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Age trajectories of everyday cognition in African American and White older adults under prompted and unprompted conditions

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Abstract

We investigated how race and verbal prompting interacted with age to predict age trajectories on a performance-based measure of everyday cognition. African American ($n = 727$) and White ($n = 2052$) older adults from the ACTIVE clinical trial were given the Observed Tasks of Daily Living (OTDL; a performance-based measure of medication management/finances/telephone use) at baseline and 1-, 2-, 3-, 5-, and 10-year follow-ups. When participants said “I don't know” or did not respond, they received a standardised verbal prompt, which served only as a cue to initiate the first step. At each occasion, unprompted (sum of items correct without prompting) and prompted (sum of correct prompted and unprompted items) scores were derived for each participant.

Mixed effects models for change were used to determine the age trajectories of OTDL performance by race. When not prompted, African Americans demonstrated more rapid decline in OTDL performance than Whites, especially after age 80. When prompted, both groups had improved performance and evinced shallower decline, although African Americans continued to demonstrate a slightly more rapid decline.

Simple prompting attenuated age-related changes of African Americans and Whites on a measure of everyday cognition. Prompting may be especially helpful for older African Americans.

Keywords

Everyday cognition; Ecologically validity; Verbal prompting; Racial disparities; Cognitive ageing

INTRODUCTION

Significance of Everyday Cognition

Everyday cognition has been described as the cognitive performance demonstrated when encountering natural (ecological) stimuli (e.g., reading food package labels or official documents; Allaire & Marsiske, 1999). Measures of everyday cognition were developed for at least two reasons. First, while self-reported instrumental activities of daily living (IADL)

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questionnaires have been shown to predict performance on everyday cognition tasks ($r = .36-.69$; Allaire & Marsiske, 2002; Diehl, Willis, & Schaie, 1995; Marsiske & Margrett, 2006; Schmitter-Edgecombe, Parsey, & Cook, 2011; Tan, Hultsch, & Strauss, 2009), their reliance on self- or informant-reports opens up the possibility of inaccurate reporting as a result of lack of insight (Bertrand & Willis, 1999) or may be confounded by one's perceived physical ability or emotional functioning (Kempen, Steverink, Ormel, & Deeg, 1996). Moreover, community-dwelling older adults who are functioning independently may be expected to evince a ceiling effect ("everything is fine") given the often limited extent and use of Likert-type scales. Performance-based measures of everyday cognition, therefore, have the goal of capturing the application of cognitive skills to important everyday tasks while remaining psychometrically sensitive to subtle between-person differences. Second, in the context of real-world tasks, we might expect that relevant and familiar everyday tasks offer greater likelihood of elders being able to draw on experience and acquired task-specific knowledge (Berg & Klaczynski, 1996; Denney, 1992; Willis & Schaie, 1986).

Everyday Cognition in African American Elders

Few studies have examined everyday cognitive performance differences between African American and White older adults on a performance-based measure of everyday cognition. Morgan, Marsiske, and Whitfield (2008) used the Everyday Problems Test (EPT; Willis & Marsiske, 1993), a paper-based measure of IADL-related everyday tasks that presents ecologically valid information on a page (e.g., nutrition labels, telephone rates), and then asks participants to answer questions about the presented information. Morgan et al. (2008) reported that African American participants performed more poorly than European American participants on the EPT, but that when controlling for reading level/literacy using the Wide Range Achievement Test (WRAT-3), this mean difference became non-significant. Another study using the EPT with African American older adults found that the number of chronic illnesses and self-rated health as compared with five years prior were significant and unique predictors of performance on the EPT (Whitfield, Allaire, & Wiggins, 2004). To our knowledge, while the Observed Tasks of Daily Living (OTDL; Diehl et al., 1995) was validated in both White and non-White participants, African American and White participants have not been directly compared on the OTDL, which is the measure used in this study. However, given the evidence that the EPT is closely related to the OTDL ($r = .64$; Diehl et al., 2005), we would expect the effect of race to be similar on both measures. A unique contribution of the present investigation was to examine the longitudinal trajectories of elder African Americans' and Whites' performance on a measure of everyday cognition, under both prompted and unprompted conditions.

Race Disparities in Late-life Cognition

Mean-level cognitive performance disadvantages for older African Americans relative to Whites have been consistently reported in the literature (e.g., Escobar et al. 1986; Fillenbaum, Heyman, Williams, Prosnitz, & Burchett, 1990; Heaton, Ryan, Grant, & Matthews, 1996; Kaufman, McLean, & Reynolds, 1988; Manly et al., 1998). These cognitive differences are likely due to a life-long disadvantage, including access to fewer years of formal education (Harper & Alexander, 1990). Moreover, the quality of education for older African Americans was likely poorer (shorter years, impoverished study materials)

relative to their White age peers (Glymour, Kawachi, Jencks, & Berkman, 2008; Jones, 2003; Whitfield, 1996). Indeed, Manly, Jacobs, Touradji, Small, and Stern (2002) found that race differences on a variety of neuropsychological measures were attenuated when literacy level (as a measure of educational quality) was included as a covariate. Health factors, especially cardiovascular factors, have also been implicated as possible mechanisms for race differences in cognition (Morgan, Sims, & Whitfield, 2010; Harper & Alexander, 1990), particularly given evidence that African Americans have a higher prevalence of hypertension and other cardiovascular issues (Go et al., 2014). Cardiovascular risk factors do appear to be important predictors of cognitive functioning in both African Americans and White older adults (e.g., Beeri, Ravona-Springer, Silverman, & Haroutunian, 2009; Izquierdo-Porrera & Waldstein, 2002; Warsch et al., 2013; Yaffe et al., 2004). Additionally, when compared to White participants, African American participants showed a stronger negative relationship between blood pressure and cognition (Robbins, Elias, Elias, & Budge, 2005).

