Adult Age and Cultural Differences in Performance on the Weekly Calendar Planning Activity (WCPA)

Joan Toglia, Orit Lahav, Eynat Ben Ari, Rachel Kizony

OBJECTIVE. We compared performance on a cognitively demanding task, the Weekly Calendar Planning Activity, of participants in three age groups and two countries (United States and Israel).

METHOD. A sample of 375 U.S. and 433 Israeli healthy adults participated. During the activity, participants were observed for speed, accuracy, strategy use, and efficiency.

RESULTS. Accuracy scores were similar in both countries; however, Israeli participants were slower and less efficient ($p < .05$). The younger and middle-aged Israeli groups were more strategic and the older Israeli group followed fewer rules than the corresponding U.S. groups ($p < .05$). Older participants in both countries were less accurate, efficient, and strategic than younger participants ($p < .05$).

CONCLUSION. Limited strategy use and poor time allocation may contribute to difficulty managing cognitively demanding activities for older adults and may also be influenced by culture. Practitioners should consider these factors when screening people for occupational performance difficulties.

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Joan Toglia, PhD, OTR/L, FAOTA, is Dean, School of Health and Natural Sciences, Mercy College, Dobbs Ferry, NY; jtoglia@mercy.edu

Orit Lahav, PhD, OT, is Deputy Director, Occupational Therapy Department, Ono Academic College, Kiryat Ono, Israel.

Eynat Ben Ari, PhD, OTR, is Faculty, Department of Occupational Therapy, Steyer School of Health Professions, Faculty of Medicine, Tel Aviv University, Tel Aviv, Israel.

Rachel Kizony, PhD, OT, is Senior Lecturer, Department of Occupational Therapy, Faculty of Social Welfare and Health Sciences, University of Haifa, Haifa, Israel, and Research Occupational Therapist, Department of Occupational Therapy, Sheba Medical Center, Tel HaShomer, Ramat Gan, Israel.

Executive function (EF) includes an interrelated set of abilities that direct and coordinate cognitive control and goal-directed actions. Impairments in EF can disrupt complex activities and occupations that involve multitasking, strategic thinking, planning, and coping with novel situations or unexpected obstacles (Katz & Maeir, 2011).

EF is the cognitive domain that has been consistently linked to complex instrumental activities of daily living (IADLs) and participation (Cramm, Krupa, Missiuna, Lysaght, & Parker, 2013) across multiple ages and populations. For example, EF is related to academic performance in children; work and employment outcomes in people with brain injury, stroke, and schizophrenia (Toglia, 2015); and health outcomes in people with chronic conditions (Hall & Marteau, 2014) and is a significant and independent correlate of functional status in normal aging (Royall, Palmer, Chiodo, & Polk, 2004). The critical role that EF plays in engagement in complex activities and participation across different ages highlights the need for occupational therapy tools that assess subtle performance difficulties.

Performance assessment of activities with high cognitive demand is challenging. The aim is not mastery or independence but efficiency and effectiveness in managing subtle obstacles, conflicts, and novelty. These skills are needed in many aspects of daily life, including work, social interactions, and independent living. Identification of performance deficits in high-functioning people who are independent in familiar or routine activities is challenging, particularly for community-dwelling older adults, for whom it may be unclear whether a slight decline in cognitive IADLs is part of the typical aging process or a sign of an impairment.

Normative data on performance-based tools for cognitively demanding activities are limited, making it difficult to interpret performance. The type and degree of differences in complex activity performance between healthy younger and older adults are uncertain. The majority of studies examining differences in executive function in younger and older adults have used neuropsychological tests that examine specific components of EF. Because functional activities with high cognitive demands require the integration of EF components and may be aided by prior experiences, it is uncertain whether performance of such activities typically declines during aging. The few studies that have examined performance of complex functional tasks across younger and older adults have found conflicting results (Sanders & Schmitter-Edgecombe, 2012), with some studies finding no significant differences (Kliegel, Martin, McDaniel, & Phillips, 2007). Insight into performance strategies and methods typically used during complex activities across different ages is needed as a foundation for work with people who have EF impairments.

