Leisure Activity Engagement, Spirituality, and Cognitive Function in Middle-Aged and Older Black Adults

Angie L. Sardina[1], PhD, Jasmine Sampson[1], BS, Alexa C. Allan[2], MA, Lena G. Simon[1], MA, Marsha Hampton-Jarmon[1], BA, Roland J. Thorpe, Jr.[3], PhD, Lesley A. Ross[1], PhD, Jason Ashe[4,5], PhD, Alan B. Zonderman[4], PhD, Michele K. Evans[4], MD, & Alyssa A. Gamaldo[1], PhD

[1]Institute for Engaged Aging, Department of Psychology, Clemson University, Seneca, South Carolina, United States

[2]Department of Human Development and Family Studies, Pennsylvania State University, State College, Pennsylvania, United States

[3]Johns Hopkins Alzheimer's Disease Resource Center for Minority Aging Research, Johns Hopkins Bloomberg School of Public Health, Baltimore, Maryland, United States

[4]Laboratory of Epidemiology and Population Sciences, National Institute on Aging, Bethesda, Maryland, United States

[5]Department of Religion, Emory University, Atlanta, Georgia, United States

Corresponding author: Angie L. Sardina. E-mail: asardin@clemson.edu

. Published by Oxford University Press on behalf of the Gerontological Society of America. 2026

Abstract

Objectives: Leisure activity engagement (LAE) and spirituality are independently associated with cognition and may serve as protective cognitive factors with age. However, the dynamic interaction of LAE and spirituality on subjective (e.g., memory complaints) and objective cognitive function (e.g., neuropsychological battery) within Black adults has not been explored. Thus, this study examined the relationships between LAE and subjective and objective cognitive function, and whether these relationships varied by spirituality levels in middle-aged and older Black adults.

Method: Black adults (N=165; M_{age}=62) from the Healthy Aging in Neighborhoods of Diversity Across the Life Span–Sleep Sub-Study (Wave-1) were included. LAE comprised the average total number of self-reported LAE across a 7-day consecutive period. Spirituality reflected the sum score on the Spiritual Transcendence Scale. Cognitive measures included subjective (e.g., memory complaints) and objective cognitive indices (e.g., attention, memory/learning, language, processing speed, executive function). Multivariable regressions were conducted to examine the relationship between LAE and each cognitive variable before and after adjusting for covariates. Analyses also included interactions between LAE and spirituality on cognitive functions.

Results: Participants averaged seven LAE per day on consecutive days. Greater LAE was associated with better performance in processing speed, executive function, and memory/learning (ps<.05). Additionally, a greater number of LAE was associated with better language/naming, particularly among individuals with higher levels of spirituality (p=.039).

Discussion: These findings provide preliminary support for the development of targeted programs coupling spiritual and leisure components to promote language cognitive domain among Black adults.

Keywords: Cognition, Religiosity, Memory Complaints

Background

Consistent physical, cognitive, and social leisure-based activity engagement (i.e., activities freely chosen for enjoyment and/or personal goals outside of work or related obligations; Sardina, Mahlobo, et al., 2022; Sardina, Tan, et al., 2022) are related to cognitive health, with leisure activity engagement (LAE) eliciting differential and positive impacts across cognition over time (e.g., global mental status, language, executive function, and episodic memory; Wang et al., 2012). While the protective effects of LAE are previously documented, limited research has examined LAE in relation to both subjective (e.g., memory complaints) and objective (e.g., neuropsychological battery) cognition, particularly within Black adults. Specifically, subjective cognitive complaints are essential to explore as they are typically the first indicator prompting medical attention and more formal diagnostics, and nearly 10% of Black adults report cognitive complaints as early as age 45 (Alzheimer's Association, 2025).

Racial Disparities in LAE

Black adults tend to experience greater LAE constraints, which may be attributed to complex interactions across biopsychosocial and contextual factors (residing in neighborhoods of concentrated poverty and experiencing low access to community leisure activities; Sardina, Tan, et al., 2022). The available literature in this respective area is limited to interindividual group comparisons (e.g., Black vs. other racial/ethnic groups; Peterson et al., 2020), and/or cross-sectional/longitudinal designs (Wang et al., 2012; Zhang et al., 2020), which do not comprehensively capture within-person variation in daily LAE patterns and/or the extent of LAE across each day, which may drive short and long-term health-related outcomes (Armstrong et al., 2022; Sliwinski, 2008), particularly within racial groups (Sardina, Mahlobo, et al., 2022). Thus,

utilizing aggregated daily-level LAE facilitates a richer understanding of overall LAE patterns and recent typical behavior, as it is more likely to identify daily experiences that are often masked within cross-sectional and longitudinal research (Sliwinski, 2008). This methodological approach also minimizes long-term recall biases as one's experiences are assessed in real-time, within one's natural environment (Cain et al., 2009). Thus, the current study aimed to address existing gaps by using the average aggregated LAE over seven consecutive days (burst measurement average; Sardina, Mahlobo, et al., 2022) within Black adults.

