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The use of Cognitive Strategies among People with Schizophrenia: A Randomized Comparative Study

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Comments

The authors report that they do not have any conflicts of interest to disclose.

Keywords

cognitive strategy, metacognitive intervention, participation

Cover Page Footnote

We deeply appreciate the participants for their willingness to take part in this study and the assistance of the occupational therapy staff of the Shavim vocational support centre who were involved in implementing the intervention.

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Metacognitive functions include flexibility of thought, planning execution, decision-making, insight, and judgment. They are typically divided into two central components: metacognitive knowledge, referred to as awareness, and metacognitive processes, referred to as executive functions (EF) (Nuechterlein et al., 2014; World Health Organization [WHO], 2001). Individuals with schizophrenia have EF limitations in areas such as abstract thinking, cognitive flexibility, planning, and monitoring, which are expressed when implementing a new activity that requires combining and synthesizing multiple cognitive abilities. Performing a new activity involves higher cognitive functions, such as cognitive strategies and EF (Josman & Katz, 2006), that are crucial to occupational performance (Gioia, Kenwothy, & Isquith, 2010). Using effective cognitive strategies facilitates functioning and participation in daily activities. Considered part of normal metacognitive function, cognitive strategies are goal-directed. They include organized methods or tactics to select efficient information processing and thus enhance activity (Josman & Regev, 2018; Josman, Schenirderman, Klinger, & Shevil, 2009; Toglia, 2005; Toglia & Berg, 2013).

The International Classification of Functioning, Disability and Health (ICF) provides a paradigm that focuses on the functional status associated with states of health and enables measurement of activity and participation limitations. It defines activity as carrying out a task by integrating and synthesizing multiple cognitive abilities and participation as involvement in a life situation (WHO, 2001). The ICF is relevant for people with schizophrenia because it provides suitable means to assess and compare the impact of illness on participation. People with schizophrenia often demonstrate ineffective use of cognitive strategies, which affects their daily activities, and show a higher percentage of participation limitations than do people with depression or anxiety (Josman & Regev, 2018; Nuechterlein et al., 2014).

Cognitive strategy refers to how the task is performed when using multiple strategies (Toglia, 2005). That is, the same strategy can influence performance across several domains and be used in different contexts to achieve various goals. For example, an association strategy can be used to study for an exam or to remember a shopping list (Josman & Regev, 2018). Limited evidence supports cognitive intervention approaches that do not focus on learning strategies but use, instead, for example, repetitive functional tasks (Parish & Oddy, 2007) or practice of cognitive components (Connell, McMahon, Eng, & Watkins, 2014). Cognitive interventions based on the dynamic interactional model (DIM) (Toglia, 2005) combine teaching cognitive strategies and practicing their implementation in various situations (Goverover, 2018). Cognitive strategy use is considered crucial for occupational performance and falls in the domain of occupational therapy practice. Studies have explored the role of cognitive strategy in overall daily functioning and participation, suggesting it should be addressed by occupational therapists when considering interventions for people with schizophrenia (Ikiugu, Nissen, Bellar, Maassen, & van Peursem, 2017). Therefore, researchers have reinforced the importance of including the use of cognitive strategies in cognitive interventions (Connell et al., 2014; Josman et al., 2009).

Metacognitive interventions refer to cognitive or emotional strategies. For example, the metacognitive training program refers to strategies aimed at cognitive bias, that is, problematic thinking styles (Goverover, 2018; Moritz & Woodward, 2007). Occupational therapy interventions, such as cognitive orientation to daily occupational performance (Moritz & Woodward, 2007) or the dynamic model of cognition and multicontext approach (Josman & Regev, 2018), assume cognitive strategies improve performance. Therefore, they focus on improving the effectiveness of cognitive strategies (Ikiugu et al., 2017).

Occupational therapists are also encouraged to use performance-based assessments to identify the use of cognitive strategies in a real-world context (Ikiugu et al., 2017). These performance-based assessments provide information directly related to interventions that promote participation. For instance, the weekly calendar planning activity (WCPA) (Toglia, 2009) is a performance-based assessment that elicits the use of multiple EFs one at a time and is considered ecologically valid (Williamson Weiner, Toglia, & Berg, 2012). It investigates cognitive strategy use while the individual focuses on solving a real-world problem: organizing a weekly calendar. Research supports the discriminant validity of the WCPA among community and at-risk teenagers (differentiating accuracy and use of cognitive strategies among age groups), as well as its effectiveness as a performance-based tool to diagnose EF use in the daily life of university students (Toglia, Johnston, Goverover, & Dain, 2010).