Effect of Culture on Performance

In addition to the influence of age, interpretation of complex activity performance requires consideration of the person's culture. Our brains and minds are shaped by our experiences. People living in different cultural environments may have varying occupations, health and educational systems, and experiences as well as different pressures, practices, values, and beliefs that can influence neural activity and the way they go about doing a task (Chiao, 2009; Park & Huang, 2010). Most studies have compared differences between Eastern and Western countries. Few studies have compared performance of people within Western cultures because it is generally assumed that no significant differences would be found. A comparison of normative data for the Trail Making Test, a timed neuropsychological test of cognitive flexibility or EF, across 10 different countries with Western cultures indicated significant differences between cultures, and it concluded that norms were not interchangeable even in demographically comparable samples (Fernández & Marcopulos, 2008).

We sought to compare performance on a cognitive IADL task, the Weekly Calendar Planning Activity (WCPA; Toglia, 2015), across three age groups and two different countries: the United States and Israel. Modern Israel is largely influenced by Western and, particularly, U.S. culture. Israeli occupational therapy practitioners commonly adopt assessment tools developed in the United States with the assumption that Israeli clients' performance will be similar to that of U.S. clients; however, this assumption has not been previously studied with a cognitive IADL task. The objective of this study was to explore and compare WCPA performance (accuracy, time, efficiency, strategy use, rules followed) of three age groups (younger, middle-aged, and older adults) in U.S. and Israeli samples to identify any significant differences. A secondary objective was to determine whether gender influenced performance.

Method

Research Design

This study used a cross-sectional design. Data were collected in the greater New York area in the United States and in central and northern parts of Israel using a convenience sampling method. Participants were recruited through snowballing techniques. In Israel, participants signed an informed consent form approved by the relevant ethics committees in each academic institution. In the United States, the study was granted exemption by the Mercy College institutional review board (IRB), because normative data were recorded such that participants could not be identified. An oral consent script was read aloud, and a written copy of the script was provided to each participant.

Participants

A total of 808 healthy adults participated in the study: 375 from the United States (46.4% women) and 433 from Israel (53.6% women). They were divided into three age groups: younger adults ages 18–39 yr, middle-aged adults ages 40–64 yr, and older adults ages ≥65 yr. Inclusion criteria were as follows: All participants were community dwelling, were independent in IADLs, and had ≥12 yr of education.

Measure

The WCPA is a paper-and-pencil, performance-based assessment that examines how subtle EF difficulties influence a person's ability to perform a multiple-step activity. The person is presented with a randomly ordered list of 17 appointments that need to be scheduled using a 1-wk calendar. Some appointments conflict with one another, so the person has to recognize the conflicts and strategically place the appointments to minimize errors while adhering to five rules: (1) leave Tuesday free, (2) do not cross out appointments after they are entered into the calendar, (3) ignore distracting questions from the examiner, (4) inform the examiner when it is a specified time, and (5) inform the examiner when finished.

The examiner observes and records strategies the person uses during the task on a list of 16 preidentified strategies and further probes strategy use through a

semistructured interview conducted after the task. The examiner notes strategies that are ineffective, that involve unnecessary steps or increased time or effort, or that result in increased disorganization and confusion. An example of an ineffective strategy is copying the list of appointments in the same order on another piece of paper before entering them into the calendar, which requires increased time and is unnecessary.

Scores include measures of accuracy (number of accurate appointments scheduled out of 17), number of appointments entered, planning time (time from the beginning of the assessment until the first appointment is scheduled), total time, efficiency (calculated from the accuracy and total time), error types, number of rules followed out of the five given, and number of strategies used. The WCPA has been shown to have practicality, interrater reliability, face validity, and discriminative validity with typical and at-risk adolescents (Toglia & Berg, 2013; Weiner, Toglia, & Berg, 2012). The test was translated into Hebrew with minor adaptations (e.g., a 24-hr clock time format) and tested in Israel (Ben Ari, Lahav, & Kizony, 2012; Grinblat, Offek, Gebert, Kizony, & Tau-Cohen, 2012).

Procedure

Participants were tested by occupational therapists or occupational therapy students who received training from an occupational therapist. Each participant was tested individually, in his or her spoken language (English or Hebrew), in a quiet room in his or her home or at the university. We interviewed each participant to obtain demographic information (i.e., age, gender, education, and functional status), and then we administered the WCPA.

