

CALIFORNIA STATE UNIVERSITY, NORTHRIDGE

Psychometric Properties of Ethnic Identity

A thesis submitted in partial fulfillment of the requirements  
For the degree of Master of Arts in  
Psychological Science

by

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## DEDICATION

This thesis is dedicated to my parents, Judy and Jack Cerneka, who have made this project possible through continued encouragement and support throughout my education ad infinitum.

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## ABSTRACT

### Psychometric Properties of Ethnic Identity

by

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Ethnic identity is a complex construct that is developed in adolescence. Unlike race, which is bestowed unto one at birth, ethnic identity involves exploration and exposure to cultural practices to be formed. The varying degree this exploration and attachment occurs produces a range of possible positions on the latent trait continua. Gallantly, a few scholars have attempted to capture this specific construct, albeit through classical test theory (CTT) methods and under false distributional assumptions. The present study is concerned with the psychometric exploration of the three most widely used measures of ethnic identity (i.e., Multigroup Ethnic Identity Measure, MEIM; Multigroup Ethnic Identity Measure-Revised, MEIM-R; Ethnic Identity Scale, EIS) under a modern test theory framework.

The three measures of ethnic identity were assessed with the nominal response model (NRM) to establish if each scale functioned as proposed under modern test theory and we conducted model modification when appropriate. The MEIM and EIS both experienced a loss of items from the NRM scale revision, which boosted test information. The MEIM-R retained its full 6-item scale. DIF analyses were also conducted on the three scales. All scales had some items experience DIF. The final objective of this study was to recommend a scale for future use.

Given the MEIM-R's success in the NRM assessment phase and relative equivalency with the other measures in the DIF portion, this measure is recommended.

## INTRODUCTION

Ethnicity is comprised of cultural practices or traditions shared by a group of people (Oxford Dictionary, n.d.). Ethnic identity is a complex construct that develops as part of the general identity development process that occurs primarily during adolescence (Erikson, 1968). Unlike race, which is primarily hereditary and bestowed at birth, ethnic identity involves the degree to which individuals see themselves as part of their culture or the degree to which their cultural practices are part of who they are as an individual (Phinney, 1992). Ethnic identity generally requires exploration and exposure to cultural practices and the internalizing of these practices into part of their sense of self (Phinney, 1992).

The study of ethnic identity and its development has led to multiple measures of ethnic identity which have illustrated the psychometric properties of, and utility for, ethnic identity scales (e.g., Phinney, 1992; Phinney & Ong, 2007; Rakhkovskaya & Warren, 2014; Umaña-Taylor, Vargas-Chanes, Garcia, & Gonzales-Backen, 2008; Umaña-Taylor, Yazedjian, & Bámaca-Gómez, 2004). However, current ethnic identity measures have been developed under classical test theory (CTT) methods utilizing exploratory and confirmatory factor models that have distributional assumptions (e.g., items are continuously scored, normally distributed; Embretson & Reise, 2000; Kline, 2011; Tabachnick & Fidell, 2012) that were violated (e.g., scale items are discrete measurement level, not continuous) when the scales were being developed and tested.

The purpose of the present study is to evaluate the psychometric properties of the three most widely used measures of ethnic identity under modern measurement frameworks (e.g., polychoric correlations, item response theory). The three scales follow: (1) Multigroup Ethnic

Identity Measure (Roberts et al., 1999); (2) Multigroup Ethnic Identity Measure-Revised (Phinney & Ong, 2007); and (3) Ethnic Identity Scale, (Umaña-Taylor et al., 2004).

### **Measurement of Ethnic Identity and Application in Psychology**

Two scales have been created to measure ethnic identity across all ethnicities: the Multigroup Ethnic Identity Measure (MEIM; Phinney, 1992; Appendix A) and the Ethnic Identity Scale (EIS; Umaña-Taylor et al., 2004; Appendix D). The MEIM has received wide attention in both application and measurement research, while the latter (i.e., EIS) was developed more recently and has received less attention. Both scales, and their variants, will be reviewed in terms of their application in substantive fields, initial development, and subsequent psychometric evaluation.

#### **Multigroup Ethnic Identity Measure**

**Application.** Since its conception the MEIM has been a prevalent measure of ethnic identity with diverse application. It has been used as a global measure of ethnic identity to assess the relationship between ethnic identity and various other constructs. For example, the influence of ethnic identity on intergroup attitudes (Whitehead, Ainsworth, Whittig, & Gadino, 2009), acculturation (Farver, Narang, & Bhadha, 2002; Schiefer & Krahe, 2013), and various health outcomes (Corneille, Fife, Belgrave, & Sims, 2012; Rakhkovskaya & Warren, 2014) have been investigated with the MEIM. Ethnic identity's relationship to depressive symptoms has been investigated among immigrant-origin adolescents (Tummala-Narra, 2015), Asian American adolescents (Stein, Kiang, Supple, & Gonzalez, 2014), and college students (Walker, Wingate, Obasi, & Joiner, 2008). Likewise, the interplay between ethnic identity and discrimination is a popular line of research for specific populations such as African Americans (Tynes, Umaña-Taylor, Rose, Lin, & Anderson, 2012) and Asian Americans (Park, Schwartz, Lee, Kim, &

Rodriguez, 2013; Yoo, & Lee 2005, 2009). The interplay between ethnic identity and self-esteem has also been explored with the MEIM (Negy, Shreve, Jensen, & Uddin, 2003; Smith, Walker, Fields, Brookins, & Seay, 1999; Umaña-Taylor, 2004). Furthermore, longitudinal studies have employed the MEIM to assess the trajectories of ethnic identity development (Huang & Stormshak, 2011), and in tandem with measures that assess psychosocial adjustment (Galliher, Jones, & Dahl, 2011) and discrimination (Greene, Way, & Pahl, 2006). These examples represent only a fraction of the varied applications of the MEIM.