Based on Dopke and Batscha's (2014) dynamic model of cognition and Toglia's (2005) DIM, which aim to promote daily activity participation by focusing on metacognitive components and individual use of cognitive strategy, we developed a metacognitive group (MCG) intervention for people with schizophrenia. The MCG aims to promote their participation and support optimal cognitive strategy use. Toglia's DIM approach captures individuals' performance and assesses their potential to learn and apply strategies to solve a problem. It was found to produce the best functioning outcomes across different groups (Toglia et al., 2010), including people with brain injuries, learning disabilities, and schizophrenia (Wykes, Huddy, Cellard, McGurk, & Czobor, 2011).

The aim of this study was twofold: to compare a group of participants with schizophrenia following the MCG intervention to a group of matched controls for (a) their use of cognitive strategies and (b) the correlate between the use of cognitive strategies and participation.

Method

Participants

The University of Haifa Ethics Committee and the Israeli Ministry of Health approved the study protocol. The participants were recruited from a vocational support center. Inclusion criteria were (a) a diagnosis of schizophrenia by a licensed psychiatrist; (b) a *t*-score of at least 65, the recommended threshold for interpreting a score as abnormal EF on the Behavior Rating Inventory of Executive Function: Adult version (BRIEF-A) (Roth, Isquith, & Gioia, 2005); and (c) fluency in Hebrew. Exclusion criteria were no severe psychiatric hospitalization of over 24 h during the month prior to beginning the study and no use of alcohol or drugs (except medications to control schizophrenic symptoms).

The sheltered work site staff invited the participants to take part in the intervention and to come in for the evaluation at their convenience. Thus, although this study was proposed as a comparative and randomized study with reservations, the participants were assigned to the groups in order of their arrival. Of the 94 potential participants screened, five (5.3%) refused to participate further and five (5.6%) did not complete the preintervention assessment. Thus, 84 participants (43 in the intervention group and 41 in the control group) began and completed the study.

As shown in Table 1, 53 (63.11%) of the participants were male and 31 (36.9%) of the participants were female, with no group gender differences. Their ages ranged from 23 to 68 years, with the participants in the intervention group being somewhat younger than those in the control group. Age was the only significant difference found between groups. Most of the participants were single; the others were either married, divorced, or widowed, with no group difference. Further, 37 (44.0%) lived

independently; the others lived in protected facilities. They had up to 15 years of education (*M* = 10.83, *SD* = 2.19).

Table 1

Demographic Characteristics of Study Participants

Demographic	Total (%) (*N* = 84) # (%)	Intervention group (*n* = 43) # (%)	Control group (*n* = 41) # (%)	Difference
Gender				
Male	53 (63.1)	26 (60.5)	27 (65.9)	*z* = 0.510
Female	31 (36.9)	17 (39.5)	14 (34.1)	*p* = 0.600
Family status				
Single	47 (56.0)	28 (65.1)	19 (46.3)	$\chi^2(2) = 3.110$
Married	21 (25.0)	9 (20.9)	12 (29.3)	*p* = 0.210
Divorced	16 (19.0)	6 (14.0)	10 (24.4)	
Widowed				
Housing				
Independent	37 (44.0)	18 (41.9)	19 (46.3)	*z* = 0.410
Protected	47 (56.0)	25 (58.1)	22 (53.7)	*p* = 0.670
	M (SD)	***M (SD)***	***M (SD)***	***t*(82)**
Age (years)				
23-68	46.85 (12.25)	43.19 (11.77)	50.68 (11.69)	2.930; *p* = 0.004
Education (years)				
6-15	10.83 (2.19)	11.00 (1.94)	10.66 (2.44)	-0.710; *p* = 0.478

Both groups continued to use the variety of psychiatric rehabilitation services for which they were eligible because of their psychiatric disability. These services were designed to help in key life domains, such as housing, employment, adult education, social and leisure activities, and case management. However, because they attended the MCG intervention during the research period, the intervention group received 2 h more of treatment each week than did the control group.