Data Analysis

IBM SPSS Statistics (Version 21; IBM Corporation, Armonk, NY) was used for data analysis. Three-way multivariate analysis of variance (MANOVA) was used to examine differences by country, age group, and gender in four WCPA outcome measures: (1) total time, (2) number of strategies, (3) number of rules followed, and (4) number of accurate appointments. Post hoc Scheffé comparisons were used to examine differences among the three age groups. One-way analysis of variance (ANOVA) and independent t tests were used to explain significant interaction effects. Three-way ANOVA was used to examine differences by country, age group, and gender in the number of entered appointments and efficiency score. Data on planning time were not distributed normally and are presented in medians and interquartile ranges (IQRs), and the nonparametric Mann–Whitney U test was used to compare groups by country and age. Significance was set at .05, and partial η square (η_p^2) is reported as the effect size for the ANOVA tests (Myers, Well, & Lorch, 2010).

Results

Characteristics and distribution of participants ($N = 808$) by country, age group, and gender are presented in Table 1. The U.S. middle-aged and older groups were significantly older, $t(283) = 2.1$, $p = .034$, than the Israeli middle-aged and older groups, $t(237) = 2.7$, $p = .007$. The gender distribution was significantly different between countries for the older group, $\chi^2(1) = 6.87$, $p = .009$.

Descriptive statistics and ANOVA results for total time, number of strategies, number of rules followed, number of accurate appointments, number of entered appointments, and efficiency score by country and age group are presented in Table 2. The medians and IQRs for planning time are presented in Figure 1. The overall MANOVA model for the four outcome measures revealed significant main effects for country, $F(4, 793) = 21.12$, $p = .0001$, $\eta_p^2 = .10$; age, $F(8, 1{,}588) = 27.69$, $p = .0001$, $\eta_p^2 = .12$; and gender, $F(4, 793) = 2.91$, $p = .021$, $\eta_p^2 = .01$.

Differences by Age Group

The middle-aged group was significantly faster than the younger ($p = .005$) and older ($p = .019$) groups. The younger and middle-aged groups were significantly more accurate and efficient, entered more appointments, followed more rules, used more strategies ($p = .0001$ for all comparisons), and had longer planning times ($U = 24{,}877.5$, $p = .0001$, and $U = 30{,}090.5$, $p = .004$, respectively) than the older group. The younger group was significantly more accurate ($p = .008$), entered more appointments ($p = .021$), used more strategies ($p = .001$), and had longer planning times ($U = 35{,}825.0$, $p = .023$) than the middle-aged group.

Table 1. Participant Characteristics

	U.S. Group ($n = 375$)				Israeli Group ($n = 433$)			
Age Group	Men, *n* (%)	Women, *n* (%)	Total *N*	Age, yr, *M* (*SD*)	Men, *n* (%)	Women, *n* (%)	Total *N*	Age, yr, *M* (*SD*)
Youngest (18–39 yr)	45 (39.8)	68 (60.2)	113	28.7 (6.3)	74 (46.3)	86 (53.8)	160	29.8 (4.9)
Middle-aged (40–64 yr)	52 (37.4)	87 (62.6)	139	53.2 (8.3)	68 (43.3)	89 (56.7)	157	51.2 (7.8)
Oldest (≥64 yr)	45 (36.6)	78 (63.4)	123	73.7 (6.3)	62 (53.4)	54 (46.6)	116	71.4 (6.4)

Table 2. Comparison of Performance on the Weekly Calendar Planning Activity, by Country and Age Group