Few studies have investigated the longitudinal trajectory of cognitive functioning in older African Americans. Marsiske et al. (2013) showed that while older African Americans generally performed more poorly than Whites, both groups displayed similar rates of age-related change (between ages 65 and 96) in several domains of cognition, including: visuospatial processing speed, memory, attention/working memory, and vocabulary. Only in the domain of reasoning did African Americans show a more rapid decline trajectory with increasing age.

Based on these cognitive findings, one might expect that there would also be mean differences between African American and White older adults on a measure of everyday cognition. Indeed, Morgan et al. (2008) found such a mean difference on a paper-and-pencil task of everyday cognition, but the question of a race difference in performance levels and rates of change on more behaviourally based (i.e., participant physically performs the tasks; e.g., OTDL) ecological and familiar tasks remains to be addressed. It could be hypothesised that the increased relevance and familiarity of everyday cognitive stimuli might attenuate race differences because of the greater ability to draw on experience. On the other hand, because African American elders might be expected to experience cumulative disadvantage from poorer education, health, and economic opportunity, one might predict performance disadvantages for older African Americans, relative to Whites, even when the task is ecologically valid (Whitfield et al., 2004; Whitfield & Baker-Thomas, 1999).

One dimension that is often ignored in everyday cognitive assessments is the role of social support and social milieu on problem solving. Many studies have reported the higher availability and use of informal social support for older African Americans (e.g., Taylor, Chatters, Woodward, & Brown, 2013), and drawing on social partners may be a disproportionately important part of the real-world context of problem solving for African Americans. The OTDL offers a partial way of assessing the benefits of social cognitive support, in that prompting—receiving assistance from others—is built into the assessment approach.

Prompting

Prompting, defined here as reminding, persuading, pointing out possible actions or (meta)cognitive processes (e.g., how to organise or approach a task) to an individual, represents one external strategy that may be used when individuals encounter cognitive failures (i.e., unsure what to do next in a sequence of actions; unable to remember a fact or action). Providing external cognitive support in the form of organisational assistance (e.g., ordering the sequence of steps) or visual cueing (e.g., visual demonstration of next step) has been shown to be effective at supporting activities of daily living in older, impaired populations (e.g., Giovannetti et al., 2007; Mihailidis, Boger, Craig, & Hoey, 2008). Recent work using tasks that involve ecologically valid stimuli (e.g., medication bottles, food items, electric bills) have investigated the use of prompting in both mild cognitively impaired (MCI) and unimpaired older adults (Seelye, Schmitter-Edgecombe, Cook, & Crandall, 2013; Thomas & Marsiske, 2014).

In previous work from the Advanced Cognitive Training of Independent and Vital Elders (ACTIVE) study we found that simple verbal prompts (e.g., for a pill reminder task: “Is there any information that can help you fill the pill reminder?”) improved scores on the OTDL for both healthy older adults and participants with mild cognitive impairment (MCI). Moreover, prompting partially attenuated both performance level and trajectory differences in adults with and without MCI (i.e., longitudinal decline was shallower for those with MCI when prompted; Thomas & Marsiske, 2014). Prompting might be considered an instantiation of the kinds of informal help and hints that social partners might provide in real world problem solving. Support in working through complex tasks has also been examined in the context of social relationships and collaborative cognition. Studies of cognitive collaboration tend to focus on the informal support, usually in spouses, that comes with working together in order to solve a shared problem (Baltes & Staudinger, 1996; Berg, Johnson, Meegan, & Strough, 2003; Dixon & Gould, 1996; Margrett & Marsiske, 2002).

The current study sought to investigate whether simple verbal prompting might also reduce race differences in performance level and rate of change in everyday cognition. The primary aims of this investigation were: (1) to investigate whether there were mean-level, race-related performance differences on the OTDL, (2) to compare the 10-year age trajectories of OTDL performance by race, and (3) to examine whether the race differences in rates of change might be attenuated by prompting.

METHOD

All participants (N = 2802) randomised in the Advanced Cognitive Training for Independent and Vital Elderly (ACTIVE) clinical trial were considered for inclusion in this investigation. All procedures were approved by the Institutional Review Boards at each collaborating site (University of Alabama-Birmingham, Indiana University, Johns Hopkins University, Hebrew Senior Life, Pennsylvania State University, and Wayne State University/University of Florida) and informed consent was obtained prior to participation.