Measures

For this study, we used assessments that addressed EF (BRIEF-A) (Roth et al., 2005), performance (WCPA) (Toglia, 2005), and participation (ACS) (Baum, Edwards, & Michael, 2001). Levels of present psychotic symptoms were evaluated using the structural clinical interview of the positive and negative syndrome scale (SCI-PANSS) (Rotenberg-Shpigelman, Rapaport, Stern, & Maeir, 2008). Demographic data were also collected.

Behavior rating inventory of executive function: Adult version (Roth et al., 2005). The BRIEF-A is a structured questionnaire containing 75 items anchored on a scale of 1 = *behavior occurs very often* and 0 = *behavior never occurs*, yielding an overall global executive composite score and scores for the behavioral regulation index and the metacognitive index. Standard scores had been calculated for each clinical scale for the summary composite, and *t*-scores based on comparison with the normative sample comprising 1,050 self-reports and 1,200 informant reports. Higher scores reflect greater difficulties experienced by the individual. The expected normative score is *t* = 50; above 65 signifies clinical impairment. The BRIEF-A has moderate to high internal consistency (from α = .58 to α = .92), high test-retest stability (ranging from *r* = 0.82 to *r* = 0.94), and high test-retest reliability (from *r* = 0.91 to *r* = 0.94) (Rotenberg-Shpigelman et al., 2008).

Weekly calendar planning activity (Toglia, 2009). The WCPA is a performance-based measure developed to examine how subtle EF difficulties influence an individual's ability to perform a multistep activity in daily life. The assessment includes scheduling meetings as part of the weekly planning. It has three difficulty levels and three versions. In this study, we used Version 2, which increases cognitive challenges and places more demands on executive control. Altogether, there are 17 appointments to be assigned. It also includes five outcome measures (number of correct answers, efficiency, time/planning and total, rules followed, and number of strategies used), three of which we used in this study (whose results were most significant): efficiency (calculated from the accuracy and total time), number of strategies, and number of correct answers. Moderate to high test-retest reliabilities for the various performance measures, with intra-class correlations, range from .60 to .85. Interrater reliability of the coding and performance scoring ranged from .94 to .99 (Hochberger et al., 2018).

Activity card sort (Baum et al., 2001; Roth et al., 2005). The ACS was developed to determine the influence of a disease on the level of a person's activity and participation. Participants classify 89 pictures according to categories that represent the extent to which they participated in them (1 = *do now/did prior to illness*, 0 = *not done prior to illness*, 0.5 = *beginning to do again*). The final score allows determination of the person's percent change in current activity level compared to before the disease. The ACS has high internal consistency for instrumental activities of daily living and sociocultural activities ($\alpha = .82$ and $\alpha = .80$, respectively) and lower consistency for low and high physical leisure activities ($\alpha = .66$ and $\alpha = .61$, respectively) (Rotenberg-Shpigelman et al., 2008).

Positive and negative syndrome scale (Kay, Fiszbein, & Opfer, 1987). A 30-item scale, the PANSS, includes seven positive and seven negative syndrome items and 16 psychopathological items. It scores the severity of each item on a scale from 1 (*none*) to 7 (*most severe*). General scores for the PANSS are between 30 (*lack of symptoms*) and 210 (*very severe state of the disease*). Potential ranges are 7 to 49 for positive and negative scales and 16 to 112 for the general psychopathology scale. The present study showed good internal reliabilities (positive $\alpha = .86$; negative $\alpha = .88$; psychopathology $\alpha = .89$).

Procedure

All of the participants who agreed to participate signed informed consent forms and completed the demographic questionnaire and the BRIEF-A. Those who met the inclusion criteria also completed the ACS and the WCPA before intervention (T1), the WCPA 4 weeks later (T2), and the ACS and WCPA at a 12-week follow-up (T3).

An occupational therapist evaluated the participants before the intervention. Another occupational therapist, who was blind to the participants' group membership, evaluated the participants at the end of the intervention and at a follow-up 12 weeks after the intervention ended. Three different occupational therapists administered the intervention. To verify adherence to the protocol, the main researcher provided the occupational therapists administering the intervention and evaluations with 8 h of training and 2 h of weekly supervision.