**Development.** The MEIM was originally developed over five-years and underwent five-revisions before its debut (Phinney, 1992). The original measure contained 14-items across three domains: positive ethnic attitudes and sense of belonging (5-items), ethnic identity achievement (which entails exploration and resolution; 7-items), and ethnic behaviors and practices (2-items). Four-category response options were included: 1 = *strongly disagree*, 2 = *somewhat disagree*, 3 = *somewhat agree*, and 4 = *strongly agree*. A second construct, other-group orientation, consisting of 6-items was also included in the Phinney (1992) version of the Multigroup Ethnic Identity Measure. Other-group orientation is generally accepted as distinct from ethnic identity and will therefore not be discussed further within the present work. Finally, respondents were asked to state their ethnicity, their father's ethnicity, and their mother's ethnicity from a list of options (an *other specify* option was included). This brings the measure's total item count to 23 (14 of which assess ethnic identity as a construct).

The samples on which the final version of the MEIM was tested included high school ( $N = 417$ ,  $\alpha = .81$ ) and college ( $N = 136$ ,  $\alpha = .90$ ) students from various ethnic backgrounds (e.g., Asian American, African American, Hispanic, mixed backgrounds, Whites, and other). Principal axis factor analysis revealed a one-factor (i.e., unidimensional) solution for all 14-ethnic identity

items (Phinney, 1992). Phinney makes no mention of corrections to the correlation matrix, and so it is assumed a standard Pearson correlation coefficient was used for the factor analysis. Pearson's  $r$  requires continuous scaled data, however, the MEIM was discrete (i.e., four response options). The limitation of assuming a continuous scale when the items are not continuous is a reduction in the variation the correlations are able to detect and therefore the correlations are truncated (Holgado-Tello et al., 2010). ANOVA revealed significant mean differences in the averaged score on the MEIM for ethnic groups, but not gender groups. Phinney detailed the extensive process (e.g., an iterative scale development process which included interviews with adolescents) taken to ensure content validity. However, there is no mention of statistical convergence with other related scales.

**Evaluation.** Following the first release of the MEIM (Phinney, 1992), the psychometric properties of the MEIM have been further evaluated. For example, Ponterotto, Gretchen, Utsey, Stracuzzi, and Saya (2003) conducted a CFA of the MEIM utilizing a high school sample ( $N = 219$ ), and they confirmed the factor solution found in Phinney's (1992) original study and also found that  $t$ -tests revealed no significant ethnic group differences on the measure.

Roberts et al. (1999) revised the MEIM to a 12-item version of the scale (Appendix B). From the original MEIM, two ethnic identity items were removed. Also, the 6-items belonging to the other-group orientation factor were removed. An exploratory factor analysis of the 12-item MEIM found a two-factor solution in a large sample ( $N = 5,423$ ) of middle-school students. The authors termed the two-factors: affirmation/belonging and exploration. This two-factor structure was further confirmed using a confirmatory factor analysis (CFA) which found good fit for the two-factor structure that was invariant across ethnic groups; confirming the use as a multi-group

scale. Roberts et al. (1999) also noted that *t*-tests revealed no significant ethnic group differences.

The MEIM was revised once more to 6-items which reflects two factors: exploration and commitment (MEIM-R; Phinney & Ong, 2007; Appendix C). Four items remained from the Roberts et al. (1999) MEIM, and two items were added. The response options were on a five-point scale: 1 = *strongly disagree*, 2, 3 = *neutral*, 4, and 5 = *strongly agree*. Phinney and Ong (2007) conducted a maximum likelihood factor analysis with oblimin rotation which revealed a two-factor solution. The authors then confirmed the factor structure with a CFA. A few studies have evaluated the factor structure of MEIM and MEIM-R (Roberts et al., 1999; Worrell, 2000), however there has yet to be a study to employ modern measurement theory procedures (i.e., methods that match the scale of the items) within the evaluation.