Spirituality, Leisure, and Cognitive Function

Prior research has identified numerous mechanisms potentially explaining the relationships between LAE and cognition (e.g., education quantity/quality, social connectedness, and/or physical/cognitive stimulation during LAE; Sardina, Mahlobo, et al., 2022; Yang et al., 2022); however, few studies have explored the interconnections between LAE, cognition, and spirituality among older Black adults (Armstrong & Crowther, 2002). Spirituality reflects one's journey to develop personal meaning and connection in life, which elicits spiritual transcendence (i.e., expanding beyond one's daily reality to focus on something larger and greater than oneself; Mishra et al., 2017; Piedmont, 2001). Often conflated with religiosity (i.e., formal development and practice of one's faith or religion through institutions and prayer supporting core religious beliefs; Emblen, 1992), spirituality reflects a broader sense of personal meaning of one's daily experiences and their surrounding world (e.g., being in nature, strong sense of connection with others; Piedmont, 2001), which may elicit affective responses associated with individual behavior and experiences (e.g., LAE; Mishra et al., 2017).

Spirituality and Religion Among Black Americans

Thus, religion and spirituality are not generally considered interchangeable (Chatters et al., 2008; Taylor & Chatters, 2010). For example, the decline in religiousness (Smith et al., 2025) connects with the spike in self-reported spirituality (Alper et al., 2023) across most American adults, which supports the unique distinctions between these two constructs. However, for many Black adults, there is an intimate overlap, whereby most would agree that they are "both religious and spiritual" (Chatters et al., 2008; Taylor & Chatters, 2010). For Black adults, spirituality and religiosity are integral for emotional support and coping for sociocultural, psychosocial, and contextual adversities (Coats, 2017). Specifically, the Black Church is regarded for its role in shaping meaning-making and coping strategies (e.g., management of stressful situations) and establishing and fostering social support networks for many Black individuals. Born out of chattel slavery, as a blended religion comprising African and Christian values, the Black Church as a social and historical institution has "no contender" to any other community enterprise or system-wide entity for Black Americans (Lincoln & Mamiya, 1990). Within it, Black people have grounded their hope for racial equity in a faith tradition echoing liberation, freedom, positive wellbeing, and personal piety.

Additionally, the Black Church has also served as a conduit for health-promoting messages (i.e., encouraging physical activity participation to avoid sedentary lifestyles and poorer cardiovascular health; Williams & Cousin, 2021) received by congregants during weekly religious service attendance (Taylor et al., 1996). Indeed, Black Christians more readily engage with the Bible as their sacred text (Mohamed et al., 2021), which comprises multiple scriptural references to taking care of their bodies and minds. Thus, it is possible that those who claim stronger religious sentiments and spirituality also view LAE as opportunities to disengage worldly troubles and refocus on personal needs, desires, and joyous times.

While existing studies have explored the relationships between religiosity and cognitive health outcomes across racial/ethnic groups (Nelson et al., 2023; Sauerteig-Rolston et al., 2025); less have explored the broader concept of spirituality and its interaction with LAE on subjective and objective cognitive function among Black adults. Independently, spirituality has been positively associated with cognitive outcomes; yet the potential interplay between LAE and spirituality on cognitive function has not been explored. This is meaningful given that LAE is posited to initiate the discovery and practice of spirituality and spiritual transcendence (Schmidt & Little, 2007), thereby warranting further examination. Thus, this study examined (1) the association between LAE and subjective and objective cognitive function in older Black Adults; and (2) whether associations between LAE and cognitive function varied by level of spirituality.

Methods

Participants

This study included data from the Healthy Aging in Neighborhoods of Diversity Across the Life Span Sleep (HANDLSleep) sub-study. HANDLSleep is an ongoing four-year longitudinal study (2021-2026), conducted in Baltimore, MD, which explores biopsychosocial factors related to sleep and cognitive functioning among adults aged 55+. This project only used Wave 1 data (collected October 2022-August 2024). HANDLSleep participants (N=165) who self-identified as Black/African American were included in the analyses.

Procedures

HANDLSleep participants completed mobile phone surveys (e.g., LAE) 4-times/day (e.g., morning, early and late afternoon, and evening) over 7-days. Participants reported LAE in the evening survey. Following the completion of all mobile phone surveys (~day 8), participants completed subjective cognitive measures and a 60-minute remote (Zoom) neuropsychological

battery that assessed cognition (e.g., memory, processing speed, language, and attention), utilizing validated methods (Terje et al., 2003). Additionally, the field interviewer assessed psychosocial and health factors related to cognitive functioning (e.g., spirituality, depression, self-reported health conditions).

Measures

LAE

LAE data were collected daily (7-days) via self-report on a mobile device application. Participants selected from 57 leisure activities (e.g., board games, reading, sewing, dancing, watching TV, volunteering, playing cards, and shopping), of which they engaged over a 24-hour period (Sardina, Mahlobo, et al., 2022 incorporates a comprehensive activities list). Healthcare activities (e.g., visiting the dentist) and chores (e.g., cleaning) were excluded as they may be obligatory and not necessarily chosen for enjoyment, relaxation, and/or individual fulfillment (Sardina, Mahlobo, et al., 2022; Sardina, Tan, et al., 2022). An LAE sum score was calculated for each participant for all 7-days. Daily sum scores were averaged to comprise one LAE score, which is consistent with previous research documenting significant associations between LAE and its explanatory variables (Sardina, Mahlobo, et al., 2022; Sardina, Tan, et al., 2022).