The overall goal of the ACTIVE study, but not of this secondary data analysis, was to investigate the effects of three different cognitive training arms (memory, reasoning, and

speed; Jobe et al., 2001). The initial training was 10 sessions over approximately six weeks. Some participants were also randomised to receive up to four additional booster training sessions in the domain in which they were initially trained approximately 11 months after the initial intervention ended. Thus far, there is little-to-no evidence that the training had an effect on the OTDL or similar outcome measures of everyday cognition through 5 (Willis et al., 2006) and 10-year follow ups (Rebok et al., 2014). Despite the lack of evidence that cognitive training had an impact on everyday cognition measures, in the analyses that follow, intervention group membership was controlled for in the analyses in an attempt to statistically control for residual effects of training, if any.

Participants

All participants were 65 years or older and screened to be relatively healthy and non-demented at baseline. Inclusion criteria for the ACTIVE trial are described in depth elsewhere (e.g., Jobe et al., 2001), but generally focused on individuals free of basic activities of daily living and frank cognitive impairment, terminal diseases with prognosis of short life expectancy, or unwillingness to commit to future sessions, resulting in an ACTIVE sample size of 2802 participants. Participants in ACTIVE were administered the OTDL at baseline (BL), and 1, 2, 3, 5, and 10 years after baseline. Of the 2802 ACTIVE participants, our sample size was further reduced to 2779 because we excluded 20 participants (< 1% of the sample) for identifying as neither African American nor White and 3 participants for having missing OTDL data at baseline. The sample size of the study was 2779 at BL (African American = 727, 26.16%; White = 2052, 73.83%), 2274 at Year 1 (African American = 548, White = 1726), 2274 at Year 2 (African American = 499, White = 1662), 2031 at Year 3 (African American = 489, White = 1542), 1801 at Year 5 (African American = 430, White = 1371), and 1110 at Year 10 (African American = 260, White = 850). The most common reason for attrition, certainly after the first year, was due to participant death and illness (Rebok et al., 2014). Comparison of returning and non-returning participants follows.

The demographic characteristics of ACTIVE have been extensively described elsewhere (e.g., Ball et al., 2002). The means (SD) of key baseline demographic and OTDL variables as well as estimates of effect size for race group differences are included in Table 1. Generally, African American participants were younger; had fewer years of education; had a greater proportion of female participants; reported worse general health; better vision; poorer performance on vocabulary, general cognitive functioning, and the OTDL; and required more prompts on the OTDL ($p < .05$). There were no differences in depression between groups. Most of the demographic differences between African American and White participants were of small-to-medium magnitude (age, education, female, general health, vision, general cognition, OTDL scores, and number of prompts); however, there was a large effect for the difference in vocabulary. Of the 2779 elders included at baseline, there were 903 participants with an OTDL score and 1876 participants without an OTDL score at the 10-year follow up. T-test comparisons of the baseline characteristics of continuing versus participants with missing OTDL data revealed that, relative to those without an OTDL score, those assessed at the 10-year follow-up were younger (71.62 versus 75.32 years), had more years of education (13.90 versus 13.35), better vision (76.05 versus 71.71), fewer depressive

symptoms (4.27 versus 5.67), better general health (73.50 versus 66.82), higher vocabulary scores (12.83 versus 12.18), and included a higher percentage of females (80.29% versus 73.83%). They did not differ on the proportion who was African American (25.25% versus 26.60%). Analyses that follow are adjusted for these variables. A more comprehensive adjustment for attrition covariates at each occasion, along with a model-based treatment of dropout, follows.

Measures

The Observed Tasks of Daily Living (OTDL; Diehl et al., 1995, 2005) was used to measure the cognitive/problem solving aspects of everyday functioning and participants' responses to verbal prompts. The OTDL is a performance-based measure of functional living skills that presented participants with nine tasks (each with multiple items, for a maximum of 28 points) in the domains of medication use, telephone use, and financial management. The OTDL has been widely used in older adults (e.g., Diehl et al., 1995, 2005; Okonkwo et al., 2009; Rebok et al., 2014; Schmitter-Edgecombe et al., 2011; Vaughan & Giovanello, 2010; Willis et al., 2006) and has also been used with patient populations such as impaired older adults, those with schizophrenia, and those with traumatic brain injury (Goverover, 2004; Goverover & Josman, 2004). While only one paper has directly compared prompted and unprompted performance (Thomas & Marsiske, 2014), the prompting portion of the OTDL has always been conceptualised as part of the OTDL and was well standardised in the ACTIVE trial.

In order to simulate everyday life as much as possible, the stimuli used in this measure are ecologically valid in that the participants physically worked with real-world items such as medication bottles, telephone records and financial statements. Each OTDL task had specific observable portions in order to ensure uniform coding of task performance. Table 2 provides examples of items similar to those that are found on the OTDL as well as the corresponding prompts. The OTDL generally takes approximately 20–30 minutes to administer (mean = 26.5 min; SD = 8.6 min; range = 10–63 min; Diehl et al., 2005). The model of three domains (medication, telephone, financial management) with three tasks within each domain has been shown to have good fit in both White and non-White participants (Whites: goodness of fit index (GFI) = .90, root mean square residual (RMR) = .08; non-Whites: GFI = .94, RMR = .06; Diehl et al., 2005).

