

SCHIZOPHRENIA SYMPTOMS IN RELATION TO WORKING MEMORY DEFICITS

Melanie Vasilopoulou, Lena Pateraki, Ion Beratis & Elvi Kanellopoulou

Department of Psychology, Deree, The American College of Greece

INTRODUCTION

- Impaired cognitive functioning is now considered a core feature of schizophrenia (Lee & Park, 2005).
- Evidence indicates that working memory deficit specifically is a core feature of the disorder (Reichenberg & Harvey, 2007).
- The source of the deficit is not yet clearly elucidated and further research is necessary.
- Working memory is critical for the integrity of the thought process. Breakdown in its circuitry may underlie the cognitive deficits and associated thought disorder observed in schizophrenia (Goldman-Rakic, 1991).



AIMS & RATIONALE

- Examine the relationship between positive and negative symptoms and working memory in schizophrenia patients.
- Few studies examine the influence of different schizophrenia symptom groups on WM with contrasting evidence (Schmidt-Hansen & Honey, 2009).
- Deeper understanding of the different areas involved in WM impairment can be useful for the creation of alternative treatments (Davidson & Keefe, 1995).
- Measure WM using a more process-oriented approach.

HYPOTHESIS

- This study expected to find more extensive working memory impairments in patients who exhibited high levels of positive or negative schizotypy than those who exhibited lower levels of both.

METHOD

Participants

| | |
|-----------------------|------|
| Participants | 32 |
| Males | 19 |
| Females | 13 |
| Mean Age | 45.3 |
| Mean Education | 11.6 |
| Mean Age of Onset | 21.3 |
| Mean Illness Duration | 28.8 |

- All participants frequented the A.F.M.H. Day Center and had a diagnosis for schizophrenia.

Materials

- Digit Span Forward Task of WAIS-III (Wechsler, 1997)
- Digit Span Backward Task of WAIS-III (Wechsler, 1997)
- Spatial Addition task of Wechsler Memory Scale-IV (Pearson, 2010).
- The Positive and Negative Syndrome Scale (PANSS) for schizophrenia was the formal measure of schizotypy (Kay et al., 1987)

Procedure

- (Counterbalanced)
- Digit Span Forward Task
 - Unrelated relaxing task

- Digit Span Backward Task
- Unrelated relaxing task
- Spatial Span Task
- PANSS questionnaire filled out by Day Center's head psychologist and the researcher.

Analysis

- Pearson Product-Moment Correlation Coefficient
- Independent-samples t-test
- ANCOVA
- Regression
- Hierarchical Multiple Regression

RESULTS

Table 1

Summary of Simple Regressions Analyses for Spatial Addition Scores

| Variable | B | SE (B) | β |
|----------------------|------|--------|---------|
| PANSS Positive Score | -.05 | .13 | -.07 |
| PANSS Negative Score | -.26 | .09 | -.46** |
| PANSS General Score | -.20 | .09 | -.38* |

Note. $R^2 = .005$ for Positive; $R^2 = .21$ for Negative; $R^2 = .15$ for General
* $p < .05$, ** $p < .01$

Table 3

Summary of Simple Regressions Analyses for Digit Forward Scores

| Variable | B | SE (B) | β |
|----------------------|------|--------|---------|
| PANSS Positive Score | .001 | .05 | -.003 |
| PANSS Negative Score | .02 | .04 | .07 |
| PANSS General Score | -.01 | .04 | -.06 |

Note. $R^2 = .00$ for Positive; $R^2 = .005$ for Negative, $R^2 = .004$ for General

Table 2

Summary of Simple Regressions Analyses for Digit Backward Scores

| Variable | B | SE (B) | β |
|----------------------|------|--------|---------|
| PANSS Positive Score | .05 | .05 | .17 |
| PANSS Negative Score | -.02 | .04 | -.09 |
| PANSS General Score | -.02 | .04 | -.11 |

Note. $R^2 = .03$ for Positive; $R^2 = .01$ for Negative; $R^2 = .01$ for General

Table 4

Summary of Hierarchical Regression Analysis for Variables Predicting Spatial Addition Scores

| Variable | B | SE (B) | β |
|----------------------|------|--------|---------|
| Model 1 | | | |
| Age | -.15 | .13 | -.35 |
| Illness Duration | .22 | .12 | .55 |
| Model 2 | | | |
| Age | -.06 | .12 | -.13 |
| Illness Duration | .14 | .12 | .36 |
| PANSS Negative Score | -.25 | .10 | -0.43* |

Note. $R^2 = .11$ for Model 1; $R^2 = .28$ for Model 2; $\Delta R^2 = .17$ for Model 2 ($p < .05$)
* $p < .05$

DISCUSSION

Digit Forward & Backward Tasks and Negative Symptoms

- No association was observed.
- Simple span tasks do not reflect accurately the complex processes of working memory.
- CWMS tasks (Spatial Addition) reflect more clearly the neural relationship between working memory deficits and negative symptoms.

Positive Symptoms and WM

- No association between positive symptoms and scores on the working memory tasks (Digit Forward, Digit Backward, Spatial Addition).
- Outcomes consistent with some studies (Lee & Park, 2005).
- Outcomes inconsistent with other studies (Schmidt-Hansen & Honey, 2009).
- Reason: differences in sampling

Negative Symptoms and WM

- Significant and stable association
- Outcomes consistent with previous studies (Reichenberg & Harvey, 2007).
- The more severe the negative symptoms, the poorer the patients performed on the Spatial Addition task.
- Negative symptoms were significant predictors of the variations in Spatial Addition scores.
- Association is indicative of the common neural relationship between the two.



What if the association were reversed?

- Goldman-Rakic (1991): "breakdown in working memory circuitry may underlie the cognitive deficits and associated thought disorder observed in schizophrenia".
- Evidence of WM deficits in:
 - Non-psychotic relatives
 - Patients with schizophrenia-spectrum disorders
 - Patients with schizotypal personality disorder
 - Deficits exist prior to psychotic symptoms (Lee & Park, 2005)
- The persistent and trait-like nature of working memory deficit suggests that it may be an endophenotypic marker for schizophrenia
- Further research should focus on measuring the predictive validity of working memory impairments on symptoms.
- Understanding mechanisms of cognitive impairment may help determine who is at risk for schizophrenia (Reichenberg & Harvey, 2007).
- Opportunity for applying prevention strategies in the form of cognitive remediation programs and of alternative drug treatments (Davidson & Keefe, 1995).

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