### **Ethnic Identity Scale**

**Application.** The EIS has mostly been used in studies with Latino and Hispanic American samples assessing various constructs, such as depressive symptoms (Brittian et al., 2015), wellbeing (Piña-Watson, Ojeda, Castellon, & Dornhecker, 2013), parenting behaviors (Umaña-Taylor, & Guimond, 2010), self-esteem (Umaña-Taylor, Gonzales-Backen, & Guimond, 2009), and mental health (Umaña-Taylor & Updegraff, 2007). The relationship between ethnic identity (as operationalized by the EIS) and family ethnic socialization has been explored in a few studies. Each study incorporated additional constructs, namely generational status (Umaña-Taylor, Alfaro, Bámaca, & Guimond, 2009); parental behaviors, neighborhood characteristics, and academic outcomes (Supple, Ghazarian, Frabutt, Plunkett, & Sands, 2006); the patterns of native-U.S. youth's ethnic identity and family ethnic socialization from either immigrant or native-U.S. parents (Umaña-Taylor, Zeiders, & Updegraff, 2013); and the perspective of bi-

racial college youth (Brittian, Umaña-Taylor, & Derlan, 2013). Lastly, a longitudinal study employed the EIS to investigate the interplay between ethnic identity and coping with discrimination and the role of parenting behaviors and self-esteem (Umaña-Taylor et al., 2008).

**Development.** The EIS was created as an alternative to the MEIM, whilst following the same theoretical perspectives, namely Erikson's identity development theory (1968), Marcia's (1980) interpretation of Erikson framework, and Tajfel's (1981) theory of social identity development (Umaña-Taylor et al., 2004). The EIS contains three domains: exploration (i.e., the extent one has explored their ethnicity), resolution (i.e., the extent one has resolved the meaning of their ethnic identity), and affirmation (i.e., the valence of the association with the resolution; see Appendix D for item assignment to each factor). Construction of the EIS began on a college sample ( $N = 615$ ), where 46-items were reduced to twenty-two, and eight factors down to the three mentioned above. Reliabilities of the factors ranged from .86 to .92, indicating good internal consistency throughout the measure. The ethnic backgrounds included in the sample were: White, Latino, Asian, Black, Native American, multi-ethnic/racial, and other (Umaña-Taylor et al., 2004). The reduced version was then assessed with a high school sample ( $N = 231$ ) where reliability ranged from .84 to .89 among the three factors. For each sample (college and high school), the authors examined the correlations between the EIS subscales between two ethnic group classifications (majority/minority) as an assessment of validity (Umaña-Taylor et al., 2004). Additionally, construct validity was evaluated by comparing correlations between the three EIS factors and other related measures (e.g., a measure of familial ethnic socialization; Umaña-Taylor et al., 2004).

**Evaluation.** The EIS has received less psychometric review than the MEIM, and most have been conducted by the scale's primary developer. In a study of a large college sample ( $N =$

1794), CFA supports the use of the exploration and resolution, but not the affirmation subfactor (Umaña-Taylor & Shin, 2007). These discrepant results may be because all of the items on the affirmation subfactor are reverse-coded. For example, Zhang, Noor, and Savalei (2016) explored the effects of reverse-coded items on factor structure in a Need for Cognition Scale. In their study, a confirmatory factor analysis demonstrated good fit for a unidimensional model when items are all forward-worded and poor fit when the scale includes a mix of forward- and reverse-worded items. In effect, reverse-coded items artificially lower reliability because it creates noise when evaluated with forward-wording items which is not driven by the latent trait.

In another study of Spanish-speaking early adolescents and their mothers ( $N = 678$ ), strict factorial invariance from the exploration and resolution subfactors, and strict partial invariance for the affirmation subfactor was found across English and Spanish-language versions of the survey (White, Umaña-Taylor, Knight, Zeriders, 2011). Lastly, in a small sample ( $N = 144$ ) of Native American youth (age 13 to 19 years), Yetter and Foutch (2013) achieved acceptable fit after removing two items; differences from Umaña-Taylor et al. (2004) were attributed to the sample, a case for further psychometric evaluation.

### **Item Response Theory**

Developed by Frederic Lord (1968), item response theory (IRT) is a measurement technique for evaluating respondents' level of ability or placement on the *latent trait* continua. IRT belongs to a family of latent trait models. The term "latent trait" refers to the construct (e.g., ethnic identity) which is directly immeasurable and thus must be captured by quantifiable items. Latent traits are signified by the Greek letter theta ( $\theta$ ); the terms latent trait and theta are therefore synonymous with one another. Theta is represented in logits (i.e., the natural log of an

odds ratio), which expresses the construct as a linear function on a standardized scale (a mean of “0” and a standard deviation of “1”).

IRT is a psychometric technique. Psychometrics are concerned with the theory and technique of educational and psychological measurement. To improve the measurement of psychological phenomenon there are three key goals: 1) to develop new and evaluate current measures, 2) to perfect and expand the theoretical approach to measurement, and 3) to thus create statistical techniques and software that correspond with the expanding theory (Crocker & Algina, 2008). IRT is also termed “modern test theory” as it is the new age improvement over its predecessor classical test theory (CTT). The modern test theory family of models provide deep insights into the functioning of tests, items, and categories within items. These insights allow for precise measurement in order to create robust tools and has the ability to enhance the test-taker experience with a shorter (i.e., relative to CTT-based tests), more accurate test.