The OTDL was given to participants in a one-on-one setting by trained administrators who underwent rigorous quality control (for procedure, see Thomas & Marsiske, 2014). If the participant had difficulty responding, a standardised verbal prompt was given. The prompts did not give the answer, but were designed to be minimally directive and serve as a reminder, motivation, or cue to help initiate the first step. Standardised prompts were only given if the participant did not respond for at least 15 seconds or stated "I don't know". Prompts were not given if the participant responded within 15 seconds with the incorrect answer. In those cases, the item was simply marked incorrect (0 points assigned). The prompt was given only once before the item was marked incorrect. At BL, 93.7% of participants (n = 2606) received at least one prompt (number of prompts, mean = 4.82, SD = 3.51, range = 0–22).

There were two different OTDL scores calculated for each participant and used in this investigation—an unprompted score and a prompted score. The unprompted score was calculated by summing the number of items correct without a prompt. Participants earned one point per correct item, with the possibility of scoring up to 28 points. There are multiple items that are considered part of each task, so participants were able to earn partial credit on a task even if the total score on that task was less than perfect. The prompted score was the unprompted score plus any items where the participant responded correctly after receiving a prompt. At each occasion, if a participant did not receive a prompt, their prompted score was set to equal the unprompted score. Baseline covariates including age, education, gender, health (a general health rating scale from the SF-36 inventory; Ware & Sherbourne, 1992), depression (Center for Epidemiological Studies–Depression–12 scale; CES-D; Radloff, 1977), objectively measured vision, the internal locus of control, powerful others locus of control, and achievement motivation subscales of the Personality in Intellectual Aging Contexts (PIC; Lachman, 1986; Lachman, Baltes, Nesselroade, & Willis, 1982), general cognitive functioning (Mini Mental State Exam; MMSE; Folstein, Folstein, & McHugh, 1975) and vocabulary (Ekstrom, French, Harman, & Derman, 1976) were included in the model in order to adjust for selective attrition and baseline race–group differences. These covariates were determined due to findings from previous work (e.g., Wolinsky et al., 2010; Yam, Gross, Prindle, & Marsiske, 2014) and by five separate stepwise logistic regressions that were used to assess the predictors of participants missing at each follow-up occasion (i.e., 1st, 2nd, 3rd, 5th and 10th annual assessment). The C-statistic (Agresti, 2013) ranged from 0.64 to 0.72, suggesting the utility of the attrition model at each occasion. Vocabulary was included as a proxy variable for crystallised intelligence/literacy, in order to adjust for race differences in performance, likely due to differential quality of education. Although no intervention effects of the memory, reasoning, or speed training have been detected on OTDL to date (e.g., Rebok et al., 2014; Willis et al., 2006), dummy codes representing the intervention groups were included to control for any perturbations to the longitudinal change trajectories that were associated with cognitive training (i.e., training and booster training group membership was statistically controlled for). Consistent with analytical practice in all ACTIVE manuscripts, the ACTIVE Field Site was included to reduce random variance associated with the arbitrary locations where the study took place (six university/research centres were involved with ACTIVE). Replicate (data collection was spread out over six independent testing cohorts, or replicates, to manage workflow) was also included, to control for random seasonal variations and to be consistent with previous ACTIVE research (e.g., Willis et al., 2006).

Analyses

A multi-level model (MLM) design was used to answer the study questions using all available data, without case-wise exclusion for a missing data point (Singer & Willett, 2003). The use of all available data (i.e., full information maximum likelihood with available cases instead of listwise deletion), as well as controlling for baseline covariates known to be predictive of dropout in ACTIVE (Wolinsky et al., 2010) at each occasion, was expected to reduce bias due to selective attrition. Additionally, however, to further examine the influence of missing data and participant attrition, a pattern mixture model (PMM) approach was conducted (Hedeker & Gibbons, 1997). PMM allows for the examination of performance as

a function of different patterns of missing data. This method involved introducing into the dataset a dummy code that distinguished between those who participated at all occasions versus those who dropped out by Year 10. This missing dummy is allowed to have both a main effect, and to interact with, in this study, variables representing time (age), prompting, and race (and their interactions). After running the model, results are adjusted for dropout group (along with covariates predicting missing at any occasion), as well as pooling the results across missing data pattern groups. Final presented estimates are weighted averages across the two missing data subgroups. The model was run two ways—once with the dummy coded variables to obtain the weighted averages and once with the z-transformed variables. The b-weights shown for the terms involving the dropout variable are based on z-transformations of all predictors, but the weighted averages were based on a version of the model that used dummy coded completion status. These parameter estimates, weighted and aggregated across dropout and non-dropout data patterns, are displayed in Table 3.