Measure	U.S. Group (n = 375), M (SD), Range			Israeli Group (n = 433), M (SD), Range			Main Effects, F (η_p^2)		
	Youngest (n = 113)	Middle-Aged (n = 139)	Oldest (n = 123)	Youngest (n = 160)	Middle-Aged (n = 157)	Oldest (n = 116)	Country (df = 1,796)	Age (df = 2,796)	Gender (df = 1,796)
Rules followed	4.4 (0.7), 2–5	4.3 (0.7), 2–5	3.9 (1.0), 1–5	4.4 (0.7), 2–5	4.2 (0.9), 1–5	3.5 (1.1), 1–5	8.60* (.01)	47.19** (.12)	0.16 (.0001)
Strategies	5.1 (2.3), 1–12	5.1 (2.3), 0–11	4.0 (2.1), 0–9	7.1 (2.6), 1–13	6.0 (2.5), 1–13	4.4 (2.1), 1–11	43.97** (.05)	40.01** (.09)	10.62** (.01)
Accurate appointments	14.2 (2.2), 6–17	14.1 (2.1), 8–17	12.3 (3.0), 5–17	14.4 (1.9), 7–17	13.4 (2.1), 6–17	11.9 (2.7), 5–17	3.57 (.004)	56.25** (.12)	2.15 (.003)
Total time, s	977.4 (406.2), 300–2,520	847.2 (299.4), 262–1,695	969.2 (434.0), 268–2,460	1,224.6 (499.6), 301–3,177	1,097.5 (573.5), 231–3,900	1,255.4 (813.6), 396–5,929	46.37** (.06)	6.05** (.02)	3.77 (.005)
Entered appointments	16.5 (0.8), 13–17	16.4 (0.9), 13–17	16.0 (1.2), 12–17	16.7 (0.6), 15–17	16.4 (0.8), 14–17	16.0 (1.0), 13–17	0.63 (.001)	27.49** (.07)	0.09 (.0001)
N	112	139	115	159	156	109			
Efficiency score[a]	87.3 (56.7), 27.9–478.1	78.2 (39.7), 17.4–237.2	119.2 (98.9), 26.8–653.4	107.1 (61.8), 22.7–379.3	108.5 (61.8), 15.5–328.4	154.7 (118.3), 39.2–667.4	26.13** (.03)	24.44** (.06)	1.87 (.002)

Note. df = degrees of freedom; F = results of analysis of variance or multivariate analysis of variance; M = mean; SD = standard deviation; η_p^2 = partial η squared.

[a]Calculated for participants who entered at least 7 accurate appointments; lower scores mean higher efficiency.

*p < .05. **p < .001.

Differences by Country

The U.S. participants were significantly faster than the Israeli participants, were more efficient, followed more rules, and used fewer strategies (see Table 2). Planning times for the U.S. group were significantly shorter than for the Israeli group in all age groups (younger, U = 6,762, p = .0001; middle-aged, U = 9,327, p = .039; older, U = 6,065, p = .045).

Country × Age Group Effect

In the overall model, a significant interaction effect for Country × Age Group was found, $F(8, 1{,}586) = 2.97$, p = .003, η_p^2 = .02. Significant interaction effects for Country × Age Group were found for number of strategies, $F(2, 796) = 7.17$, p = .001, η_p^2 = .02, and number of rules followed almost reached significance, $F(2, 796) = 2.96$, p = .052, η_p^2 = .007. The Israeli younger and middle-aged groups used significantly more strategies than the U.S. younger group, $t(271) = -6.74$, p = .0001, and middle-aged group, $t(294) = -3.22$, p = .001. The U.S. older group followed significantly more rules than the Israeli older group, $t(230) = 2.99$, p = .003. The U.S. younger and middle-aged groups used more strategies (p = .002 and p = .001, respectively) and followed more rules (p = .0001 for both) than the U.S. older group. The Israeli younger and middle-aged groups used more strategies and followed more rules than the Israeli older groups (p = .0001 for all comparisons). The Israeli younger group used more strategies than the Israeli middle-aged group (p = .0001).

Differences by Gender

In the overall sample, women used significantly more strategies than men (5.6 ± 2.6 vs. 5.1 ± 2.4). They were also slower than men (1,085.0 ± 577.5 s vs. 1,040.6 ± 492.9 s), a difference that almost reached significance (p = .053).

Country × Gender Effect

A significant interaction effect for Country × Gender was found for total time, $F(1, 796) = 5.41$, p = .02, η_p^2 = .007, and efficiency, $F(1, 778) = 5.02$, p = .025, η_p^2 = .006. Israeli women performed significantly more slowly than Israeli men (1,253.6 ± 677.8 s vs. 1,111.8 ± 553.6 s), $t(431) = 2.37$, p = .018, with no significant differences in the U.S. sample. U.S. men and women were more efficient than Israeli men and women, and within each country no significant differences were found between men and women.

Discussion

This study demonstrated distinct differences between the performance of younger and older adults on the WCPA. In addition, important similarities and differences were identified between two countries, the United States and Israel, with Western cultures. We first discuss our findings on age differences and then address key variations observed across countries.

Age Differences

Our results indicate significant differences between adults below and above age 65 in both countries on the majority of WCPA variables, with the exception of time. This finding supports the discriminative validity of the WCPA and suggests that subtle declines in complex activity performance and strategy use can be expected with typical aging. Although this finding is consistent with the literature on age-related cognitive decline in EF, most studies have used laboratory-based tasks. Relatively few studies have examined complex activity performance and strategy use in a functionally relevant task in older adults, and we could not identify any studies that examined activity performance and strategy use across two different countries.

