

**CULTURAL BIAS IN MEMORY SCREENING OF AMERICAN INDIAN  
INDIVIDUALS IN ARIZONA**

A Thesis submitted to the University of Arizona College of Medicine -- Phoenix  
in partial fulfillment of the requirements for the Degree of Doctor of Medicine

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**Dedication**

The authors wish to dedicate this project to the participants whose warmth, wisdom, and generosity made it possible.

**Acknowledgements**

Thanks to Dr. Vicky Lomay for her considerable efforts and expertise that led to the development of the SWICA, a novel screening tool for use with older adults of southwestern American Indian descent. Thanks also to Jan Dougherty and colleagues at the Banner Alzheimer's Institute for organizing the multiple screening events that facilitated the accumulation of these valuable data.

## **Abstract**

Purpose: compare the Southwestern Indigenous Cognitive Assessment (SWICA), a novel tool for screening AI older adults in Arizona, with The Montreal Cognitive Assessment (MoCA), a commonly used memory screening tool, for comparison of cultural bias.

Methods: Cultural bias was assessed by retrospectively comparing coded participant responses to 16 questions about their cultural context. Intrasample variation on MoCA and SWICA tests was controlled by using the participants as their own controls. Data were analyzed using a multiple regression general linear model on SPSS software.

Results: Scores on the SWICA test were independently associated with English use in the home (Beta = .396,  $p = .026$ ), years of education (Beta = .335,  $p = .027$ ), and ease of learning (Beta = .361,  $p = .029$ ), but not age (Beta = .366,  $p = .054$ ). Scores on the MoCA test were independently associated with age (Beta = -.491,  $p = .001$ ), English use in the home (Beta = -.320,  $p = .039$ ), and years of education (Beta = -.284,  $p = .030$ ), but not ease of learning (Beta = -.267,  $p = .067$ ).

Conclusions: Scores were similar on both tests ( $t=3.934$ ,  $p=.001$ ), and were independently associated with English use in the home and years of education. SWICA was uniquely associated with ease of learning and MoCA was uniquely associated with age. This preliminary comparison demonstrates the usefulness of SWICA, and validation of this tool is recommended.

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## **Introduction/Significance**

It is estimated that in 2004, as many as 8.5% of American Indian and Alaska Native (AIAN) individuals in the U.S. were over the age of 65<sup>1</sup>. This is a historic high, and presents new challenges to health care providers who serve these individuals. Demographic studies have shown that they have unique healthcare needs in addition to complex needs that accompany older age. These include one of the highest rates of diabetes in the world, and the many cardiovascular, renal, and neurological complications that can accompany the disease process in diabetes. American Indian (AI) elders appear to be particularly vulnerable to the cerebrovascular changes associated with diabetes, which can manifest as a vascular dementia<sup>2</sup>. Additionally, older AI adults often come from cultures of origin very different from the mainstream American culture, including much of our medical culture, which is largely descended from European cultural mores and traditions. This is further complicated by the fact that people of native descent come from hundreds of unique backgrounds within the “American Indian” demographic that are often quite different from each other, depending upon tribal heritage, personal identification with one or multiple cultural groups, and the amount of time these individuals have spent living in reservations, cities, or other communities around the world.

Because of the cultural diversity among AI individuals, a unified approach to treating older adults based on their identification as “American Indian” is not a reasonable target for healthcare providers. However, certain aspects of western medicine that are particularly biased toward its European roots merit closer examination and possible attenuation of that cultural bias to allow for a more valid understanding of the state of health in these patients. With an ageing native population, one such area that has come under scrutiny in recent years is the use of standardized memory screening tools among AI adults with concern for memory loss. For example, the most commonly used of these tests, the Mini-Mental Status Exam (MMSE), places

a heavy emphasis on verbal performance, a domain that may be challenging for a population with variable education and English fluency, independent of memory impairment<sup>3</sup>.