An MLM design allowed for both the fixed and random effects to be examined. The model included OTDL performance as the dependent variable, and included participants' age at each occasion, within-subjects' prompting status (prompted or unprompted score), and race (African American or White). These effects were adjusted for aforementioned baseline covariates predictive of missingness at each occasion— replicate, site, intervention group, education, gender, BL vision, BL depressive symptoms (CES-D), BL SF-36 General Health, BL Vocabulary, BL PIC Internal Locus of Control, BL PIC Powerful Others Locus of Control, BL PIC Achievement Motivation, BL MMSE—as well as dropout group membership (Hedeker & Gibbons, 1997) and its interaction with age, age2, prompting status, and race. Race group differences in the trajectory of prompted and unprompted scores were assessed via the race $\times$ age (and age2) and race $\times$ prompting status $\times$ age (and age2) interactions. Age was centred around the average age across all available assessments, and quadratic age was created by squaring the centred linear age. All variables, including the OTDL dependent variable and initially dummy coded variables such as race (0 = White, 1 = African American) and dropout (0 = retained, 1 = dropout), along with all predictors and covariates, were z-transformed such that zero equals the overall mean ($SD = 1$) of the sample across all occasions for inclusion in the model to improve interpretability of the estimates. This model, conducted using SPSS Statistics 22 (IBM Corp, 2013), included both linear and quadratic age as continuous parameters. Both the fixed effects and random effects that were included in this model are displayed in Table 3.

RESULTS

Table 3 shows the covariate and missingness-adjusted weighted averaged estimates across dropouts' and completers' results of the MLM examining the age trajectory of prompted versus unprompted OTDL performance by race. For clarity in presentation, Table 3 does not include the main effects of the baseline covariates and the main effect and specific interactions involving the missing data pattern. The main effect and interactions involving dropout are described below.

Fixed effects

When controlling for years of education and vocabulary, the main effect of race on OTDL performance was non-significant ($p > .05$). The linear effect of age was significant, such that with increasing age, OTDL showed a negative, linear trajectory. The quadratic effect of age was also significant, suggestive of more rapid decline in OTDL performance at older ages. Prompted performance was significantly higher than unprompted performance. Interactions qualified these main effects: Both the linear and quadratic age $\times$ prompting interactions were significant, such that unprompted performance showed a faster and more rapid rate of decline than prompted performance. The linear and quadratic age $\times$ race interactions were also significant. Decline was more rapid and negative in African American than in White participants. Furthermore, the three-way linear age $\times$ race $\times$ prompting and quadratic age $\times$ race $\times$ prompting interactions were significant. The reduction in more negative and faster rates of change after prompting was greater for African Americans than for Whites. As Figure 1 shows, under prompted conditions, African American participants' performance was essentially the same as that of prompted White participants' for most of the age ranges studied.

Examination of the main effect and interactions involving dropout found that there was a main effect of dropout, $\beta = -.120$, $SE = .012$, $t(2867.21) = -9.89$, $p < .001$, such that, on average, participants who dropped out had lower OTDL performance. The linear age $\times$ dropout interaction was significant, $\beta = -.040$, $SE = .010$, $t(1874.69) = -4.06$, $p < .001$, suggesting that older participants who dropped out had poorer OTDL performance than older participants who did not drop out; however, the quadratic age $\times$ dropout interaction was non-significant ($p > .05$). The race $\times$ dropout interaction was non-significant such that African American and White participants' OTDL performance did not differ by dropout status. The linear age $\times$ race $\times$ dropout interaction was significant, $\beta = .030$, $SE = .010$, $t(1718.66) = 3.04$, $p = .002$, indicating differences in the age $\times$ race interaction by dropout status. The quadratic age $\times$ race $\times$ dropout interaction was non-significant. The four-way linear age $\times$ race $\times$ prompting $\times$ dropout interaction was significant, $\beta = -.009$, $SE = .004$, $t(11,174.46) = -2.42$, $p = .016$, such that the reduced negative decline after prompting, particularly for African American participants, differed by dropout status. The quadratic age $\times$ race $\times$ prompting $\times$ dropout was non-significant ($p > .05$).

Random effects

This model examined between-subject variability in OTDL performance (random intercept) as well as age trajectory. Linear age had significant random variance, suggesting that there remained significant unexplained differences in linear rates of change; this was not true for the quadratic trend. The model had a total $R^2 = .646$, and represented a significant improvement over the unconditional growth model that included both fixed effects of time, baseline covariates and the random intercept, $-2LL \chi^2$ difference ($df = 21$) = 1425.18, $p < .001$.

DISCUSSION

This is the first study to investigate the longitudinal relationships between age and race and their effect on a measure of everyday cognition. Additionally, the interaction of age, race, and the use of simple verbal prompting during everyday task completion was examined. Both African American and White elders demonstrated an age-related decline in OTDL performance; however, African American participants appeared to experience a more rapid rate of decline, especially after the age of about 75–80 years. This faster age-related decline was particularly evident for the African American participant's unprompted OTDL performance trajectory. Consistent with previous work (Thomas & Marsiske, 2014), simple verbal prompts successfully improved the mean level of performance on the OTDL across age and race. Prompting also appeared to reduce the rate of age-related decline for all participants on average, demonstrated by a shallower curve (less negative and quadratic decline) with increasing age. Moreover, the current study was able to show that simple verbal prompts partially attenuated the race differences in trajectory between African American and White older adults, with African American participants experiencing a greater reduction in linear and quadratic decline following prompting. Thus, African American participants improved more from these simple prompts.