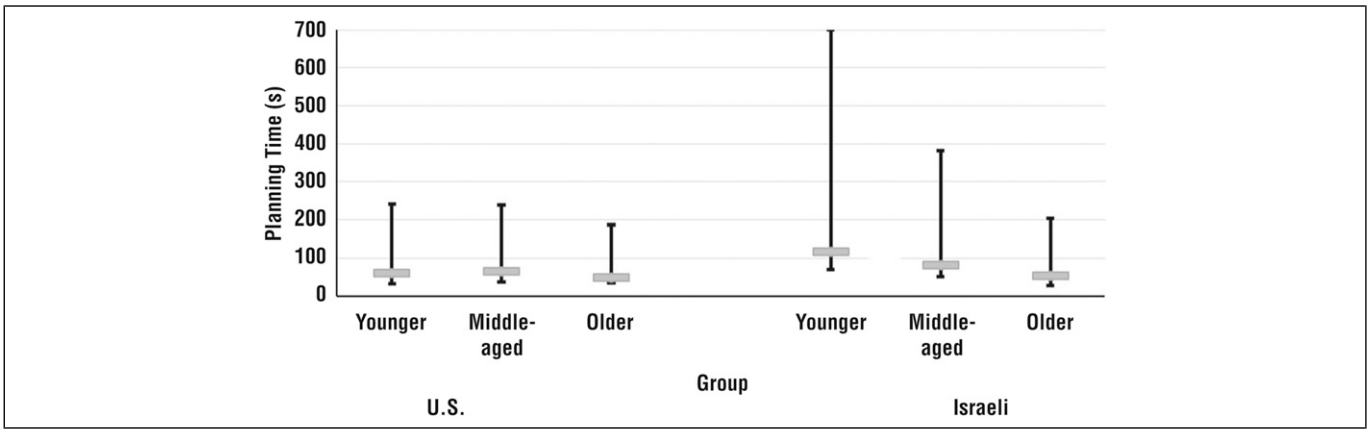

Figure 1. Planning time medians (gray bars) and interquartile ranges (black bars), by country and age group.

The task of placing appointments into a calendar with rule constraints and conflicts draws on both executive control processes and effective use of real-life knowledge and experience. Older adults not only were less accurate and less efficient but also used fewer strategies and followed fewer rules during the task. This finding is contrary to those of previous studies suggesting that older adults may be able to compensate for age-related cognitive decline in simulated functional planning or problem-solving tasks because of their prior experience (Kliegel et al., 2007; Phillips, Kliegel, & Martin, 2006). Although participants were likely familiar with the task of placing appointments, the structure of the WCPA introduced novelty or obstacles that required flexibility and adjustment during performance. The current study supports the findings of Sanders and Schmitter-Edgecombe (2012) and suggests that even when tasks are familiar, elements of novelty or unexpected obstacles can increase cognitive load and decrease performance in healthy older adults.

An unexpected finding was that total time for completion was not significantly different between the youngest and oldest groups. The middle-aged group completed the task faster than the other two groups in both countries; this pattern is inconsistent with those identified in studies using laboratory-based tasks, which have indicated that processing speed declines with age (Albinet, Boucard, Bouquet, & Audiffren, 2012). More years of experience with calendar use may have given the middle-aged group an advantage compared with the youngest group. The youngest group in our sample had a mean age of 29.4 yr (standard deviation = 5.6, median = 29.0) and likely had fewer years of experience in calendar use than those in midlife. This advantage may have been slightly mitigated by changes in processing abilities in the oldest age group; however, familiarity and more years of experience may explain why the oldest group showed completion times nearly equivalent to those of the youngest group. Further investigation that considers degree of familiarity in calendar use is needed to determine whether this observation is accurate.

On closer inspection, it appears that allocation of time within the task differed between the youngest and oldest groups. For example, participants in the youngest group, especially the Israeli group, spent a longer time planning the task than participants in the oldest group, raising the total time. More time spent planning reflects a metacognitive strategy that may have contributed to higher accuracy in this group. Although the overall time for both younger and older adults was similar, older adults made more errors and were less efficient. Older adults may therefore have needed to slow down their performance or allocate time differently within the task.