### **CTT and Limitations**

CTT has been the reigning test theory since the field was founded (Reise, Ainsworth, & Haviland, 2005). Despite the popularity of CTT, there are issues that surround this measurement strategy. As Crocker and Algina (2008) explain, CTT operates on the true score model ( $X_i = T_i + E_i$ ), which purports an observed score ( $X_i$ ) can be partitioned into two components: the respondent’s true score ( $T_i$ ) and measurement error ( $E_i$ ). There are three assumptions in this equation regarding error. First, it is assumed to be uncorrelated with the true score. Meaning, a respondent’s actual ability level is not predictive or otherwise related to the occurrence of error. Secondly, as with many statistical assumptions, error is normally distributed. Lastly, the error distribution is assumed to be centered at zero. As error is assumed to occur in both directions across the normal distribution, scores will be over- and under-estimated at the same rate, thus

averaging to zero. Unfortunately, these assumptions are un-testable and therefore have unknown reliabilities.

Just as the fundamental equation of CTT, the analyses of this theory are unstable. Item analysis includes two parameters of estimation: (1) difficulty (i.e., the proportion of respondent who answer an item correctly) and (2) discrimination (i.e., an index of how well the item differentiates between respondents at different levels of theta; Crocker & Algina, 2008). These calculations are derivatives of the ability within the specific sample assessed. Any variation in the ability represented by the sample will alter the difficulty and discrimination, thereby limiting the generalizability of the measure's scoring guidance (Crocker & Algina, 2008). Test analysis is represented by reliability (internal consistency; Cronbach, 1951), which is specific to the pool of items included in the test. The inclusion of items that were not included in the original test analysis will change the reliability statistic. The same can be said for the exclusion of an item that was originally included in the analysis. Therefore, item and test analyses are test specific and heavily reliant on the test sample.

### **Addressing Limitations with IRT**

IRT amends the problems of CTT through its signature quality of invariance. The term invariance describes the ability of IRT estimations to be independent of both the sample and test. That is, the results of IRT calculations will not vary by the testing-sample or with the inclusion/exclusion of items within the assessment. Invariance is a product of the item response function (IRF). The IRF characterizes the relation between the respondent's ability or position on the latent trait continuum and the probability of that respondent to endorse a specific item. IRFs are converted into a graphical representation, termed item characteristic curves (ICCs). Although

they are always monotonically increasing, there are three parameters (a - discrimination, b - difficulty, and c - guessing) that determine the shape of ICCs (Harris, 1989).

In IRT, how accurate a scale is at assessing the latent construct is measured by the test information function (Embretson & Reise, 2000). Information is estimated at every level of theta for each item and indicates where on the latent trait continuum the scale can differentiate with precision. There is also a parallel to Cronbach's alpha in IRT: marginal reliability. This statistic is an average of marginal error variance and is an indicator of internal consistency and interpreted along the same scale as Cronbach's alpha (Sireci, Thissen, & Wainer, 2005). Marginal reliability is helpful to easily convey internal consistency, especially when making comparisons across measures. However, it is less informative than information as the single number (an average) cannot capture the variation an information density plot can.

**Parameters.** IRT parameters are mathematical functions that describe persons and items. The person parameter is the latent construct of interest (theta). However, there are a few parameters (namely: a, b, and c) to describe items. Though it may seem counterintuitive, the concept of these parameters is most readily explained when beginning with the b-parameter.

The b- or "location" parameter is the conceptual equivalent of CTT's difficulty ("p"; the proportion-correct statistic), however difficulty is computationally inferior to location. An item's location is defined as the amount of the latent trait needed to have a 0.5 probability of endorsing the item (Embretson & Reise, 2000). "Endorsing an item" may take on a few forms, such as: respond "true" on a true/false scale, select the correct answer on a multiple-choice test of ability, or choosing a particular category on a rating scale. In each of these situations the implication is that the level of theta possessed by the participant is driving the response. Higher "b" values signify that a respondent must be higher on the latent trait continuum to endorse an item;

similarly, lower “b” values indicate that respondents who possess lower levels of theta are apt to endorse the item just as those with higher amounts of theta. Thereby, location is a response threshold based on theta (Embretson & Reise, 2000).

The a- or “discrimination” parameter indicates the slope of the ICC. Though it is conceptually analogous to discrimination in CTT (“d”), which is the correlation between the total test score and the item score, IRT uses a different mathematical process. IRT’s “a” is the slope at the inflection point (location) on the item’s ICC (Embretson & Reise, 2000). That is, the discrimination parameter describes the item’s ability to identify those high and low on the latent trait. Large values of “a” equate steep ICC slopes; steep slopes require very little changes in location to shift the most probable response and are thus “highly discriminating”. Conversely, a “low discriminating” item has a gradual slope which then requires a substantial change in theta to adjust response pattern.

Last is the c- or “guessing” parameter. Since the assessments that IRT evaluates have fixed response options (such as true/false or multiple choice), there is always a chance that the test-takers with lower rates of the latent trait to have guessed their response. To compensate for guessing, the lower asymptote is adjusted to match the proportion of chance there is in guessing (i.e., .25 for a 4-category item; Embretson & Reise, 2000). These 3-parameters can be implemented in dichotomous and polytomous items (Embretson & Reise, 2000).

**Models.** Item response theory offers a host of models to select from (Embretson & Reise, 2000). Dichotomous models are the 1, 2, and 3-parameter logistic (PL). Each consecutive model in the 1, 2, and 3-PL series incorporates an additional parameter from the a, b, and c-parameters (such that the 1-PL estimates only the a-parameter and so on).