Intervention

We developed the initial MCG intervention protocol tailored to individuals with schizophrenia based on the DIM (Toglia, 2005; Toglia et al., 2010). Subsequently, three expert occupational therapists with experience in cognitive interventions approved the protocol. The intervention focuses on processing strategies and self-monitoring skills (e.g., participants learn how to use a systematic and planned approach toward a task). The aim was to improve functioning by increasing the effectiveness of

strategy use while the participants learn to independently review their performance and examine the strategy's effectiveness.

The MCG structure consists of:

1. Introducing the meeting's specific topic.
2. Teaching metacognitive terms and strategies.
3. Providing metacognitive training (e.g., activity and cue analysis, self-questioning cue cards, role play, strategy, and self-monitoring worksheets). Participants practice the strategies (e.g., rereading, talking out loud, and using fingers), perform functional tasks (e.g., planning supermarket shopping or doctors' appointments) during the group, and discuss differences in the strategy use among themselves.
4. Asking questions before and after each exercise; the participants complete an awareness questions page regarding their cognitive function (e.g., "What steps are required to accomplish the task?", "How much do you think you'll be able to accomplish the task?", and "Which strategy would you use to perform the task?").
5. Sharing.
6. Discussing among the group.

The study followed six groups (six to seven participants in each group, and all were present for all sessions) through eight sessions (two hourly sessions each week for 4 weeks). Session 1 was the introduction (e.g., of group members and session topics). Sessions 2 through 4 were metacognitive training (self-awareness, self-monitoring, self-regulation, and strategy training). In Sessions 5 through 8, the participants worked on personal goals that integrated the EF components they had learned with self-awareness evaluation (e.g., to shop in an orderly and economical manner or to start participating in sports). The intervention took place at the sheltered work site, and the participants were released from work so they could participate in the intervention group (Kay et al., 1987). Each participant presented the goals he or she had set before the intervention using the Canadian Occupational Performance Measure and worked on those goals through worksheets and group discussion on strategies by which the goals could be achieved. To improve treatment effectiveness, the occupational therapists followed a treatment guide developed for the research. In addition, the primary researcher presented weekly training and supervision sessions to the team of therapists to strengthen the treatment integrity.

Data Analysis

We determined the sample size using G*power software with an alpha of 0.05 and power of 0.85. For repeated measures ANCOVA with two groups and three measurements (WCPA efficiency, number of strategies used, and number of correct answers) with effect size, f equaled .20 and the sample size was 66. For multiple regression analysis with four predictors with moderate effect size, f^2 equaled .20 and the sample size was 73. We used SPSS version 24 for data analysis. We examined between-group differences in use of cognitive strategies with Mann-Whitney *U*-tests at each time point, and within-group time differences with Cochran's Q.

A summary score of cognitive strategies used was computed, time-by-group difference analyzed with repeated ANCOVA measures controlling for the participants' ages, and significant interaction analyzed with estimated marginal means. Pearson correlations were calculated between the various strategies used, as well as the total number of strategies used and the two WCPA variables (efficiency and correct answers) compared within time and group. We also computed change scores for the total number of strategies used and the two WCPA variables as residual gain scores, controlling for the initial

scores. We analyzed the significance of the differences in the correlations between the two groups with Fisher's *z*. Pearson correlations were calculated between the total number of strategies used and the ACS within time and group. Finally, we used regression analysis to assess the significance of the interactions between groups and the total number of strategies used in predicting ACS, and then evaluated significant interactions with simple slopes analysis (Katz, Karpin, Lak, Furman, & Hartman-Maeir, 2013; Weiner, Toglia, & Berg, 2012).

Results

In light of the first aim of this study (comparing use of cognitive strategies), group and time differences were assessed in the use of the 13 WCPA cognitive strategies (rereading, fixing appointments, talking aloud, self-checking, using fingers, covering lines, using keywords, using highlights, using color codes, crossing off, outlining lists, using notes, and crossing off Wednesday). We found time or group differences for six of the strategies (see Table 2). Specifically, for rereading and talking aloud, significant group differences were found at T2 and T3 and a significant increase in their use in the intervention group (no change was evident in the control group). Although all of the participants seldom used the fixing appointments strategy at T1 and T2, we found a significant increase in its use in the intervention group and, thus, a significant group difference at T3. The participants in the intervention and control groups used the covering line strategy at T1 and T2 with no group difference. However, we noted a decrease in its use by the intervention group at T3 with no change evidenced in the control group, leading to a significant time difference in the intervention group and a significant group difference at T3. Intervention group participants used the color coding strategy at T1 but not at T2 and T3, leading to a significant time difference. The participants in the intervention and control groups used the crossing off strategy with no time difference, but we found a constant group difference. Use of the other strategies revealed no time or group differences.