Cognitive Function

Survey assessments evaluated cognitive functioning (~Day 8) with a common standardized neuropsychological battery of objective cognitive tests assessing seven cognitive domains. The battery consists of: (1) Mental Status (Montreal Cognitive Assessment; MoCA; Nasreddine et al., 2005); (2) Memory and Learning (Benton Sivan, 1991); Auditory-Verbal Learning Test (AVLT; Rey, 1941); (3) Attention (Wechsler Adult Intelligence Scale–Revised, (WAIS-R); Wechsler, 1997a), Digit Span Forward and Backward (Wechsler, 1955), and Trails

Making Test–Part A (TMT-A; Reitan, 1958)); (4) Processing Speed (Digit Symbol Substitution Test (Wechsler, 1955), Number Comparison (Ekstrom et al., 1976), and TMT-A)); (5) Visuospatial Skills (Clock Drawing Test; Manos & Wu, 1994); (6) Language and Naming (Boston Naming Test; Goodglass & Kaplan, 1983); and (7) Executive Functioning Trails Making Test–Part B (TMT-B; (Reitan, 1958) and verbal fluency (Benton & Hamsher, 1989; Goodglass & Kaplan, 1983)). Subjective Cognition comprised cognitive complaints (Supplementary Table 1 provides measurement descriptions and scoring).

Spirituality

Spirituality was assessed during the Zoom interview portion using Piedmont's Spirituality Transcendence Scale (STS; Piedmont, 2001). Item examples include "I feel that on a higher level all of us share a common bond," and "My prayers or meditations provide me with a sense of emotional support." Item responses comprised a five-point Likert-type scale ranging from 1 (strongly agree) to 5 (strongly disagree). Responses to negatively scored items were reversed coded, and an STS sum score was calculated (higher scores=greater level of spiritual transcendence).

Covariates

Covariates included age (years) and sex (male/female). Poverty status was defined as (0) below (<125%) or (1) above (≥ 1 25%) poverty levels (U.S. Department of Health and Human Services, 2004). The Wide Range Achievement Test, 3rd Edition (WRAT-3) assessed education quality (Snelbaker et al., 2001). Self-reported health conditions were summed and comprised health comorbidities (i.e., heart attack, hypertension, diabetes, stroke, and renal disease; possible range=0-5). The 9-item Patient Health Questionnaire (PHQ-9; Kroencke et al., 2001) assessed

depression. Scores ranging from 0 ("Not at all") to 3 ("Nearly Every day"; higher total scores=greater depression severity).

Statistical Analysis

Descriptives and frequencies were calculated for all variables. Two multiple linear regression models were conducted to explore the association between LAE and cognitive function (Aim 1). Model 1 was an unadjusted model examining relationships between LAE and cognitive domains. Model 2 adjusted for covariates. Two additional models were conducted to examine Aim 2. Model 3 adjusted for the main effect of spirituality. Model 4 tested two-way interactions between LAE and spirituality. Given spirituality may overlap with LAE (e.g., engaging in spiritual practices like yoga), we tested for multicollinearity by examining the relationship between LAE and spirituality via Pearson correlation prior to running Model 1, and with variance inflation factors (VIF) and tolerance in Model 4. All variables were group-mean-centered for ease of output interpretation. IBM SPSS Statistics version 29.0 was used to conduct analyses.

Results

Participant descriptive characteristics and cognitive function scores are reported in Table 1. The sample was predominantly late middle-aged to early older adulthood, female, and above poverty status. Over seven days, participants averaged 7 LAE/day. A weak, but significant, association was identified between LAE daily average and spirituality sum score (r=-.24, p=.003), which falls below the correlation coefficient multicollinearity cutoff of ≥ . (Berry & Feldman, 1985).

LAE and Cognitive Function (Aim 1)

Higher LAE was positively associated with better performance on global mental status (p=.005; MoCA), processing speed (p=.030; Number Comparison), and executive function (p=.020; Verbal Fluency-Letters) after adjusting for covariates (see Table 2 for unstandardized coefficients and standard errors for significant findings between LAE and cognitive domains). Non-significant associations between LAE and the remaining cognitive tests are available in Supplementary Table 2.

LAE and Spirituality on Cognition (Aim 2)

A significant two-way interaction was observed between LAE and spirituality (β=.16, p=.039). Simple slopes for the interaction were estimated using Preacher's compositional tool (Preacher et al., 2006). Among individuals who reported high spirituality (2 standard deviations above the sample mean), higher LAE was significantly associated with better language/naming (β=.16, p=.04; Figure 1). Multicollinearity was not a concern as tolerance values were above .10 (i.e., LAE=0.91, spirituality=0.78, LAE×spirituality interaction=0.87), and VIFs were below 5 (i.e., LAE=1.09, spirituality=1.29, and LAE×spirituality=1.15) suggesting no multicollinearity was observed (Neter et al., 1996). No significant interactions were observed between LAE, spirituality, and other cognitive functions.

Discussion

This study examined the associations between LAE and cognitive function and whether this relationship varied by spirituality in Black adults. Participants reported more than double the daily LAE (i.e., seven) than those in Sardina, Mahlobo, et al. (2022), who averaged three LAE/day. It is possible that the larger sample size included within the current study, coupled with the inclusion of computer-based gaming and activities (e.g., social media), may have driven higher average LAE. After adjusting for covariates, a higher average LAE across 7 days was

significantly associated with better performance on cognitive tests of global mental status, executive function, and processing speed. Furthermore, more LAE was significantly associated with better language/naming domain (spontaneous responses) performance, particularly among those with higher spirituality.