The current study also suggests that differences between performance in younger and older adults is not limited to decreased accuracy but also is reflected in the methods used during performance. Older adults used fewer strategies, consistent with aging studies using laboratory-based activities (Lemaire, 2010). Cognitive strategies help people cope with performance challenges. Note that measurement of strategy use in this study was limited to the number of strategies used; frequency and effectiveness of strategies were not rated. These aspects of strategy use should be examined in future studies.

Limitations in the number of items that can be attended to at once have been hypothesized to account for more restricted strategy use in older adults and may explain greater difficulties in adhering to rules. As the cognitive challenge of an activity increases, more demands are placed on executive control. The person is less able to juggle multiple task components while using strategies and adhering to rules (Lemaire, 2010). Age-related executive control deficits diminish the ability to multitask or successfully manage activities with high cognitive demand. Restrictions in complex activities in older adults have been shown to predict those

who are at risk for future functional and cognitive decline (Luck et al., 2012; Reppermund et al., 2011). This research and the pattern of differences found in the current study highlight the need to identify deficits in complex activity performance in older adults and to develop methods that help older adults effectively allocate time and use strategies to cope with performance challenges.

Country Differences

Our findings indicate that Israeli and U.S. participants demonstrated similarities in average task accuracy and number of appointments entered on the WCPA, despite significant differences in strategy use, rules followed, efficiency, and time. The most notable difference was in the area of time (planning and total time) and efficiency. U.S. participants were faster and therefore more efficient than Israeli participants across all ages. In addition, more Israeli participants made more time errors than U.S. participants (40.5% vs. 21.1%). This finding is consistent with literature that has documented cultural variations in how people understand, use, and perceive time. Significant variations in performance times on neuropsychological tests of EF have been identified across countries (Cores et al., 2015; Fernández & Marcopulos, 2008). Cores et al. (2015) concluded that this variation was related to differences in the subjective conception of speed rather than in processing speed capabilities.

Social psychologist Robert Levine (1998) examined time perception and use across countries and observed that the fastest people, including those in North America, assessed punctuality in 5-min intervals, whereas the slowest, including those in the Middle East, assessed punctuality in 15-min intervals. A website explaining Israeli–U.S. cultural differences cautions U.S. visitors to keep in mind that "Punctuality is relaxed in Israel. Always allow up to 15–20 minutes before thinking that your party is late" (Leyden, 2007, "When in Rome Act as a Roman!" para. 10). The culture of the United States, particularly in the fast-paced New York City area, reflects the idea that "time is money," and punctuality is more strictly observed.

In addition to slower performance, younger and middle-aged Israeli participants were more strategic than younger U.S. participants. Although use of more strategies is usually related to better performance of complex tasks, it can also slow down performance and may have contributed to increased total task time and decreased efficiency. The number of strategies used by older adults was similar across countries; however, the number of rules followed was greater in U.S. older adults. Number of strategies and planning and total times were also related to gender in the Israeli participants: Israeli women used more strategies and took more time than Israeli men. These differences may have been related to differences in environment or experiences and need further investigation.

Limitations

Several factors limit interpretation of our findings. The convenience sample was limited to a single geographic area in the United States (Greater New York), and the participants' education level was high (>12 yr); these factors limit the generalizability of findings. The groups were not equivalent in size or in gender representation. Although participants were independently living in the community and were screened using mental status exams, we cannot rule out the possibility that some of the older adults had undiagnosed mild cognitive impairment.

Implications for Occupational Therapy Practice

The findings of this study have the following implications for occupational therapy practice:

- Cross-cultural normative data for the WCPA provided by this study can aid occupational therapy practitioners in interpreting higher ranges of everyday cognitive functioning.
- Data on typical adult performance across three age groups for the WCPA provide a foundation to enhance occupational therapy practitioners' ability to identify subtle difficulties clients experience in cognitively demanding activities and screen for those who may be at risk for occupational performance deficits.
- Methods to improve strategy use and time allocation may help clients across ages and cultures manage cognitively demanding activities.

Conclusion

This study extends research on cognitive aging by reporting analysis of performance and strategy use on a complex functional task across three age groups and two countries. Mildly lower EF and strategy use were identified in older adults across countries. However, some aspects of executive performance, such as time for completion, varied across countries, indicating that caution is needed when interpreting speed of performance and strategy use in people from different cultural backgrounds. ▲

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