# Correcting for Demographic Variables on the Modified Telephone Interview for Cognitive Status

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**Objective:** *To examine the effect of demographic variables on scores on the modified Telephone Interview for Cognitive Status (mTICS) in a healthy cohort and develop demographically corrected normative data.* **Design:** *Observational.* **Setting:** *Primarily academic medical centers.* **Participants:** *576 healthy older adults.* **Measurements:** *mTICS.* **Results:** *Age and education significantly correlated with mTICS score, and sex differences were also observed on this score. Ethnicity differences were not observed. Using regression equations, age, education, and sex significantly predicted mTICS total score.* **Conclusions:** *By using these corrections, an individual's cognitive status may be more accurately predicted with this telephone screening instrument, although clinical validation is needed.* (Am J Geriatr Psychiatry 2013; ■:■−■)

**Key Words:** Cognitive screening, normative data

The modified Telephone Interview for Cognitive Status (mTICS)[1] is a 14-item screening measure that can quickly evaluate an individual's global cognitive status. Its items tap attention, orientation, language, and learning and memory, yielding a total score ranging from 0−50, with higher scores indicating better cognition. The mTICS is similar to screening measures such as the Mini Mental Status Examination, with the advantage that it can be administered by telephone. It was modified from the TICS by adding a delayed recall trial, which was dropped in the original version because it was too difficult for patients with Alzheimer disease.[2] Because the mTICS is more memory-laden (i.e., 20 of its possible 50 points coming from learning and memory items), this measure may be a useful tool for identifying cases with a primary amnestic profile (e.g., amnestic mild cognitive impairment [MCI] and early Alzheimer disease).

Studies of the mTICS and the TICS have led to mixed results regarding its diagnostic usefulness. For example, multiple studies have suggested that although these measures adequately identify cases of dementia, they struggle to identify milder phases of late-life cognitive disorders.[3−5] Conversely, other studies have found these measures to be useful in MCI,[6−9] especially when they controlled for age and education in the analyses.[10,11] Because the mTICS tends to correlate with other screening measures[12,13] and more comprehensive assessments of cognitive

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functioning,[14–16] the mTICS might be useful as a screening measure for clinical trials on patients with cognitive impairments.[7,17] Its applicability in clinical settings, however, has not been widely studied.

Despite the potential benefits of the mTICS, a notable limitation is its lack of normative data with demographic corrections. Age and the mTICS total score tends to have an inverse association,[11,12,14] whereas education has been positively associated with mTICS scores.[11,12,18,19] Interpretive errors can occur if demographic variables are not accounted for in cognitive measures.[20–22]

Therefore, the purpose of the current study was to examine demographic influences on the mTICS and generate corrected normative data for this instrument. Based on existing research, we expected that age and education would be related to mTICS scores. Although there is little mTICS-specific data to generate hypotheses on other demographic variables, it is also suspected that sex and ethnicity would also affect scores on this screening measure.

## METHODS

The institutional review board at each participating site approved all procedures prior to study commencement. As part of an epidemiological study of progressive supranuclear palsy (clinicaltrials.gov NCT00431301), two comparison groups were recruited. One comparison group consisted of non-genetically related family members (e.g., in-laws), friends, or neighbors of the patient, who were sex-matched and within 5 years of the patient's age. The second comparison group consisted of spouses or non-blood relatives of the patient, again within 5 years of the patient's age. To ensure that the comparison subjects were relatively healthy, they were administered the mTICS and a parkinsonism screening questionnaire. The first comparison group was administered these measures by telephone, and the second comparison group could have had them administered either in person or by telephone. Comparisons from either group were excluded if: 1) they had an mTICS score less than 28, as this could indicate dementia,[1] or 2) responses on the parkinsonism questionnaire suggested a diagnosis of, treatment for, or other characteristic symptoms of Parkinson disease.

The two comparison groups did not significantly differ on mTICS scores, so they were combined for the following analyses. In the first set of analyses, the influence of demographic variables (age, education, sex, ethnicity) on mTICS scores was examined. Age and education influences on mTICS scores were examined with Pearson correlations. An independent t test examined mTICS scores between men and women. A one-way ANOVA compared four ethnicity groups (Asian or Pacific Islander, black or African American, Latina/Latino or Hispanic, white or European American) on mTICS scores. Statistically significant influences from this first step were carried forward to the next step. In the second analysis, a stepwise linear regression was used to predict mTICS score from the statistically significant demographic variables in the first step. Stepwise regression was chosen over other models (e.g., hierarchical regression) as this type of regression has been widely used in neuropsychology to develop demographic corrections and to predict cognitive change across time.[23,24] Given the number of statistical comparisons, an $\alpha$ level of 0.01 was used.

## RESULTS

Five hundred seventy-six comparison subjects provided data for these analyses. As a group, they tended to be elderly (age; M: 68.1 years, SD: 7.7, range: 46–91), have some college (education; M: 15.5 years, SD: 3.3, range: 2–30), were primarily white/European American (95.8%), and were slightly more female (55%). Overall, their mean mTICS score was 37.8 (SD: 4.0, range: 28–50).

In the first step of the analyses, age negatively correlated with mTICS scores ($r = -0.32$, $N = 576$, $p < 0.001$), and education positively correlated with this score ($r = 0.21$, $N = 576$, $p < 0.001$). Women had significantly higher mTICS scores than men ($t_{(574)} = -4.1$, $p < 0.001$). No mTICS differences occurred among the ethnicity groups ($F_{(3, 572)} = 0.61$, $p = 0.61$). In examining statistical assumptions of the data, the linearity of associations appeared supported for age, education, and sex compared to the mTICS, whereas ethnicity deviated from linearity.

In the final model of the stepwise regression, age, education, and sex were all statistically significant predictors of the mTICS score ($F_{(3, 572)} = 39.0$,