LAE and Cognitive Function

These findings are consistent with prior research documenting relationships between LAE and cognitive function (Wang et al., 2012). This study expands upon prior research (Sardina, Mahlobo, et al., 2022; Zhang et al., 2020) given its inclusion of middle-aged and older Black adults using a 7-day average LAE total, which differs from typical cross-sectional (Zhang et al., 2020) and longitudinal approaches (over longer timeframes vs measurement bursts; Wang et al., 2012). Although the study participants in Sardina, Mahlobo, et al. (2022) reported three LAE/day, similarities existed in the types of LAE reported, mean age of the samples (M_{age}=62, current study; and M_{age}=65), and data collection approaches. The average LAE differences between the two studies may be attributed to differing sample sizes; however, future research should continue to explore the mechanisms and constraints to daily LAE in Black adults, as this may inform the development of meaningful strategies to promote greater LAE in homogeneous groups.

Interestingly, we did not observe significant findings with subjective cognition, which may be attributed to lower average cognitive complaints (M=2, SD=1.72) reported by participants, and/or the younger sample age. Furthermore, higher LAE has been linked to increasing cognitive reserve (Stern et al., 2020) via engagement in novel and/or stimulating activities that may elicit neuroplasticity, consistent with the Scaffolding Theory on Aging and Cognition (Goh & Park, 2009). Furthermore, LAE often elicits positive mental health, increased

positive affect, reduced negative affect (Sardina, Mahlobo, et al., 2022), and facilitate opportunities for social interaction/engagement, which have been associated with reduced cognitive complaints (Guo et al., 2025), and better cognitive function, reduced cognitive decline, and lower dementia risk over time (Duffner et al., 2022).

LAE, Spirituality, and Cognitive Function

We found that spirituality significantly moderates the relationship between LAE and language (i.e., spontaneous naming), a novel finding that may reflect dynamic interconnections between leisure and spirituality. Indeed, LAE and spirituality are philosophically and historically intertwined, as LAE facilitates greater opportunities to explore and discover the essence of "self", life purpose and meaning, and sense of connection, which spirituality also embodies (Schmidt & Little, 2007). Hence, LAE engagement may be the vehicle for the actualization of spiritual practices. Through freedom to choose personally meaningful leisure activities, individuals can explore their potential and nurture sacralization (i.e., leisure's ability to nurture the spiritual dimension of one's life; Schmidt & Little, 2007). Like LAE, spirituality was previously independently associated with, and served as a protective factor for, cognitive function (Hosseini et al., 2019), particularly in older Black adults (Herren et al., 2019). Within the current study, we observed significant interactions between LAE and spirituality only in the language domain. While it is unclear why people with more LAE and higher spirituality performed better only on the spontaneous naming portion of the language tests, one potential explanation for this association may be attributable to more opportunities for social engagement/interactions within LAE and/or spirituality practices (e.g., recitation during affirmations; Taylor & Chatters, 2010; Wang et al., 2012). Alternatively, LAE may facilitate opportunities to expose one to additional forms of spiritual media (e.g., meditation

apps/podcasts), expand opportunities for mindfulness and reflection, and elicit internal and external readings and recitations that may reinforce existing language/naming and vocabulary skills and promote language-related pathways in the brain (Schmidt & Little, 2007). This study lays the groundwork for additional qualitative and mixed-methods research to uncover the interrelationships across these psychosocial factors, LAE, and cognition.

Limitations and Future Directions

Although the study's findings are novel and expand upon existing literature, some limitations should be noted. Indeed, given that the sample was small, predominantly female, and resided within similar geographical contexts, generalizability may be limited. Additionally, the 7-day window of data collection may be limited by unique individual circumstances occurring throughout a respective week (e.g., traveling, illness, seasonal weather), which may hinder findings pertaining to the extent of LAE at the daily level or across the week. Thus, future studies incorporating similar methodological designs should aim to capture contextual data and incorporate as covariates for increased validity (e.g., daily items assessing health status and/or factors influencing LAE engagement (e.g., poor transportation access, financial and/or time constraints, poor weather, and/or holidays celebrated).

Conclusion

We observed that LAE is significantly associated with better performance on neuropsychological measures of global mental status, processing speed, and executive functioning. Additionally, more LAE and higher spirituality were associated with better language domain performance (e.g., spontaneous response) in middle-aged and older Black adults. These findings elucidate potential pathways for leisure and gerontological researchers and clinical practitioners to consider person-centered and targeted strategies (e.g., community-based

programs) that couple spiritual and leisure components to promote the language cognitive domain within this population.

Funding

This work was supported by the National Institute on Aging's Intramural Research Program (Z01–AG000194 – M.K. Evans & A.B. Zonderman) and the National Institute on Aging (UF1 AG072619 and UF1 AG072619-S1—A.A. Gamaldo and A.L. Sardina), and effort partially supported by South Carolina Alzheimer's Disease Research Center (SC-ADRC). Dr. Thorpe was supported by the National Institute on Aging (P30AG059298). Preparation of this report was supported in part by T32 AG049676 (A.C. Allan). This manuscript is the result of funding in whole or in part by the National Institutes of Health (NIH). It is subject to the NIH Public Access Policy. Through acceptance of this federal funding, NIH has been given the right to make this manuscript publicly available in PubMed Central upon the Official Date of Publication, as defined by NIH (NOT-OD-25-101).