In the divide-by-total class of polytomous IRT models, there is a similar variation. This class has a nested structure such that the most constrained model, the rating scale partial credit (RSPC), does not estimate the two additional parameters (described below) which separate polytomous from dichotomous estimation. Conversely, the most general of this class, the nominal response model (NRM; Bock, 1972, 1997) is the only model that estimates both parameters and is the model employed herein. The NRM has the unique ability to estimate the category boundary discrimination (CBD) parameter, which evaluates the information provided by each within-item category (Preston & Reise, 2013; Preston, Reise, Cai, & Hays, 2011). That is, the CBD identifies the probability of responding in a category versus an adjacent category in polytomous response formatted items.

The second parameter unique to polytomous models (mentioned above) is the location on the latent trait at which each CBD exists. The purpose of CBD evaluation is to identify the most informative items on the scale and to determine the viability of all response options within each item (Preston et al., 2015). Polytomous models are graphically represented in category response curves (CRCs), the polytomous equivalent of ICCs mentioned above. Results from these analyses will inform scale reduction decisions, which in turn promotes a psychometrically sound tool and minimizes respondent burden.

**Differential item functioning.** Differential item functioning (DIF) is an application of IRT where the items are assessed for group biases (e.g., ethnicity). DIF occurs when items have different IRFs for two or more groups (de Ayala, 2013). A problem is raised by this difference: respondents are equivalent on the latent trait (ethnic identity) but have different probabilities of selecting a specific category within an item. DIF will be exhibited when items that inherently have different meaning to different subsets of participants. DIF analyses will calibrate item

parameters for groups separately, which will then be tested for differences through the Wald test (Woods, Cai, & Wang, 2012). The particular interest regarding the present scales is whether DIF exists based on ethnic background, as the usability of the scales would be greatly impacted without this psychometric support. Testing for DIF is important to ensure that a construct like ethnic identity is being interpreted and utilized by the different groups.

**Assumptions.** IRT requires the satisfaction of two assumptions: unidimensionality and local independence. Unidimensionality is the assumption there is a single trait (i.e., factor) that accounts for the item covariance. Violation to this assumption (i.e., two-factor solution) requires the use of multidimensional item response theory (MIRT). As its name suggests, MIRT is the extension of item response theory to multidimensional models, but the incorporation of MIRT models into software (e.g., FlexMIRT, MIRT package in R) is an emerging field with limited published applications. The local independence assumption states items are uncorrelated after controlling for theta. Violation to this assumption (termed: local dependence) results in inflated test precision (e.g., a magnified Cronbach's alpha under CTT).

### **The Present Study**

The present study is concerned with the psychometric exploration under a modern test theory framework of the three most widely used measures of ethnic identity: (1) the Multigroup Ethnic Identity Measure (MEIM; Roberts et al., 1999; Appendix B), (2) the Multigroup Ethnic Identity Measure-Revised (MEIM-R; Phinney & Ong, 2007; Appendix C), and the Ethnic Identity Scale (EIS; Umaña-Taylor et al., 2004; Appendix D). Using the modern measurement methods on these measures provided a tradeoff: while the IRT model delivers deep insight into an item's functioning, it is at the cost of unidimensional assumption violation. In contrast, the measures were developed and evaluated with assumption violations in classical test theory

methods (e.g., factor analysis requires continuous variables). Provided the vast applications and many CTT evaluations of the three scales, it was determined to be a worthwhile endeavor to utilize IRT despite the assumption violation. Indeed, these scales are useful candidates to apply the IRT method with the assumption violation in order to see the impact it may have.

### **Objective 1**

The first objective was to psychometrically test each of the three measures of ethnic identity (MEIM, MEIM-R, and EIS) to establish if each scale functions as proposed under modern test theory and conduct model modification when appropriate. *Hypothesis 1:* Each of the ethnic identity scales will perform poorly under modern test theory assumptions (i.e., unidimensionality, local independence) as previous psychometric analyses conducted suggested there will be violations to the unidimensionality assumption. Most items were expected to have categories which were not discriminating between changes in the latent trait. Therefore, each scale will need to be modified (e.g., items removed, response categories collapsed) to adequately fit the data as none of the scales were developed under the statistical rigor of modern measurement theory. That is, although these measures have proven to be stable under past examination, they have never been assessed at the item, nor, category level (i.e., assessment has been at the test level).

### **Objective 2**

The next objective was to conduct differential item functioning on each scale to establish if each item is free of bias (e.g., no group differences across scale parameters) across two ethnic groups (Caucasian and Hispanic) and to ensure that the scale functions the same across the groups. While some invariance testing of the scales has been conducted (e.g., Roberts et al., 1999; Avery et al., 2007) most have focused on configural (i.e., items in the same factor configuration

across groups) and weak factorial invariance (i.e., equal loadings across groups). Those that have tested for invariance of the item means (i.e., strong or scalar invariance) have demonstrated only partial invariance; with non-Caucasian respondents having higher item means than Caucasian respondents on several items (Feitosa, Lacerenza, Joseph, & Salas, 2017). *Hypothesis 2*: Once the psychometric viability of each scale is established, it is predicted that the psychometric structure of each scale will differ across ethnic groups (i.e., Caucasians and Hispanics will respond to items differently at similar levels of theta). The probability of responding in a particular category is expected to shift based on ethnic group, not theta. For example, item 11 from the MEIM, “I feel a strong attachment towards my own ethnic group” has been shown to evoke higher item means from non-Caucasian respondents compared to Caucasian respondents even after controlling for differences on the factor (Feitosa et al., 2017).