While there is a long tradition of screening patients for dementia when there is concern for cognitive impairment, much of the data validating the standard tools does not take into consideration the cultural differences that present in the AI population. It is uncertain whether current tools are "culture fair" or effectively measure cognitive function, especially with Diagnostic and Statistical Manual (DSM) emphasis on occupational decline when many tribal elders are systematically involved in craft and other such activities, as was described among Cree elders by Jervis and Manson<sup>4</sup>. These investigators also found that there are limited resources targeted toward AI caregiver audiences, which raises concern that perhaps early signs of memory loss may not be recognized and brought to the attention of healthcare providers. A Texas group found that one commonly administered battery of cognitive tests, the (CERAD), was not significantly different in an AI cohort, but the study sample included mostly individuals with a small quantum of AI ancestry in a limited number of tribes. No post hoc analysis of cultural, quantum variability was performed, and so it remains to be seen if this might have affected their findings<sup>5</sup>.

One promising tool for memory screening is The Montreal Cognitive Assessment (MoCA). This brief screen has been shown to be more sensitive to mild cognitive impairment (MCI) than the MMSE, and is increasingly being employed by healthcare practitioners who diagnose and treat memory disorders<sup>6</sup>. To date, no formal data have been collected about AI elder attitudes toward the MoCA.. However, anecdotal accounts and challenges encountered during memory screening events with AIAN participants have yielded consistent reports that AIAN elders and their families feel that the tool is too difficult and that it does not give a fair account of their cognitive functioning<sup>7</sup>

Because these reports are subjective and not formally recorded, it is difficult to determine the actual effect of cultural bias on MoCA scores. There is precedent for altering memory-screening tests to account for cultural differences among AI participants. However, these alternations have not undergone formal validity testing, and it is unclear how these alterations may have affected the effectiveness of the screening tool in achieving its primary objective, assessing cognitive function<sup>8,9</sup>. As such, there is still some question as to whether a modified MoCA could still serve as an effective memory-screening tool, even if it alleviated the concerns of AI participants.

## **Research Materials and Methods**

In the present study, the gap of knowledge with regard to cultural bias in the MoCA was initially addressed by retrospectively comparing 41 participants using both the standard and modified versions of the test. This design was later modified to employ enhancements to the experimental SWICA tool against the control MoCA tool. The design is such that it controlled for intrasample variation by using the participants as their own controls. In addition to raw scores on the MoCA and SWICA, participants were also asked to fill out a brief written survey. Questions queried cultural data from both childhood and contemporary life. Examples include, “is English your first language,” and, “currently, how involved are you with your culture and community.” Responses were recorded on a Likert or binary scale depending on the nature of the question and were subsequently deidentified and coded prior to reporting to the investigators for aggregation and analysis. Although not a selection criterion for the study, all participants were literate and were able to complete the written survey without difficulty. While the question of validity will remain because this is a preliminary test in multiple small samples of a complex and varied population with a moving target in the evolving experimental tool, significant findings would merit future validity testing to justify the use of this modified test with AI individuals in the future.

Data fit a normal distribution, and were analyzed using a multiple regression general linear model on SPSS software with the generous assistance of the statistician at University of Arizona College of Medicine – Phoenix, Dr. Janet Foote.