Conflict of Interest

The authors have indicated no financial conflicts of interest.

Author Contributions

A.L. Sardina: conceptualization (equal), writing–original draft preparation (lead), table and figure creation/revision (lead), formal analysis (equal), project administration (lead). **J. Sampson**: conceptualization (equal), writing–original draft preparation (equal), writing–review/editing (supporting), formal analysis (equal), visualization (equal). **A.C. Allan**: data curation (supporting), formal analysis (supporting), writing–review/editing (equal). **L.G. Simon**: writing–original draft (supporting), writing–review/editing (equal). **M. Hampton-Jarmin:** project administration (equal). **R.J. Thorpe, Jr.**: funding acquisition (supporting), writing–

review/editing (equal), supervision (supporting). **L.A. Ross:** funding acquisition (supporting), writing–review/editing (equal), supervision (supporting). **J. Ashe:** writing–review/editing (equal), validation (supporting). **A.B. Zonderman:** funding acquisition (supporting), supervision (supporting), writing–review/editing (equal), validation (equal). **M.K. Evans:** funding acquisition (supporting), supervision (supporting), writing–review/editing (equal), validation (equal). **A.A. Gamaldo:** conceptualization (lead), data curation (equal), formal analysis (equal), funding acquisition (lead), methodology (equal), resources (lead), supervision (lead), validation (lead), writing–review/editing (equal).

Acknowledgements

We would like to thank the participants in the study. Data, analytic code, and other study materials will be made available by request.

References

Alper, B. A., Rotolo, M., Trevington, P., Nortey, J., & Kallo, A. (2023). *Spirituality Among Americans*. https://www.pewresearch.org/wp-content/uploads/sites/20/2023/12/PR_2023.12.7_spirituality_REPORT.pdf

Alzheimer's Association. (2025). *2025 Alzheimer's Disease Facts and Figures Special Report: American Perspectives on Early Detection of Alzheimer's Disease in the Era of Treatment*. Alzheimer's Association. https://www.alz.org/getmedia/ef8f48f9-ad36-48ea-87f9-b74034635c1e/alzheimers-facts-and-figures.pdf

Armstrong, N. M., Tom, S. E., Harrati, A., Casaletto, K., Pa, J., Arce Rentería, M., Gu, Y., Rajan, K. B., Schupf, N., & Fieo, R. (2022). Longitudinal relationship of leisure activity engagement with cognitive performance among non-demented, community-dwelling older adults. *The Gerontologist*, *62*(3), 352-363. https://doi.org/10.1093/geront/gnab046

Armstrong, T. D., & Crowther, M. R. (2002). Spirituality among older African Americans. *Journal of Adult Development*, *9*, 3-12. https://doi.org/10.1023/A:1013821116396

Benton, A. L., & Hamsher, K. D. (1989). *Multilingual Aphasia Examination* (3rd ed.). AJA Associates.

Benton Sivan, A. (1991). *Benton Visual Retention Test* (5th ed.). APA Psyctests. https://psycnet.apa.org/doi/10.1037/t14985-000

Berry, W. D., & Feldman, S. (1985). *Multiple Regression in Practice* (1st ed.). SAGE publications.

Cain, A. E., Depp, C. A., & Jeste, D. V. (2009). Ecological momentary assessment in aging research: A critical review. *Journal of Psychiatric Research*, *43*(11), 987-996. https://doi.org/10.1016/j.jpsychires.2009.01.014

Chatters, L. M., Taylor, R. J., Bullard, K. M., & Jackson, J. S. (2008). Spirituality and subjective religiosity among African Americans, Caribbean Blacks and Non-Hispanic Whites. *Journal for the Scientific Study of Religion*, *47*(4), 725-737. https://doi.org/10.1111/j.1468-5906.2008.00437.x

Coats, H. L. (2017). African American elders' psychological-social-spiritual cultural experiences across serious illness: An integrative literature review through a palliative care lens. *Annals of palliative medicine*, *6*(3), 1-23. https://doi.org/10.21037/apm.2017.03.09

Duffner, L. A., Deckers, K., Cadar, D., Steptoe, A., De Vugt, M., & Köhler, S. (2022). The role of cognitive and social leisure activities in dementia risk: Assessing longitudinal associations of modifiable and non-modifiable risk factors. *Epidemiology and Psychiatric Sciences*, *31*, 1-10. https://doi.org/10.1017/S2045796022000038

Ekstrom, R. B., French, J. W., Harman, H., & Derman, D. (1976). Kit of factor-referenced cognitive tests. 1976 (Rev. Ed.). *Princeton, NJ: Educational Testing Service*.

Emblen, J. D. (1992). Religion and spirituality defined according to current use in nursing literature. *Journal of Professional Nursing*, *8*(1), 41-47. https://doi.org/10.1016/8755-7223(92)90116-G

Goh, J. O., & Park, D. C. (2009). Neuroplasticity and cognitive aging: The scaffolding theory of aging and cognition. *Restorative Neurology and Neuroscience*, *27*(5), 391-403. https://doi.org/10.3233/RNN-2009-0493

Goodglass, H., & Kaplan, E. (1983). *Boston Diagnostic Aphasia Examination (BDAE)*. Lea & Febiger.