Table 2

Distribution by Group and Time of Significant Cognitive Strategies Used

	Group						Difference				
	Intervention (*N* = 43)			Control (*N* = 41)			Group			Time	
Strategy used	T1 *n* (%)	T2 *n* (%)	T3 *n* (%)	T1 *n* (%)	T2 *n* (%)	T3 *n* (%)	T1 *z* (*p*)	T2 *z* (*p*)	T3 *z* (*p*)	Intervention group Q (*p*)	Control group Q (*p*)
Rereading	6 (14.0)	31 (72.1)	41 (95.3)	2 (4.9)	2 (4.9)	4 (9.8)	1.41 (.159)	6.30***	7.86***	55.71***	1.33 (.513)
Fixing appointment	0	4 (9.3)	11 (25.6)	2 (4.9)	1 (2.4)	1 (2.4)	–	–	3.03** (.002)	15.50***	2.00 (.368)
Talking aloud	0	20 (46.5)	35 (81.4)	4 (9.8)	3 (7.3)	2 (4.9)	–	4.03***	7.06***	51.39***	1.20 (.549)
Covering lines	21 (48.8)	18 (41.9)	10 (23.3)	15 (36.6)	17 (41.5)	20 (48.8)	1.13 (.260)	0.04 (.971)	2.44* (.015)	6.69* (.035)	2.37 (.305)
Color coding	7 (16.3)	0	0	3 (7.3)	5 (12.2)	3 (7.3)	1.26 (.208)	–	–	14.00***	1.60 (.449)
Crossing off	7 (16.3)	8 (18.6)	6 (14.0)	16 (39.0)	14 (34.1)	15 (36.6)	2.34* (.019)	1.61 (.107)	2.39* (.017)	0.40 (.819)	0.50 (.779)

Note. *N* = 84; *z* differences were not calculated in cases of low variance.
*$p < .05$, **$p < .01$, ***$p < .001$.

The sum of the cognitive strategies used was computed, as shown in Table 3. No significant group differences were detected at T1 ($t(82) = 0.275$, $p = 0.784$). Repeated measures ANCOVA (controlling for age) revealed a no significant time difference ($F(2,162) = 1.840$, $p = 0.164$, $\eta^2 = 0.022$), a significant group difference ($F(1,81) = 14.361$, $p < 0.001$, $\eta^2 = 0.151$), and a significant time-by-group difference ($F(2,162) = 18.514$, $p < .001$, $\eta^2 = .186$). Post hoc analysis of the significant interaction showed that the time difference in the intervention group was significant ($F(2,80) = 34.403$, $p < 0.001$, $\eta^2 = 0.462$), revealing gradual increases between T1 to T2 ($p < 0.001$) and T2 to T3 ($p = 0.002$), whereas the time difference in the control group was nonsignificant ($F(2,80) = 0.014$, $p = 0.986$, $\eta^2 = 0.001$).

Table 3

Distribution by Group and Time of Total Number of Cognitive Strategies Used

Number strategies used	Intervention group ($N = 43$) T1 *n* (%)	T2 *n* (%)	T3 *n* (%)	Control group ($N = 41$) T1 *n* (%)	T2 *n* (%)	T3 *n* (%)
1	2 (4.70)	–	–	2 (4.90)	1 (2.40)	2 (4.90)
2	24 (55.80)	8 (18.60)	2 (4.70)	19 (46.30)	20 (48.80)	17 (41.50)
3	13 (30.20)	18 (41.90)	19 (44.20)	16 (39.00)	19 (46.30)	20 (48.80)
4	2 (4.60)	15 (34.90)	17 (39.50)	4 (9.80)	1 (2.40)	2 (4.90)
5	2 (4.70)	2 (4.70)	4 (9.30)	–	–	–
8	–	–	1 (2.30)	–	–	–
M (SD)	2.49 (0.86)	3.26 (0.82)	3.65 (1.00)	2.54 (0.74)	2.49 (0.60)	2.54 (0.67)