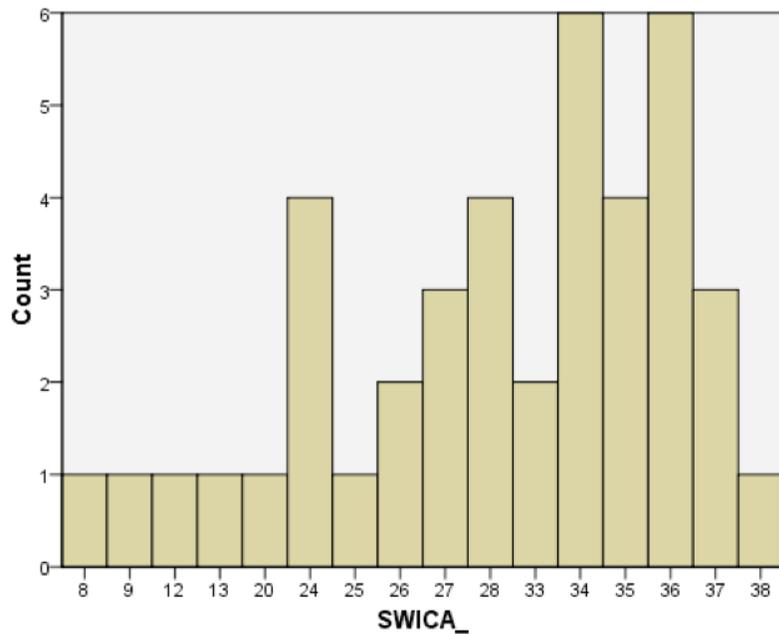
## Results

Scores on the SWICA test were independently associated with English use in the home (Beta = .396,  $p = .026$ ), years of education (Beta = .335,  $p = .027$ ), and ease of learning (Beta = .361,  $p = .029$ ), but not age (Beta = .366,  $p = .054$ ). Scores on the MoCA test were independently associated with age (Beta =  $-.491$ ,  $p = .001$ ), English use in the home (Beta =  $-.320$ ,  $p = .039$ ), and years of education (Beta =  $-.284$ ,  $p = .030$ ), but not ease of learning (Beta =  $-.267$ ,  $p = .067$ ). The full analysis output is listed on *Table 1*. The overall model fit was  $R^2 = .751$  with SWICA as the dependent variable and  $R^2 = .815$  with MoCA as the dependent variable.

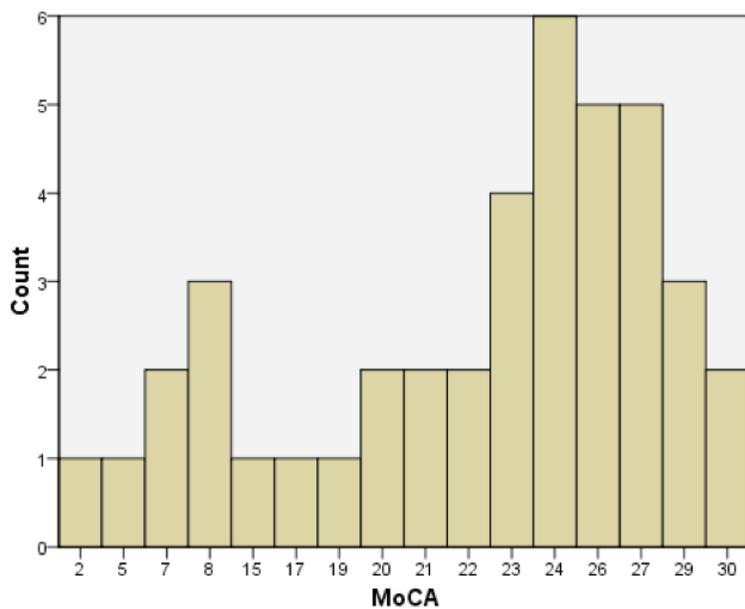
	BetaSWICA	p	BetaMoCA	p
Age	.366	.054	-.491	.001*
Gender	-.041	.768	-.152	.881
Tribal affiliation	-.090	.610	-.020	.895
English 1st language	-.045	.784	.176	.209
English use in the home	.396	.026*	-.320	.039*
Childhood tribal involvement	.027	.877	.059	.694
Current tribal involvement	-.146	.430	.034	.832
Attended school	-.051	.755	-.200	.145
Urban/rural/reservation school	-.133	.397	-.092	.770
Public/private/religious/boarding school	.085	.541	-.040	.517
Years of education	.335	.027*	-.284	.030*
Ease of learning	.361	.029*	-.267	.067
Employment status	-.249	.099	.134	.315
Type of employment	-.178	.250	.110	.412

**Table 1: Multiple regression Beta standardized coefficient for selected self-reported cultural markers as they relate to scores on the SWICA and MoCA. \*significant at  $p < 0.05$ . BetaSWICA = Beta for regression with SWICA score as the dependent variable. BetaMoCA = Beta for regression with MoCA score as the dependent variable.**

Frequency data for scores on both the SWICA and MoCA tests approximate a normal distribution, with slight negative skew (*Figure 1, Figure 2*).