Consistent with previous work (e.g., Manly et al., 2002), controlling for crystallised intelligence/quality of education attenuated the level difference between African American and White older adults' performance on the OTDL. However, results of this study show that more rapid decline with increased age exists in the unprompted OTDL performance, and this pattern is stronger in African American elders. One possible explanation might relate to the trajectory of reasoning performance. Marsiske et al. (2013) demonstrated that while there are mean level differences between African American and White ACTIVE study participants, being African American did not moderate the linear or quadratic five-year trajectories in any of the cognitive domains (e.g., memory, visual processing speed, digit symbol, and vocabulary) with the exception of the reasoning trajectory, where African American participants evinced a slightly more negative quadratic trajectory than White participants. The age trajectory of the unprompted OTDL for both African American and White older adults in ACTIVE looks similar to the trajectories of reasoning performance (Marsiske et al., 2013). The fact that the OTDL and reasoning trajectories are similar is not surprising given the consistent finding that reasoning performance change is predictive of change in everyday cognition (e.g., Tucker-Drob, 2011; Yam et al., 2014). Thus, differential changes in reasoning performance are likely contributing to the differential trajectories of African American and White participants on the unprompted OTDL.

Other possible reasons for the race differences in unprompted performance include health status, specifically cardiovascular health, which predicts cognitive performance in older African Americans (Morgan et al., 2010). Given the increased prevalence of cardiovascular disease in African Americans relative to Whites (Go et al., 2014), it is possible that African Americans are experiencing a greater cognitive burden as a result of these risk factors (Kuo et al., 2005; Warsch et al., 2013). While this study controlled for self-reported general health, future work should use more specific cardiovascular health data (e.g., blood pressure, diabetes status, etc.), to attempt to explain more between-group variance in age trajectory.

Using ACTIVE data, we have previously shown that prompting improves OTDL performance in participants with and without mild cognitive impairment; thus, this current investigation is the second set of findings from our group demonstrating that prompting works to improve performance on a measure of everyday cognition (Thomas & Marsiske, 2014). In our previous work, participants who were cognitively impaired benefited more from prompting (e.g., particularly non-amnesic MCI). Similarly, in this study, African Americans, on average, had lower cognitive performance. Thus, it may be that prompting would benefit anyone with lower cognitive or OTDL performance in the same manner regardless of race. It is important to also consider that the raw, unprompted OTDL performance was lower for African American participants and the number of prompts differed between African American and White participants (shown in Table 1). These differences may help to explain why African Americans appeared to gain more (i.e., had more prompts, so greater likelihood of improvement) and, therefore, may be a limitation of this study. However, the reasons for why African American participants elicited more prompts is likely more complex.

Differential reasoning performance, as described above, may be one contributor. The OTDL requires participants to understand what they are being asked to do, understand the real-world materials, develop and organise a plan to solve the problem, and then initiate a response. Thus, it can be construed that people who have poorer reasoning abilities may encounter difficulties at the point of task initiation, when they have to devise a plan for solving the problem. If they persevere (i.e., persist in struggling with what to do next because of difficulty developing a new approach or response) or give up at this point, they would elicit a prompt, either because they took too long trying to develop a plan (> 15 seconds) or they gave up on the task because they felt it was too difficult (said “I don’t know”). The prompt itself may be particularly beneficial to people with reasoning difficulty because the prompts tend to either cue the participant to what should be done first (e.g., assist with developing a plan) or urge the participant to “look again” (e.g., may assist those who are quick to give up in the face of difficulty to keep trying). In addition to the possible reasoning influence, we must also consider possible cultural and self-efficacy factors.

The social cues involved in prompting may simulate the natural, more socially embedded, context of everyday problem solving for older adults (e.g., Meegan & Berg, 2002). The benefit of social cueing for older adults can be linked to the research on collaborative cognition, which shows improved problem solving and memory performance in older adults when working with another person (e.g., Berg et al., 2003; Margrett & Marsiske, 2002). The next question becomes, how can we leverage this benefit of prompting and integrate it into feasible interventions? Future directions would likely be either to pursue automatic prompting devices or metacognitive self-awareness training such that someone would essentially learn to “self-prompt”. Of even greater interest is the question of why African American participants may have profited disproportionately from prompts.

While all participants appeared to benefit from prompting, prompting appeared to be particularly beneficial to African American participants, especially over the age of 80. The differential raw OTDL performance between African American and White participants may contribute to this finding; however, there may be additional social, cultural, or cognitive

factors that are also contributory. Previous studies have reported that African Americans have stronger informal social supports (e.g., church networks, family) in later life (Ajrouch, Antonucci, & Janevic, 2001; Hatch, 1991; Hayward & Krause, 2013; Taylor et al., 2013). To the extent that this suggests that there might be a pattern of greater reliance on support and social partners in the everyday lives of older African Americans, the prompted condition may have more naturally simulated the real-world context of everyday problem solving for our African American participants.