### **Objective 3**

The final objective was to compare each of the three scales as tested in Objectives 1 and 2 to select which scale to utilize in future studies. *Hypothesis 3*: Given the rigorous development process of the MEIM series, the MEIM (Roberts et al., 1999) is hypothesized to have better psychometric properties. This scale was modified from the Phinney (1992) version but maintains twice as many items as the Phinney and Ong (2007) MEIM-R version, affording this measure more opportunity for success. The MEIM scales were developed with varied ethnic groups and so is expected to have fewer problems with DIF than the EIS.

## METHOD

### Participants

The participants in the study included students enrolled in Introduction to Psychology or Physiological Correlates of Human Behavior in one of four sequential semesters at a large, urban University in Southern California. These courses are lower-level, general education classes. Four thousand eight hundred eleven respondents were included in the study. This large sample size ( $N = 4,811$ ) was ample for accurate parameter estimation by the nominal response model (NRM; DeMars, 2003). This sample ranged in age between eighteen and twenty-five years old ( $M = 19.25$ ,  $SD = 1.57$ ) and were predominantly women (68%). The ethnic breakdown was: 55% Hispanic/Latino, 17% Caucasian, 13% Asian, 5% African American, and 10% other (including Native Hawaiian, Pacific Islander, Native American/American Indian/Alaska Native, and multiethnic). All respondents, regardless of ethnicity, were included in the NRM assessment (objective one). However, only respondents from the two largest ethnic groups (Caucasian,  $n = 821$ ; Hispanic,  $n = 2636$ ) were evaluated for differential item functioning (Objective two).

### Measures

**Multigroup Ethnic Identity Measure.** Respondents received the full 23-item Multigroup Ethnic Identity Measure (Phinney, 1992) detailed in Appendix A. However, the full measure contains the other-group orientation subfactor which was not of interest in the current work. While the respondents provided responses to the expanded 23-item scale, only the 12-item version of the Multigroup Ethnic Identity Measure (referred to as “MEIM” henceforward; Roberts et al., 1999) was included in the analysis of this measure. Users of the MEIM have varied in their usage of the 4-point (e.g., Syed & Juang, 2014) and 5-point (e.g., Stepney, Sanchez, & Handy, 2015) Likert scale. To investigate all options that are used in the field, the 5-

point scale was employed herein. Response options in the present study were as follows: 1 = *strongly disagree*, 2 = *disagree*, 3 = *neutral*, 4 = *agree*, and 5 = *strongly agree*. Table 1 details the 12-items from Appendix B which will be examined and provides a *short code* for each item. The purpose of the *short codes* is to provide the reader with a quick reference to the corresponding item throughout this work.

Table 1  
*Items from the Multigroup Ethnic Identity Measure (MEIM) and their Short Codes*

Short code	MEIM item
Spend time	1. I have spent time trying to find out more about my ethnic group, such as its history, traditions, and customs.
Active in groups	2. I am active in organizations or social groups that include mostly members of my own ethnic group.
Clear sense	3. I have a clear sense of my ethnic background and what it means for me.
Affected	4. I think a lot about how my life will be affected by my ethnic group membership.
Happy	5. I am happy that I am a member of the group I belong to.
Sense of belonging	6. I have a strong sense of belonging to my own ethnic group.
Understand	7. I understand pretty well what my ethnic group membership means to me.
Talk to others	8. In order to learn more about my ethnic background, I have often talked to other people about my ethnic group.
Pride	9. I have a lot of pride in my ethnic group.
Participate	10. I participate in cultural practices of my own group, such as special food, music, or customs.
Strong attachment	11. I feel a strong attachment towards my own ethnic group.
Feel good	12. I feel good about my cultural or ethnic background.

*Note.* Response options: 1 = *strongly disagree*, 2 = *disagree*, 3 = *neutral*, 4 = *agree*, 5 = *strongly agree*. Adapted from Roberts et al., 1999

**Multigroup Ethnic Identity Measure-Revised.** The 6-item Multigroup Ethnic Identity Measure-Revised (MEIM-R; Phinney & Ong, 2007) was also included within the full-length Phinney (1992) version administered to respondents. This scale has four items that are repeated with the MEIM. Items were only shown once to the respondent but will be analyzed independently within each scale. Response options were the same as for the MEIM: 1 = *strongly disagree*, 2 = *disagree*, 3 = *neutral*, 4 = *agree*, and 5 = *strongly agree*. Table 2 details the 6-items of this measure from Appendix C and provides the *short code* for each item.

Table 2

*Items from the Multigroup Ethnic Identity Measure-Revised (MEIM-R) and their Short Codes*

Short code	MEIM-R item
Spend time	1. I have spent time trying to find out more about my ethnic group, such as its history, traditions, and customs.
Sense of belonging	2. I have a strong sense of belonging to my own ethnic group.
Understand	3. I understand pretty well what my ethnic group membership means to me.
Done things	4. I have often done things that will help me understand my ethnic background better.
Talk to others	5. I have often talked to other people in order to learn more about my ethnic group.
Strong attachment	6. I feel a strong attachment towards my own ethnic group.