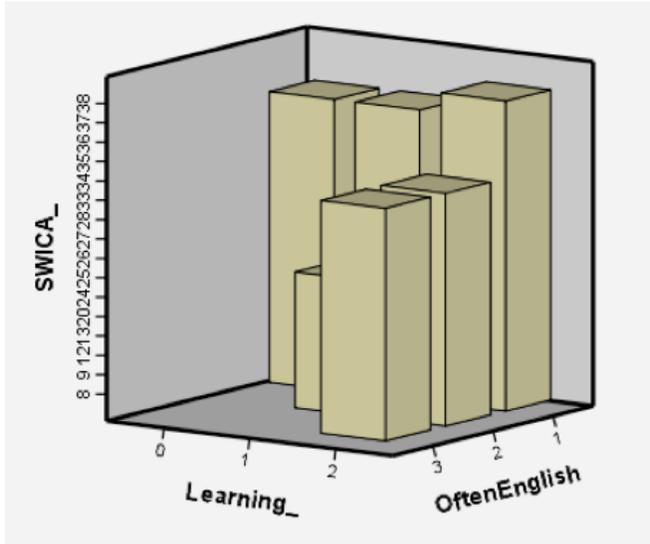


**Figure 1: Frequency count of SWICA scores among participants**

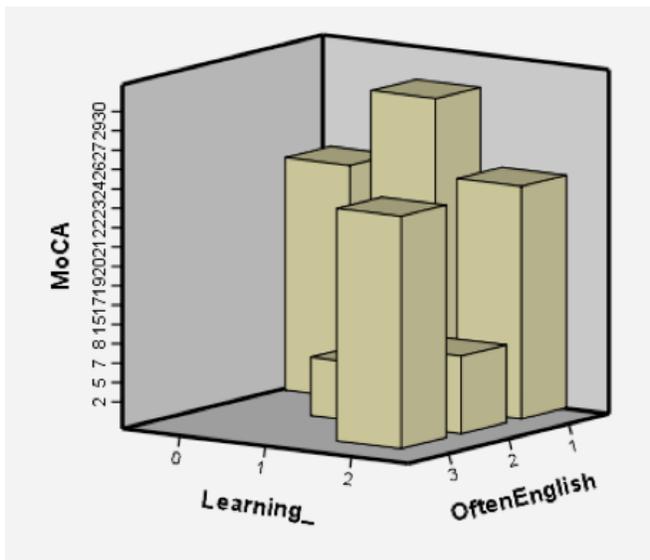


**Figure 2: Frequency count of MoCA scores among participants**

The relationship between SWICA and MoCA scores with ease of learning and how often English is spoken is contrasted graphically in *Figure 3* and *Figure 4*. Notably, in the case of SWICA, both independent variables demonstrated significant association, whereas only how often English is spoken in the home is associated with the MoCA test score.



**Figure 3: Relationship of SWICA score to ease of learning and how often English is spoken**



**Figure 4: Relationship of MoCA score to ease of learning and how often English is spoken**

## **Discussion**

By 2050, current minority populations will make up more than 50% of the U.S. population and 18.7% of the total U.S. population will be over age 65. This presents a new challenge to the healthcare community to identify and treat dementia on a much larger and more culturally diverse scale. In AI individuals, memory impairment is likely underreported and strategies are lacking for helping families and communities manage this emerging public health threat<sup>8</sup>. Even among AI older adults who may be showing signs of memory impairment, varying cultural norms may delay identification of a degree of impairment that may benefit from intervention<sup>10</sup>. The limitations of screening AI participants has been demonstrated in several observational studies even with commonly used and validated screening tools<sup>4,5,10</sup>. The results of this pilot investigation of cultural bias in the MoCA and the novel SWICA memory screening tool demonstrate comparable score trends among participants, and similar influence of level of education and how often the participants use English. Unlike the MoCA, the SWICA appears to control for age in the study sample, but is independently associated with self-reported ease of learning. This finding was not reported elsewhere in the literature reviewed for this study, and presents a novel area for ongoing study and potential future advances in individualized screening for AI older adults.

## **Conclusions**

Participant raw scores were similar on both SWICA and MoCA ( $t=3.934$ ,  $p=.001$ ). Scores on both tests were independently associated with English use in the home and years of education. SWICA was uniquely associated with ease of learning and MoCA was uniquely associated with age. The former may indicate that the SWICA has a steeper learning curve, and the latter may mean the MoCA is skewed to age independent of memory issues. Both issues merit further study.

### **Future Directions and Limitations**

The major limitations of this study include the novel tool under examination, the small sample size, self-reported cultural markers, and the absence of longitudinal data to examine the long-term outcomes of participants. Because both raw scores and relationships between measures of cultural bias were statistically similar between MoCA and SWICA, a logical next step would be formal validation of the SWICA as a memory screening tool with a larger sample of AI older adults.

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