Consistent with these findings that African Americans may be more reliant on, or simply more comfortable with, social support are the findings on race differences in locus of control beliefs. Kennedy, Allaire, Gamaldo, and Whitfield (2012) found that older African Americans had lower intellectual locus of control beliefs than White participants. The intellectual locus of control beliefs composite consisted of internal locus of control beliefs (i.e., “I can do it myself”), external locus of control beliefs (i.e., “I need others to help me”) and chance locus of control beliefs (i.e., “I can’t control what is fated to happen”; Lachman, 1986), and was found to be positively predictive of cognition and everyday cognitive functioning (Kennedy et al., 2012). Thus, consistent with the reported differences in belief structures, it is possible that African Americans may be more amenable to or comfortable with eliciting prompting support. We cannot determine the specific mechanism of prompting in this current study; however, it is possible that reasoning and locus of control beliefs are possible targets of these very simple prompts. Regarding reasoning ability, the prompt may be assisting participants with getting organised, since many of the prompts cue the first step of the task. For persons with lower internal locus of control beliefs or higher external locus of control beliefs, the prompt may simply encourage a person to “give the task a try”—to persist and persevere and believe that a correct answer is possible. In order to better understand the mechanism of prompting, an approach similar to that used by Le Dorze, Villeneuve, Zumbansen, Masson-Trottier, and Bottari (2014) for moderate-to-severe traumatic brain injury would be ideal in that they examined a hierarchy of verbal assistance (e.g., restarting, action cueing, strategy suggestion, etc.) to determine what level and types of verbal support improve performance on instrumental activities of daily living.

While there are limitations to the very short and standardised nature of the OTDL prompts used in this study such that older adults may benefit more from certain types of prompts (e.g., motivational rather than directive), we find the standardisation of the prompts as well as the simplicity of the prompts to be a relative strength. The standardisation of the prompts ensured that the prompted score was comparable across testers and sites. Furthermore, while we believe there are a number of interesting follow up questions to this paper related to optimising specific types of prompts (e.g., Do more complex prompts produce even better performance?), we also find it exciting that such basic, simple prompts (e.g., “Look again”, “What is the first step?”) can show this strong effect ($r = .58$) across participants.

We would argue that the prompting in general, and the option to have a prompted score on a measure like the OTDL, actually improves the ecological validity for measuring what older adults are capable of in the real world. Indeed, prompted assessment of everyday cognitive capacity may be particularly relevant for persons with lower cognitive performance (e.g., mild cognitive impairment, who may already receive some assistance from social partners)

and persons who are used to functioning within an integrated social network (i.e., those who regularly seek help and collaboration from social partners for the performance of everyday tasks).

There may be clinical implications of our current findings. Performance-based assessments allow a fuller observation of behavioural strategies, including issues like help seeking and self-correction. These are fuller and potentially more ecologically valid ways of assessing real-world cognitive performance, a point that is widely noted in the occupational therapy literature (e.g., Baum et al., 2008; Bottari, Shun, Le Dorze, Gosselin, & Dawson, 2014; Rogers et al., 1999). Typical testing in neuropsychological practice and research is individual (unprompted). To the extent that testing context ignores the (potentially culturally salient) role of help seeking during problem solving, this may be a source of test performance non-equivalence between African American and White elders (Calasanti, 1996). Such cultural differences may even be implicated in higher rates of cognitive impairment reported in African American elderly (e.g., Manly, 2006; i.e., functional assessment fails to capture the real world, and potentially more social, context of problem solving for older African Americans). Prompting is naturally built in to some neuropsychological tests (e.g., phonemic cues on the Boston Naming Test or cued recall of the California Verbal Learning Test-II; Delis, Kramer, Kaplan, & Ober, 2000; Kaplan, Goodglass, & Weintraub, 1983) and is used to test the limits using a process approach to assessment. One possible implication would be to more commonly incorporate both prompted and unprompted assessments in regular testing practice, both to note whether participants experience a benefit from prompting, and also to more fairly capture the real world social context in which prompting occurs.

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Figure 1.

Age trajectories of prompted and unprompted Observed Task of Daily Living (OTDL) performance by race.

Note: The Y-axis shows the model-implied values of the OTDL variable in standardised (Z-score) metric. This figure illustrates that the linear and quadratic age effects show more rapid effects of age at higher ages, prompting boosts the performance of both White and African American participants, and also reduces the more rapid (quadratic) trend, particularly in African Americans.

Table 1

Demographic and OTDL variables at baseline.

	All participants (n = 2779)	African American (n = 727)	White (n = 2052)	Cohen's d
Age (years)	74.12 (5.91)	72.64 (5.32)	74.65 (6.02) *	0.344
Education (years)	13.52 (2.70)	12.95 (2.67)	13.67 (3.28) *	0.23
Female (%)	75.92%	83.38%	73.27% *	r = .104
CES-D	5.24 (5.15)	5.16 (4.76)	5.26 (5.28)	0.019
SF-36 General Health	68.97 (19.26)	66.93 (19.23)	69.68 (19.22) *	0.143
Vision	73.09 (11.49)	74.83 (11.05)	72.48 (11.58) *	0.205
Vocabulary	12.38 (3.94)	9.75 (4.19)	13.31 (3.39) *	0.985
MMSE	27.31 (2.01)	26.59 (2.07)	27.56 (1.93)	0.493
OTDL Unprompted score	16.99 (4.62)	15.65 (4.98)	17.46 (4.39) *	0.398
OTDL Prompted score	20.51 (3.82)	20.09 (4.16)	20.66 (3.67) *	0.15
OTDL number of prompts	4.82 (3.51)	6.16 (3.91)	4.35 (3.23) *	0.529

Note: Cohen's d for t-tests and r-value for the chi-square test represent the effect size for the difference between African American and White participants.

