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Older Versus Middle-Aged Adults with Schizophrenia: Executive Functioning and Community Outcomes

Anjana Muralidharan^{a,b}, Anastasia Finch^{a,1}, Christopher R. Bowie^{c,d}, Philip D. Harvey^{e,f}

^aVA Capitol Healthcare Network, Mental Illness Research Education and Clinical Center, 10 N. Greene Street, Baltimore, MD, 21201, USA

^bDepartment of Psychiatry, University of Maryland School of Medicine, 655 W. Baltimore Street, Baltimore, MD, 21201, USA

^cDepartment of Psychology, Department of Psychiatry, Queen's University, Kingston, ON, K7L3N6, Canada

^dCenter for Addiction and Mental Health, Toronto, ON, Canada

^eDepartment of Psychiatry, Leonard M. Miller School of Medicine, 1120 NW 14th Street, Miami, FL, 33136, USA

^fResearch Service, Bruce W. Carter Miami VA Medical Center, 1201 NW 16th Street, Miami, FL, 33125, USA

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To the editors:

Older individuals with schizophrenia experience significant psychiatric, medical, and psychosocial challenges and are at elevated risk for early institutionalization (Cohen 2015).

Corresponding author: Anjana Muralidharan, Ph.D., VA Capitol Healthcare Network, Mental Illness Research Education and Clinical Center, 10 N. Greene Street, Attn: MIRECC (Annex Bldg.), Baltimore, MD 21201, Phone: 1-410-637-1872, Fax: 1-410-637-1880, anjana.muralidharan2@va.gov.

¹ Dr. Finch is presently at Triangle Neuropsychology Services, 3310 Croasdaile Drive, Suite 400, Durham, NC 27705.

Contributors

Dr. Harvey obtained the research funding and designed the overall study with Dr. Bowie. Dr. Bowie supervised data collection. Drs. Muralidharan and Finch conceptualized the research question and conducted data analyses. Dr. Muralidharan oversaw the writing of the manuscript. All four authors contributed to the writing of this manuscript. All authors contributed to and have approved the final manuscript.

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Conflict of Interest

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Adults with schizophrenia exhibit cognitive impairment across the lifespan, and the age-associated burden of cognitive changes is substantially greater in this group compared to the general population (Loewenstein et al., 2012).

Impairment in executive function is thought to be a core component of schizophrenia (Wobrock et al., 2009); few studies have examined the impact of aging on this construct in this group. In one cross-sectional study, people with schizophrenia in their 40's and 50's exhibited greater impairment in executive functioning and overall cognitive function than those in their 20's and 30's (Mosiolek et al., 2016). Whether executive functioning is even worse among individuals with schizophrenia with increased ages, such as those in their 60's and 70's, is unknown.

The current study compared community-dwelling adults with schizophrenia above and below 60 on tests of executive functioning. A younger age cut-off is commonly used in this population due to a shortened life expectancy (Walker et al., 2015). We hypothesized that the above 60 group would exhibit worse performance. In exploratory analyses, controlling for global cognitive impairment, we examined whether executive function differentially impacts community functioning, as measured by performance-based assessments and clinician report, among older versus younger individuals.

The current study utilized baseline data from a longitudinal dataset of community-dwelling adults with schizophrenia (Bowie et al., 2006), recruited through outpatient programs within academic, state, and VA centers. Inclusion criteria were a diagnosis of schizophrenia or schizoaffective disorder, active symptomatology, and a Mini-Mental Status Exam above 18 (MMSE; Folstein et al., 1975). Participants were excluded for medical illness that could impact cognition. All participants 40 and above were included in the present analyses (N=245); see Table 1.

The Positive and Negative Syndrome Scale (PANSS; Kay, 1991), a structured clinical interview, was used to assess positive and negative symptoms and general psychopathology (PANSS-Total). Participants completed a comprehensive neurocognitive battery, including two assessments of executive functioning: the Wisconsin Card Sorting Test, categories completed (WCST-Cat; Heaton et al., 1993) and the Trail Making Test Part B, a measure of mental flexibility (TMT-B; Reitan, 1955). Functional outcomes were measured using (1) the UCSD Performance-Based Skills Assessment (UPSA; Patterson et al., 2001), which assesses performance across functional skill domains through role-plays (Bowie et al., 2006), and (2) the Specific Level of Function Scale (Harvey et al., 2011), a clinician-rated measure which assesses community functioning; for the present study, a composite of interpersonal relationships, work skills, and daily activities domains (SLOF-Fx) was utilized.

To calculate a measure of global cognitive impairment, excluding executive function, unrotated principal components analysis was utilized to create a factor score (Non-EF Cognitive Composite) from the following neuropsychological measures: animal naming, phonemic fluency (F-A-S), digit span, digit symbol, letter-number sequencing, the Boston Naming test, Trail Making Test Part A, and total learning from trials 1–5 of the Rey Auditory Verbal Learning Test. Mann-Whitney U tests were conducted to compare

participants above and below 60 years on PANSS-Total, Non-EF Cognitive Composite, WCST-Cat, TMT-B, UPSA, and SLOF-Fx. Next, a regression-based bootstrapped approach to linear moderation (Hayes, 2013) was used to examine age (above/below 60) as a moderator of the relationships between executive function (WCST-Cat, TMT-B) and functional outcomes (UPSA, SLOF-Fx), controlling for psychiatric symptoms (PANSS-Total) and global cognitive impairment (Non-EF Cognitive Composite). Analyses were conducted using IBM SPSS Version 24.0.