Notes. Response options: 1 = *strongly disagree*, 2 = *disagree*, 3 = *neutral*, 4 = *disagree*, 5 = *strongly disagree*.

Adapted from Phinney & Ong, 2007

**Ethnic Identity Scale.** The 17-item Ethnic Identity Scale (EIS) was also included (Umaña-Taylor et al., 2004). Six-items are reverse-coded. An item from the scale is, “I am clear about what my ethnicity means to me.” While the EIS is typically administered with four category response options, five response options have also been utilized (White, Umaña-Taylor, Knight, & Zeiders, 2011).

Table 3

*Items from the Ethnic Identity Scale (EIS) and their Short Codes*

Short code	EIS item
Negative feelings	1. My feelings about my ethnicity are mostly negative. (RC)
No participation	2. I have not participated in any activities that would teach me about my ethnicity. (RC)
Clear	3. I am clear about what my ethnicity means to me.
Experienced	4. I have experienced things that reflect my ethnicity, such as eating food, listening to music, and watching movies.
Attended events	5. I have attended events that have helped me learn more about my ethnicity
Read books	6. I have read books/magazines/newspapers or other materials that have taught me about my ethnicity.
Feel negatively	7. I feel negatively about my ethnicity. (RC)
Participated exposed	8. I have participated in activities that have exposed me to my ethnicity.
Wish different	9. I wish I were of a different ethnicity. (RC)
Not happy	10. I am not happy with my ethnicity. (RC)
Learned	11. I have learned about my ethnicity by doing things such as reading (books, magazines, newspapers), searching the internet, or keeping up with current events
Understand	12. I understand how I feel about my ethnicity.
Prefer different	13. If I could choose, I would prefer to be of a different ethnicity. (RC)
Know	14. I know what my ethnicity means to me.
Participated taught	15. I have participated in activities that have taught me about my ethnicity.
Dislike	16. I dislike my ethnicity. (RC)
Clear sense	17. I have a clear sense of what my ethnicity means to me.

Note. Reverse-coded items are indicated with "(RC)." Response options: 1 = *Not at all*, 2, 3, 4, 5 = *Very much*.

Adapted from Umaña-Taylor et al., 2004

Therefore, under the same rationale as with the MEIM and for continuity across measures, participants were instructed to indicate their agreement with each item using five response options: 1 = *not at all*, 2, 3, 4, 5 = *very much*. Table 3 details the 17-items from Appendix D and the corresponding *short codes*.

## **Procedure**

The measures were included in a department-wide online research system. Online accounts to a subject pool management system were created for students to participate in research for course credit. Through the online portal, students were given the option to participate in a prescreen questionnaire, which would provide access to various studies. Informed consent (Appendix E) was obtained prior to participation. Within the prescreen, participants began by completing a demographic questionnaire. Then respondents took various surveys to determine eligibility for research studies conducted within the Department of Psychology. The three measures of interest in the present work (i.e., MEIM, MEIM-R, and EIS) were included among those surveys. Upon completion of the questionnaires, students were able to register for participation in research studies for which they qualify. Respondents received research credit toward their course (e.g., Introduction to Psychology) for their participation in the prescreening questionnaire. No other compensation was extended as a result of participation.

Ethnicity for the analysis was determined based on the respondent's response to item 21, "My ethnicity is," of the Multigroup Ethnic Identity Measure detailed in Appendix A (Phinney, 1992). Response options were: (1) Asian, Asian American, Oriental, (2) Black or African American, (3) Hispanic or Latino, (4) White, Caucasian, European, not Hispanic, (5) American Indian, (6) mixed, parents are from two different groups, (7) other (write in).

## **Analysis Procedure**

**Step one: Response option review.** Category response frequencies were assessed in preparation for the item response theory analysis to follow. Category response options with under 10% of the responses for a given item were combined with an appropriate adjacent category (e.g., responses in the *agree* category were collapsed with those of *strongly agree*; see Preston et al., 2011, 2015). For example, if a five-category item (categories 1, 2, 3, 4, and 5) comprised of the following frequencies for each sequential option: 3%, 21%, 50%, 7%, 19%, the first two categories (1 and 2) and the last two categories (4 and 5) would be combined. The result would be a three-category option item: 1, 1, 2, 3, 3. This procedure helps to ensure there are enough responses in each category to be evaluated later by the nominal response model (NRM).

**Step two: Polychoric correlations.** A polychoric correlation matrix for each scale was obtained in R using the “psych” package (Revelle, 2013). This particular correlation was selected as it was developed specifically for ordinal scales, as opposed to interval-level like the Pearson correlation coefficient. Holgado-Tello et al. (2010) demonstrated in a simulation study with ordinal data the Pearson correlation matrix had truncated values compared to that of the polychoric correlation. It is common practice to use polychoric correlations in item response theory (Revelle, 2013) as is the case in the present study.

