Implications:

PM should be routinely measured in standard practice
- → PM was substantially worse in the sMCI group, leaving it a potential indicator of early neurocognitive decline
- → PM generally accounts for a significant proportion of subjective memory complaints, meaning it provides excellent face validity of neuropsychological assessment

Targets for intervention:
- → Those with MCI may benefit from compensatory strategies for PM
- → Those at risk of MCI may benefit from early intervention for PM
- → Those with MCI may benefit from metacognitive techniques, given improvement in postdiction accuracy
- → Rehabilitation techniques addressing EF may account for some improvement in PM, despite non-significant findings, via PFC networks

Limitations & Future Directions

Sample Limitations:
- → Rural setting leaving a racially & ethnically homogenous sample
- → Heterogeneous means of participant recruitment
- → Collected during Fall 2020/Spring 2021 in midst of COVID-19; potential differences in those not opting to participate

Measurement Limitations:
- → Simple measures of PM
- → No correlated memory data to determine amnestic vs. non-amnestic MCI
- → Task-specific memory aid use not recorded
- → General memory aid use not analyzed
- → No measure of memory self-efficacy
- → No psychological data collected

Future Directions:
- → Address limitations
- → Run experimental study testing metacognitive intervention