Guo, W., Cheng, G., Li, W., & Wang, B. (2025). Association between leisure activities and subjective memory complaints in older adults: A cross-sectional study. *Geriatric Nursing*, *64*, 1-7. https://doi.org/10.1016/j.gerinurse.2025.103387

Herren, O. M., Burris, S. E., Levy, S. A., Kirk, K., Banks, K. S., Jones, V. L., Beard, B., Mwendwa, D. T., Callender, C. O., & Campbell, A. L. (2019). Influence of spirituality on depression-induced inflammation and executive functioning in a community sample of African Americans. *Ethnicity and Disease*, *29*(2), 267-276. https://doi.org/10.18865/ed.29.2.267

Hosseini, S., Chaurasia, A., & Oremus, M. (2019). The effect of religion and spirituality on cognitive function: A systematic review. *The Gerontologist*, *59*(2), e76-e85. https://doi.org/10.1093/geront/gnx024

Kroencke, K., Spitzer, R. L., & Williams, J. B. W. (2001). The PHQ-9: Validity of a brief depression severity measure. *Journal of General Internal Medicine*, *16*(9), 606-613. https://doi.org/10.1046/j.1525-1497.2001.016009606.x

Lincoln, C. E., & Mamiya, L. H. (1990). *The Black Church in the African American Experience* (1st ed.). Duke University Press.

Manos, P. J., & Wu, R. (1994). The ten point clock test: A quick screen and grading method for cognitive impairment in medical and surgical patients. *The International Journal of Psychiatry in Medicine*, *24*(3), 229-244. https://doi.org/10.2190/5A0F-936P-VG8N-0F5R

Mishra, S. K., Togneri, E., Tripathi, B., & Trikamji, B. (2017). Spirituality and religiosity and its role in health and diseases. *Journal of Religion and Health*, *56*, 1282-1301. https://doi.org/10.1007/s10943-015-0100-z

Mohamed, B., Cox, K., Diamant, J., & Gecewicz, C. (2021). *Faith among Black Americans: Most Black worshippers attend predominantly Black congregations and see a role for religion in fighting racial injustice, but generational patterns are changing*. Pew Research Center. https://www.pewresearch.org/wp-content/uploads/sites/20/2021/02/PF_02.16.21_Black.religion.report.pdf

Nasreddine, Z. S., Phillips, N. A., Bédirian, V., Charbonneau, S., Whitehead, V., Collin, I., Cummings, J. L., & Chertkow, H. (2005). The Montreal Cognitive Assessment, MoCA: A brief screening tool for mild cognitive impairment. *Journal of the American Geriatrics Society*, *53*(4), 695-699. https://doi.org/10.1111/j.1532-5415.2005.53221.x

Nelson, I. S., Kezios, K., Elbejjani, M., Lu, P., Yaffe, K., & Zeki Al Hazzouri, A. (2023). Associations of religious service attendance with cognitive function in midlife: Findings

from the CARDIA study. *The Journals of Gerontology: Series B, Psychological and Social Sciences*, *78*(4), 684-694. https://doi.org/10.1093/geronb/gbac165

Neter, J., Kutner, M. H., Nachtsheim, C. J., & Wasserman, W. (1996). *Applied Linear Statistical Models* (4th ed.). McGraw Hill/Irwin.

Peterson, R. L., Gilsanz, P., George, K. M., Ackley, S., Glymour, M. M., Mungas, D. M., & Whitmer, R. A. (2020). Differences in association of leisure time activities and cognition in a racially/ethnically diverse cohort of older adults: Findings from the KHANDLE study. *Alzheimer's & Dementia*, *6*(1), 1-9. https://doi.org/10.1002/trc2.12047

Piedmont, R. L. (2001). Spiritual transcendence and the scientific study of spirituality. *Journal of Rehabilitation*, *67*(1), 4-14.

Preacher, K. J., Curran, P. J., & Bauer, D. J. (2006). Computational tools for probing interactions in multiple linear regression, multilevel modeling, and latent curve analysis. *Journal of Educational and Behavioral Statistics*, *31*(4), 437-448. https://doi.org/10.3102/10769986031004437

Reitan, R. M. (1958). Validity of the Trail Making Test as an indicator of organic brain damage. *Perceptual and Motor Skills*, *8*(3), 271-276. https://doi.org/10.2466/pms.1958.8.3.271

Rey, A. (1941). Psychological examination of traumatic encephalopathy. *Archives de Psychologie*, *28*, 286-340.

Sardina, A. L., Mahlobo, C. T., Gamaldo, A. A., Allaire, J. C., & Whitfield, K. E. (2022). Exploring the association between affect and leisure activity engagement in Black adults. *The Journals of Gerontology: Series B*, *12*(22), 2157-2169. https://doi.org/10.1093/geronb/gbac084

Sardina, A. L., Tan, S. C., Perry, J., & Gamaldo, A. A. (2022). A preliminary study of the correlates of leisure interests and constraints among adults residing in public housing. *Journal of Aging and Environment*, *36*(2), 1-21. https://doi.org/10.1080/26892618.2021.1887041

Sauerteig-Rolston, M. R., Barnes, L. L., Thomas, P. A., Angel, J. L., & Ferraro, K. F. (2025). Religious involvement and cognitive function among White, Black, and Hispanic older adults. *Research on Aging*, *47*(2), 116-127. https://doi.org/ 10.1177/01640275241269949

Schmidt, C., & Little, D. E. (2007). Qualitative insights into leisure as a spiritual experience. *Journal of Leisure Research*, *39*(2), 222-247. https://doi.org/10.1080/00222216.2007.11950106