In light of the second aim of this study (correlation between strategy use and participation), we assessed Pearson correlations between the various cognitive strategies and the WCPA variables, as shown in Table 4. Correlations between strategies used and the two WCPA variables (efficiency and correct answers) within time and group revealed that in the intervention group at T3, using keywords positively related with *correct answers* ($r = 0.321$, $p = 0.036$). In the control group, *highlighting* was positively related with *correct answers* at T1 ($r = 0.307$, $p = 0.050$) and at T3 ($r = 0.425$, $p = 0.006$), whereas *rereading* was positively related with *correct answers* at T2 ($r = 0.395$, $p = 0.011$). In addition, the change scores computed for the total number of cognitive strategies used and the two WCPA variables as residual gain scores (controlling for the initial scores) correlated.

Table 4

Correlations by Time Between Total Number of Cognitive Strategies Used and WCPA Variables

	Sum of strategies used				
WCPA variable	T1	T2	T3	Change T1–T2	Change T1–T3
Total sample ($N = 84$)					
Efficiency	.33**	.37***	.54***	.47***	.55***
Correct answers	.51***	.62***	.68***	.54***	.65***
Intervention group ($n = 43$)					
Efficiency	.39**	.41**	.30*	.26	.20
Correct answers	.38*	.58***	.51***	.40**	.45***
Control group ($n = 41$)					
Efficiency	.23	-.09	.19	-.08	-.13
Correct answers	.66***	.60***	.58***	.17	.18

Note. *$p < 0.050$, **$p < 0.010$, ***$p < 0.001$.

These results revealed that the higher the number of cognitive strategies used, the greater the efficiency and the more correct answers occurred. A different pattern was revealed in the control group, in which the total number of cognitive strategies used was unrelated to efficiency. An analysis of the significance of the differences in the correlations between the two groups revealed only one significant result: The correlation between the *total number of strategies used* and *efficiency* at T2 was significantly higher in the intervention group than in the control group ($z = 2.321$, $p = 0.020$).

Finally, for the relationship between the total number of cognitive strategies used in the WCPA and ACS (total score) within group and time revealed no significant correlation at T1 in either group (intervention: $r = -0.004$, $p = 0.978$; control: $r = 0.171$, $p = 0.286$). However, at T3, a positive and significant correlation was revealed in the intervention group ($r = 0.551$, $p < 0.001$), whereas the correlation in the control group remained nonsignificant ($r = 0.033$, $p = 0.836$). Likewise, a positive and significant correlation was revealed regarding change in the intervention group ($r = 0.471$, $p = 0.001$), whereas the correlation regarding change in the control group was nonsignificant ($r = -0.283$, $p = 0.073$).

Indeed, at T1, the interaction between the group and total number of cognitive strategies used in predicting ACS was not significant ($b = -0.252$, $SE = 0.338$, $\beta = -0.114$, $p = 0.458$), revealing that the relationship of the number of strategies used with ACS did not differ by group. However, at T3 the interaction became significant ($b = 1.164$, $SE = 0.557$, $\beta = 0.279$, $p = 0.040$), as did the interaction regarding the change scores ($b = 0.654$, $SE = 0.258$, $\beta = 0.492$, $p = 0.013$). That is, the relationship between the number of strategies used and the ACS was significantly different in both cases. We used simple slopes analysis to evaluate the differences (Weiner et al., 2012).

As shown in Figure 1 regarding T3, the intervention group slope was found to be significant ($b = 1.163$, $t = 3.741$, $p < 0.001$), revealing a positive significant relationship between the number of strategies used in the WCPA and the ACS. The slope for the control group was not significant ($b = -0.001$, $t = -0.002$, $p = 0.998$).