CES-D = Center for Epidemiological Studies-Depression-12 item scale; SF-36 General Health = MOS Short Form Health Survey, General Health subscale; MMSE = Mini Mental State Exam.

* p < .05 differences between African American and White participants.

Table 2

Examples of items and corresponding prompts from the Observed Tasks of Daily Living.

Sample 1—Balancing checking account	
Stimuli	The tester presents a check ledger and pencil
Instructions	The tester presents an index card with the following instructions: “The person who holds this checking account received a check for \$262.00 for deposit and also paid a utility bill for the amount of \$61.45. Please balance the checkbook for this person.”
Correct steps	(1) Examine the check ledger. (2) Write \$262 in the Credit/Deposit column. (3) Write \$61.45 in the Debit/Withdrawal column. (The order of steps 2 and 3 can be reversed.) (4) Add the deposit and subtract the withdrawal to come up with a final balance.
Prompt:	“Which amount is deposited?”“Which amount is paid out?”
Sample 2—Loading a pill reminder	
Stimuli	The tester presents a fictitious person's (named Laura Latrisse) medication chart and the medicine bottles for all six medications listed on the chart to the participant. On the chart
Instructions	The tester then presents a 4?×?6 in (10.2?×?15.2 cm) index card with the following instructions: “Mrs. Latrisse uses this pill reminder so that she does not forget to take her pills. Please fill this reminder with the three drugs marked on the medication chart.”
Correct steps	(1) Thalitone all days morning(2) Zestril all days morning
Prompt	“Please look at the medication bottles.”“Is there any information that can help you fill the pill reminder?”
Sample 3—Checking itemised calls on a phone bill	
Stimuli	The tester presents a complete monthly phone bill (nine pages) to the participant. All pages are in numerical order and clearly labelled.
Instructions	The tester then presents a 4?×?6 in (10.2?×?15.2 cm) index card with the following instruction: “According to this bill
Correct steps	(1) Goes to page 5 of bill(2) June 7(3) June 14(4) June 26(5) June 28
Prompt	“Can you see any information on this bill that tells you when and where calls were made?”

To protect test security, these are example items that are similar to, but not in the current version of, the OTDL.

Table 3

Estimates for the full longitudinal model of prompted vs. unprompted OTDL performance by race.

	Estimate (β)	SE	df	t	p	r
Level 1 (Within subjects effects)						
Age	-0.09	0.01	1834.41	-8.615	<.001	0.197
Age2	-0.06	0.007	774.23	-8.377	<.001	0.288
Prompting status	0.32	0.004	10,413.65	72.846	<.001	0.581
Age $\times$ Prompting	0.06	0.004	11004.52	16.239	<.001	0.153
Age2 $\times$ Prompting	0.01	0.003	10984.12	4.14	<.001	0.039
Age $\times$ African American	-0.05	0.01	1606.35	-4.898	<.001	0.121
Age2 $\times$ African American	-0.04	0.008	860.63	-5.134	<.001	0.172
Prompting $\times$ African American	0.09	0.005	10,536.57	19.939	<.001	0.191
Age $\times$ Prompting $\times$ African American	0.03	0.003	11164.23	8.787	<.001	0.083
Age2 $\times$ Prompting $\times$ African American	0.01	0.003	11179.81	2.893	0.004	0.027
Level 2 (Between subjects effects)						
African American	0.01	0.015	2665.54	0.966	0.334	0.019
Intercept	0.04	0.038	2383.75	1.046	0.296	0.021
Random effects	Estimate	SE	Wald Z	p		
Diagonal (Residual)	0.42	0.006	71.81	<.001		
ARI ρ	0.32	0.009	36.15	<.001		
Intercept	0.16	0.008	18.93	<.001		
Age	0.04	0.008	5.05	<.001		
Age2	0	0.002	0.2	0.842		

ARI ρ = average between occasion covariance. Estimates are adjusted for covariates that predicted participant attrition at any time of measurement: education, gender, BL vision, BL depressive symptoms (CES-D), BL SF-36 General Health, BL Vocabulary, BL PIC Internal Locus of Control, BL PIC Powerful Others Locus of Control, BL PIC Achievement Motivation, and BL MMSE. Following Hedeker and Gibbons (1997), missing data status was allowed to interact with all main effects and interactions shown above. Results above are weighted, pooled results combining model results for participants who did and did not drop out. Estimates are also adjusted for study site (indicating in which of six field sites data collection occurred), an indicator of when in time data collection occurred (replicate), and cognitive intervention group membership. There were no hypotheses about site, replicate, and intervention group, but they constituted a substantial identifiable source of participant variation. A table illustrating covariate effects is available upon request from the authors.