Sliwinski, M. J. (2008). Measurement-burst designs for social health research. *Social and Personality Psychology Compass*, *2*(1), 245-261. https://doi.org/10.1111/j.1751-9004.2007.00043.x

Smith, G. W., Cooperman, A., Alper, B. A., Mohamed, B., Rotolo, M., Tevington, P., Nortey, J., Kallo, A., Diamant, J., & Fahmy, D. (2025). Decline of Christianity in the US has Slowed, May Have Leveled Off. *Communications*, *202*, 1-393. https://search.issuelab.org/resources/45020/45020.pdf

Snelbaker, A. J., Wilkinson, G. S., Robertson, G. J., & Glutting, J. J. (2001). Wide Range Achievement Test 3 (wrat3). In W. I. Dorfman & M. Hersen (Eds.), *Understanding Psychological Assessment* (pp. 259-274). Springer US. https://doi.org/10.1007/978-1-4615-1185-4_13

Stern, Y., Arenaza-Urquijo, E. M., Bartrés-Faz, D., Belleville, S., Cantilon, M., Chetelat, G., Ewers, M., Franzmeier, N., Kempermann, G., & Kremen, W. S. (2020). Whitepaper:

Defining and investigating cognitive reserve, brain reserve, and brain maintenance. *Alzheimer's & Dementia*, *16*(9), 1305-1311. https://doi.org/10.1016/j.jalz.2018.07.219

Taylor, R. J., & Chatters, L. M. (2010). Importance of religion and spirituality in the lives of African Americans, Caribbean Blacks and non-Hispanic Whites. *Journal of Negro Education*, *79*(3), 280-294. https://muse.jhu.edu/article/806982

Taylor, R. J., Chatters, L. M., Jayakody, R., & Levin, J. S. (1996). Black and White differences in religious participation: A multisample comparison. *Journal for the Scientific Study of Religion*, *35*(4), 403-410. https://doi.org/https://doi.org/10.2307/1386415

Terje, S., Stein, A., & Jan-Magne, K. (2003). Neuropsychological assessment and telemedicine: A preliminary study examining the reliability of neuropsychology services performed via telecommunication. *Journal of the International Neuropsychological Society*, *9*(3), 472-478. https://doi.org/10.1017/S1355617703930128

U.S. Department of Health and Human Services. (2004). *The 2004 HHS Poverty Guidelines*. https://aspe.hhs.gov/2004-hhs-poverty-guidelines

Wang, H.-X., Jin, Y., Hendrie, H. C., Liang, C., Yang, L., Cheng, Y., Unverzagt, F. W., Ma, F., Hall, K. S., Murrell, J. R., Li, P., Bian, J., Pei, J.-J., Gao, S., & Kritchevsky, S. B. (2012). Late life leisure activities and risk of cognitive decline. *The Journals of Gerontology: Series A*, *68*(2), 205-213. https://doi.org/10.1093/gerona/gls153

Wechsler, D. (1955). Wechsler Adult Intelligence Scale. *Archives of Clinical Neuropsychology*. https://doi.org/10.1037/t15169-000

Wechsler, D. (1997a). *Wechsler Adult Intelligence Scale* (3 ed.). The Psychological Corporation.

Williams, L. F., & Cousin, L. (2021). "A charge to keep I have": Black pastors' perceptions of their influence on health behaviors and outcomes in their churches and communities.

Journal of religion and health, *60*(2), 1069-1082. https://doi.org/10.1007/s10943-021-01190-0

Yang, X., Xu, X. Y., Guo, L., Zhang, Y., Wang, S., & Li, Y. (2022). Effect of leisure activities on cognitive aging in older adults: A systematic review and meta-analysis. *Frontiers in Psychology*, *13*, 1-14. https://doi.org/10.3389/fpsyg.2022.1080740

Zhang, J., Zou, L., Jiao, C., Zhang, M., Wang, L., Song, W., Yu, Q., Grabovac, I., Zhang, Y., Willeit, P., & Yang, L. (2020). Cognitive benefits of activity engagement among 12,093 adults aged over 65 years. *Brain Sciences*, *10*(12), 1-17. https://doi.org/10.3390/brainsci10120967

Table 1. Sample Sociodemographic, Health, Cognitive Function, Leisure Activity Engagement, and Spirituality Characteristics (N=165)

Characteristics	*M* (SD)	Range	*n* (%)
Sociodemographics			
Age	62.1 (8.2)	46-83	-
Sex (Female)	-	-	121 (73.3)
WRAT-3	40.9 (7.5)	22-53	-
Poverty Status (Below)	-	-	66 (40.0)
Mental and Physical Health			
PHQ-9 (total score)	3.5 (4.3)	0-25	-
Comorbidities (sum)	1.3 (1.0)	0-13	-
Leisure Activity Engagement			
Leisure Activity Engagement (Sum, 7-day average)	6.99 (3.6)	17-22.70	-
Spirituality			
Spirituality (composite score)	36.7 (6.1)	17-45	-
Cognitive Function			
Cognitive Complaints (sum)	2.1 (1.7)	0-7	-
MoCA	22.3 (5.0)	1-30	-
AVLT (Correct)[a]	6.1 (1.8)	1.33-11.67	-
AVLT Delayed (Correct)	3.8 (3.1)	0-13	-
Digit Span Forward (Correct)	7.2 (2.5)	2-12	-
Digit Span Backward (Correct)	5.4 (2.3)	2-14	-
Trail Making Test. Part A (Seconds)	10.7 (4.6)	4.68-49.30	-
Trail Making Test, Part B (Seconds)	41.8 (20.0)	2-120	-
Clock Drawing (Composite Score)	7.9 (2.0)	1-10	-
Verbal Fluency Semantics (Sum)	39.9 (9.6)	16-70	-
Verbal Fluency Letters (Sum)	33.4 (12.9)	0-73	-
Digit Symbol Substitution Test (Sum Correct)	35.2 (14.2)	2-100	-