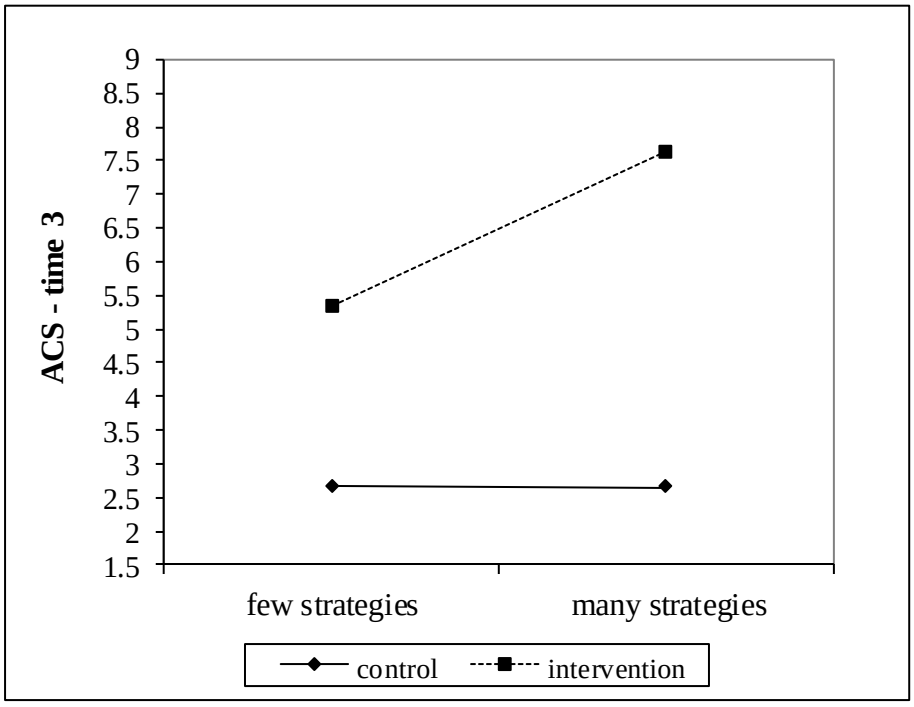

Figure 1. Group as a moderator between the number of cognitive strategies used and ACS at T3.

Figure 2 shows the slope for the intervention group change score was significant (b = 0.463, t = 3.842, $p < 0.001$), revealing a positive significant relationship between the increase in number of strategies used and increased ACS score. The slope for the control group was not significant (b = -0.191, t = -0.838, p = 0.405).

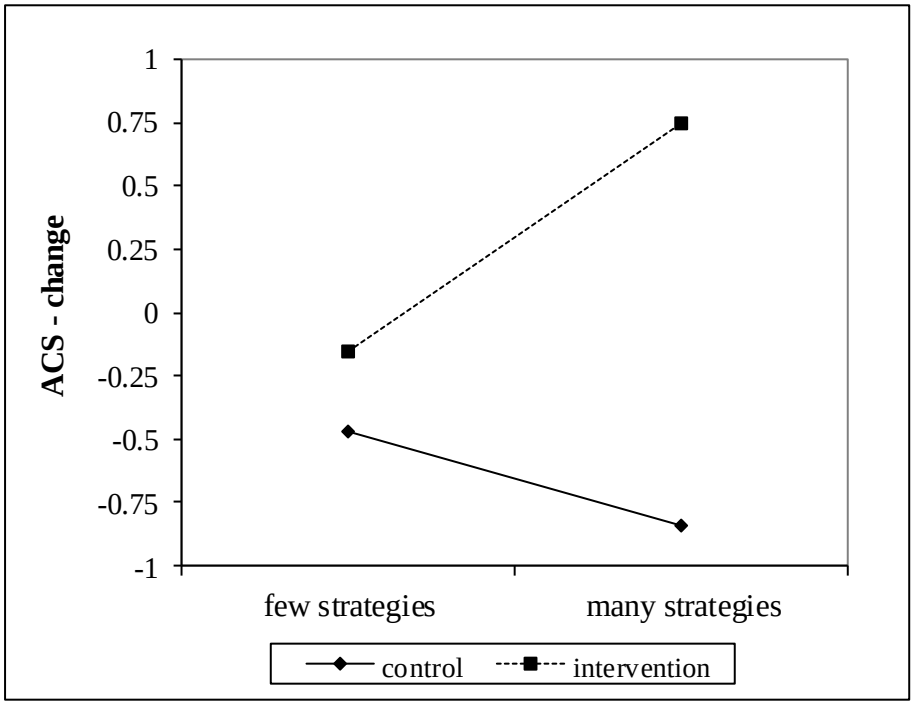

Figure 2. Group as a moderator between change in the number of cognitive strategies used and change in ACS.

Discussion

This study aimed to investigate the use of cognitive strategies among people with schizophrenia following an MCG intervention. The results indicate that in the intervention group (a) the larger the number of cognitive strategies, the better the efficiency and correct answers (WCPA); (b) a significant increase in the use of four cognitive strategies (rereading, talking aloud, fixing appointments, and covering lines) occurred by T3; and (c) the number of cognitive strategies predict the participation level (ACS).