Descriptive statistics are in Table 1. See supplementary materials for bivariate correlations separated by group. There was a significant difference between individuals older and younger than 60 on Non-EF Cognitive Composite ($U=2,980$, $p=.002$), TMT-B ($U=6,526.00$, $p=.009$), and SLOF-Fx ($U=2,944.00$, $p=.031$). There were no other significant differences between age groups.

Moderation analyses controlled for PANSS-Total and Non-EF Cognitive Composite. There was a significant effect of age on the relationship between TMT-B and UPSA-Total ($b = -.24$; 95% CI $[-.4652, -.0281]$; bootstrap $p=.027$), with TMT-B significantly predicting UPSA-Total among older ($B_1 = -.35$, $p=.002$) but not younger ($B_2 = -.10$, $p=.126$) participants. There was a significant effect of age on the relationship between TMT-B and SLOF-Fx ($b = -.43$; 95% CI $[-.7678, -.1014]$; bootstrap $p=.011$), with TMT-B significantly predicting SLOF-Fx among younger ($B_0 = .27$, $p=.004$) but not older ($B_1 = -.16$, $p=.347$) participants. There was a significant effect of age on the relationship between WCST-Cat and UPSA-Total ($b = .3426$; 95% CI $[.0722, .6130]$; bootstrap $p=.013$), with WCST-Cat predicting UPSA-Total among older ($B_1 = .32$, $p=.016$) but not younger ($B_0 = -.03$, $p=.640$) participants. There was a trend for an effect of age on the relationship between WCST-Cat and SLOF-Fx ($b = .3966$; 95% CI $[-.0491, .8423]$; bootstrap $p=.081$), with a trend for a stronger relationship among older ($B_1 = .35$, $p=.102$) versus younger ($B_0 = -.04$, $p=.634$) participants.

The present study found that older individuals with schizophrenia showed greater impairment in community functioning and mental flexibility, compared to middle-aged individuals with schizophrenia. This extends findings from Mosiolek and colleagues (2016) and suggests worsening deficits in executive function among geriatric adults with schizophrenia when compared to middle-aged groups.

Results from moderation analyses suggest executive functioning plays a larger role in functioning as individuals with schizophrenia age. Executive dysfunction was generally more strongly associated with poorer functional outcomes among older versus younger participants, controlling for global cognitive function. Younger individuals may have been better able to overcome executive function deficits by drawing on additional resources, such as social support.

Limitations of this study must be noted, including the cross-sectional design and the fact that executive function assessment consisted of only two measures.

In summary, older adults with schizophrenia and executive dysfunction may be in particular need of targeted intervention. Cognitive skills training has been shown to improve cognitive

flexibility and problem-solving skills among older adults (Nguyen et al., 2019) and adults with schizophrenia (Wykes et al., 2011); these approaches could be tailored and leveraged to improve outcomes among older adults with schizophrenia.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1.

Demographics and Descriptive Statistics by Age Group (N=245)

Variable	Below 60 Years (n=181)	60 and Above (n=64)
	N (%)	N (%)
Gender		
Male	136 (75.1%)	42 (65.6%)
Female	42 (23.2%)	22 (34.4%)
Race		
White	84 (46.4%)	44 (68.8%)
African-American	59 (32.6%)	12 (18.8%)
American Indian/Alaskan Native	2 (1.1%)	1 (1.6%)
Multiracial	12 (6.6%)	1 (1.6%)
Marital Status		
Never married	90 (49.7%)	34 (53.1%)
	M (SD)	M (SD)
Age (Years)	51.83 (5.16)	67.82 (7.15)
Education (Years)	12.69 (2.34)	12.59 (3.14)
^a PANSS Total	40.85 (10.22)	38.35 (12.34)
^b Non-EF Cognitive Composite **	.12 (0.84)	-.55 (1.20)
^c TMT_B **	152.41 (60.36)	176.11 (58.96)
^d WCST_Cat	1.17 (1.36)	0.81 (1.01)
^e UPSA_Total	74.82 (15.79)	70.53 (19.80)
^e SLOF_Fx *	105.30 (13.36)	98.61 (18.48)

Notes. PANSS = Positive and Negative Syndrome Scale; Non-EF Cognitive Composite = Non-Executive Function Cognitive Composite; TMT_B=Trail Making Test Part B; WCST_Cat=Wisconsin Card Sorting Test, Categories Completed; UPSA = University of California San Diego Performance-Based Skills Assessment; SLOF = Specific Levels of Functioning scale.

^aPANSS total score with higher scores reflecting more severe psychopathology.

^bFactor score reflecting a composite of the following neuropsychological tests: Letter-Number Sequencing, Digit Span, Verbal Fluency, Rey Auditory Verbal Learning Test, Animal Naming, Boston Naming Test, Trail Making Test Part A, and Digit Symbol.

^cScores can range from 0 to 240 seconds, with higher scores reflecting more impaired performance.

^dScores can range from 0 to 6, with lower scores reflecting more impaired performance.

^eScores can range from 0 to 100, with higher scores reflecting higher functional capacity.

^eScores can range from 24 to 120 with lower scores indicating more assistance is needed to perform functional skills. SLOF work scores can range from 6 to 30, SLOF Activities scores can range from 11 to 55, SLOF Interpersonal scores can range from 7 to 35. For each domain, lower scores indicate more assistance needed to perform that skill.

* Significant difference between age groups on Mann-Whitney U Tests at $p < .05$

** Significant difference between age groups on Mann-Whitney U Tests at $p < .001$