Note: LAE = Leisure Activity Engagement; WRAT-3 = Wide Range Achievement Test – 3rd Edition; PHQ-9 = Patient Health Questionnaire – 9 items; AVLT = Rey's Auditory Verbal Learning Test.

Table 2. Significant Associations between LAE and Cognitive Domains (Global Mental Status, Processing Speed, and Executive Function; Model 3).

Predictors	MoCA	Number Comparison	Verbal Fluency [a]
LAE	**.18 (.08)***	**.18 (.17)***	**.15 (.26)***
Age	**-.22 (.04)****	**-.31 (.08)*****	**-.25 (.12)*****
WRAT-3	**.34 (.04)*****	.12 (.09)	**.47 (.13)*****
Sex	**.23 (.65)****	-.13 (1.43)	.01 (2.16)
Poverty Status	-.04 (.56)	-.08 (1.26)	.02 (1.88)
PHQ-9	-.05 (.06)	-.09 (.14)	-.11 (.21)
Comorbidities	.03 (.28)	-.01 (.62)	-.03 (.93)
Spirituality	**.19 (.05)***	-.03 (.11)	.05 (.16)

Note. LAE = Leisure Activity Engagement; MoCA = Montreal Cognitive Assessment; WRAT-3 = Wide-Ranging Achievement Test, 3rd Edition; PHQ-9 = Patient Health Questionnaire – 9-Item. Results depict standardized Beta coefficients (βs) and standard errors in parentheses. Bold values represent significant findings.

[a] Verbal Fluency Letter (F, A, S) Words Sum.

*$p < .05$; **$p < .01$; ***$p < .001$.

Figure 1. *Two-way Interaction between Leisure Activity Engagement (LAE) and Spirituality on Language.*

Note: Findings revealed that among those who reported two standard deviations higher across the average mean, higher LAE was significantly associated with more spontaneous responses on the Boston Naming Test (language cognitive domain).

Alt Text: Figure depicting the interaction between LAE and spirituality on the total number of spontaneous responses (language/naming) with linear lines reflecting spirituality scores up to 2 standard deviations above the mean.

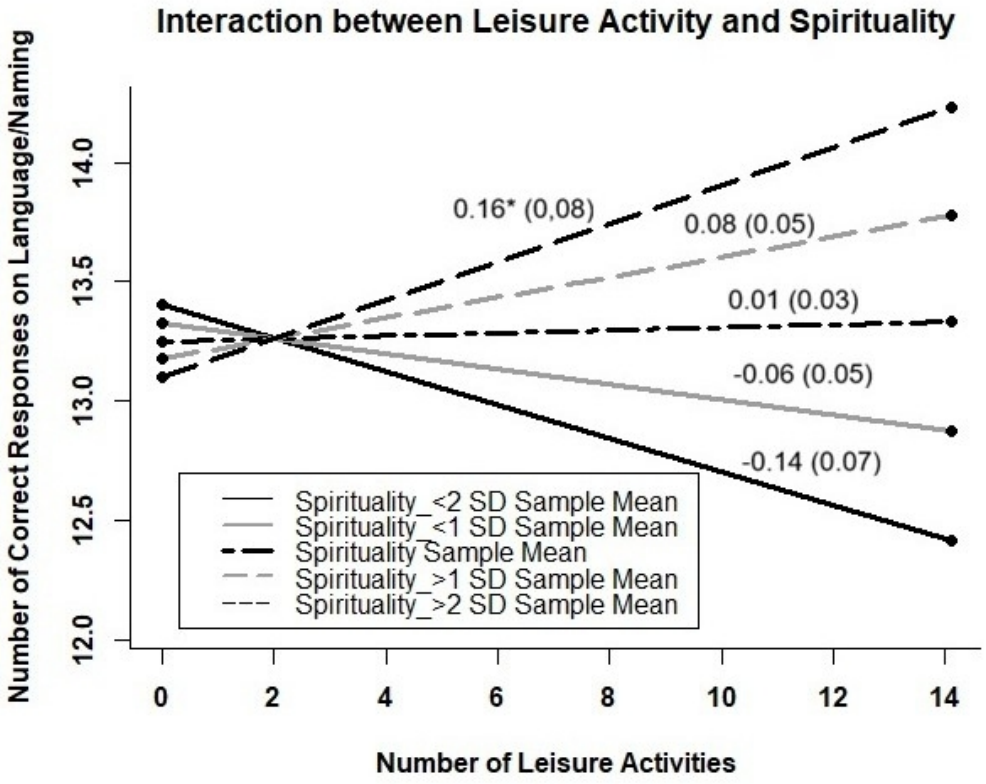

Figure 1

50x40mm (300 x 300 DPI)