Efficiency is crucial to everyday functioning because an individual can use multiple cognitive strategies (e.g., making a list and highlighting it before shopping) but still not be able to perform the task as planned (e.g., shopping but not purchasing the planned items). Our findings are consistent with Reid, Lienemann, and Hagaman (2013), who found that using several cognitive strategies simultaneously enhanced performance and learning among students and at-risk youth and in the community (Josman & Regez, 2018; Katz et al., 2013). Likewise, in their good information processor model, Pressley and Harris (2006) linked the number of cognitive strategies in use to efficiency and claimed that the use of a number of cognitive strategies evidenced good information and effective metacognitive processes (Kaizerman-Dinerman, Roe, & Josman, 2017). Our findings relate to the learning potential among people with schizophrenia (Dawson, 2014) and reinforce the effective use of focusing on cognitive strategies in metacognitive interventions.

Another finding relates to the significant increase in the use of rereading, talking aloud, fixing appointments, and covering lines: all external, overt strategies. Several definitions and use variations make cognitive strategies clearer and more conducive to individual needs and capabilities. For example, cognitive strategies can be described in terms of the depth of information processing (deep vs. surface strategies [Reid, Lienemann, & Hagaman, 2013]); in terms of whether it is external (overt or visible) or internal (covert or invisible mental process [Wykes et al., 2011]); or whether it is domain specific or general (Moritz & Woodward, 2007). Whereas young children use overt (e.g., verbal) strategies that require working memory to increase the effectiveness of performance, adults use more covert strategies that require less working memory (Pressley & Harris, 2006). Nevertheless, persistent disorders during childhood and adolescence (e.g., from abuse) have been associated with enduring abnormalities in brain structure and organization that affect cognitive performance (Harris, Alexander, & Graham, 2008). Likewise, Toglia and Berg (2013) found that more at-risk youth than community youth use external cognitive strategies, resulting in inefficient functioning. In a few systematic reviews, researchers explained that among people with schizophrenia, working memory limitations are expressed in varying degrees of cognitive impairments. In other words, people use different cognitive strategies that rely (or do not rely) on working memory and can achieve good cognitive function despite the working memory limitations (e.g., Raizada & Kishiyama, 2010).

Our results show a widespread use of external cognitive strategies that increase performance efficiency. External cognitive strategies reduce working memory load, allowing cognitive resources to be used more effectively. Thus, even numerous (i.e., covert and external) strategies can be meaningful and can achieve good cognitive function, as expressed in our research (Josman & Regev, 2018). In addition, our results echo Toglia and Berg (2013), who found that community youth spontaneously implemented a greater number of cognitive strategies than did the at-risk group, which the researchers associated with better function outcomes.

Of interest is that, although the participants in this study used fewer mature and covert cognitive strategies, there was a significant relationship to participation. That is, the number of cognitive strategies used predicts the participation level (Josman & Regev, 2018). Cognitive strategies are considered among the five structures of EF (with inhibition, working memory, shifting, and emotional feelings) that have empirical support as major cognitive components that affect participation. They are considered crucial to generalizing from cognitive to functional outcomes (e.g., Ikiugu et al., 2017). One study found that metacognitive limitations decrease the participation level (Diwadkar et al., 2011). However, our results show increased participation with the use of many (both covert and overt) strategies. The participants in the intervention group may have used fewer overt cognitive strategies (e.g., talking to themselves) that require additional channels (e.g., auditory) because of their cognitive limitations.

In summary, our study demonstrates the types of cognitive strategy use among people with schizophrenia. The participants used fewer covert cognitive strategies after the MCG intervention, possibly in the context of metacognitive limitations, which should still be examined. Despite their use of fewer strategies, intervention group participants still achieved good cognitive function. Further, we noted a change in their participation, as measured by the WCPA and the ACS.

Methodological Considerations and Limitations

Although our procedure included an allocation to either the intervention or control groups, we did not use group randomization. Because we did not use a block method, the sample was not fully randomized, which might limit generalization of our findings. Future studies are needed to cross-

validate our findings in the same population. In addition, the Pearson correlations conducted should be interpreted with caution because of the inflated alpha level.

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