**Step three: Exploratory factor analysis.** With the polychoric correlation matrix as the input matrix, principal axis factor analysis (PAF) with varimax rotation was conducted in SPSS version 26. This method was selected as it parallels what was done in the EIS development (Umaña-Taylor et al., 2004), and consistency among evaluation techniques between the measures was highly valued. It was predicted that each measure would replicate the factor structure provided in its instructions: MEIM = 2 factors (Appendix B), MEIM-R = 2 factors (Appendix C), EIS = 3 factors (Appendix D).

Given the detailed development and breadth of application of these measures, it was expected the factor structures would be robust and in accordance with their instructions. Unfortunately, unidimensionality is a key assumption in item response theory. Multidimensional extensions for each item response theory model are under current investigation in the field of psychometrics. In their recent work, Falk and Ju (2020) explored the specification of the item response function (IRF) with a multidimension nominal response model (MNRM). However, there has yet to be an evaluation of the MNRM in its ability to accurately estimate category boundary discrimination parameters (CBDs). To accomplish this later point is outside the scope the present work. Instead, the focus was to evaluate the unidimensionality assumption in step three with the expectation the assumption will be violated in each of the three measures and will impact the results in later steps to an unknown degree. This process is inarguably an imperfect solution. The intention is to acknowledge the assumption violation, consider the implications on the present work, and bring attention to the need for future research in the arena of MNRM.

**Step four: NRM assessment.** To evaluate the first objective, the nominal response model (NRM) calibrated parameter estimates for each scale in flexMIRT 2.0 (Cai, 2013). Item parameter estimates were then evaluated by the Wald test per Preston et al. (2011) and Preston (2014). Items with significant Wald tests were evaluated based on the NRM, whereas nonsignificant results were re-estimated under the more restricted generalized partial credit model (GPCM; Muraki, 1992). The GPCM constrains the category boundary discrimination (CBD) to equal one. By excluding CBDs from estimation, within-item category distinctions cannot be assessed. Intersections, the location in which responses shift from one category to another, are still estimated.

For items evaluated by the NRM (i.e., that have a significant Wald tests), CBD parameters were then assessed. High, positive (i.e., +1.00-4.00) CBD parameters indicated the utility of the distinct response options. Whereas near-zero (e.g., .23) CBDs indicated a negligible distinction between categories, which then required revision. One within-item category was collapsed for each candidate item for each scale revision. Revisions occurred until either (1) all items return a nonsignificant Wald test, or (2) until each CBD parameter returned a satisfactory value (i.e., +1.00). Collapsing adjacent categories is expected to increase information at the category, item and test levels per Preston et al. (2015). Information values were assessed for each original scale (i.e., the full scale with categories only collapsed per the 10% category frequency cutoff described earlier) and the proposed scale (i.e., the revised scale when the revision criteria had been met).

**Step five: DIF assessment.** To assess the second objective, each proposed scale as found in step four will be re-calibrated in flexMIRT (Cai, 2013) to assess for differential item functioning (DIF) between two groups: Caucasian ( $n = 821$ ) and Hispanic ( $n = 2636$ ). These ethnic groups were selected as they comprised the two largest subsamples within the study allowing for no loss in power for DIF detection. Woods et al. (2015) established the use of the Wald Test for assessing DIF in two groups with a 2-parameter logistic model (2-PL). At present there has not been a review of whether the Wald test functions accurately for a two group DIF analysis with the NRM.

**Step six: Recommendations.** To evaluate the third objective, the results of step four and five were considered together to provide a recommendation for which scale to include in future studies.

## RESULTS

### **Response Option Evaluation**

Category response frequencies were assessed in SPSS version 26. The Multigroup Ethnic Identity Measure (MEIM; Roberts et al., 1999), Multigroup Ethnic Identity Measure-Revised (MEIM-R; Phinney & Ong, 2007), and Ethnic Identity Scale (EIS; Umaña-Taylor et al., 2004) all required categories to be collapsed to some degree. Tables 4-6 present the resulting frequencies for every category response option in each item of the three measures. The frequency of missing values was included in the tables. Only the EIS had items which retained all five category response options (items 5-attended events, 6-read books, 11-learned). The MEIM and EIS were initially developed on four-point scales, so it was expected there would be a reduction from the five categories offered in this study. The MEIM-R instructions (Appendix C) suggests using a five-point scale. The frequencies suggest three response options would suit most items on the MEIM and MEIM-R. Four response options are appropriate for most items on the EIS, based on the frequencies.

### **Polychoric Correlations**

The polychoric correlation matrix for each measure was obtained in R using the “psych” package (Revelle, 2013; Tables 7-9). There is one area of note: The EIS resulted in many negative correlations. Negative values were consistent among, but not limited to, reverse-worded items correlated with forward-worded items. This is despite all reverse-worded items being reverse-coded prior to analysis in accordance with the measure’s scoring directions (Appendix D). It remains unclear whether this is expected behavior for the EIS as inter-item correlations are not reported in the scale’s development (Umaña-Taylor et al., 2004) nor numerous application studies (e.g., Umaña-Taylor & Fine, 2004; Umaña-Taylor et al., 2006). Per the EIS instructions

(Appendix D), reverse-worded items comprise the Affirmation subscale and one additional reverse-worded item (Item 2) which loads onto the Exploration subfactor.

Table 4  
*Category Response Option Frequencies for the Multigroup Ethnic Identity Measure (MEIM) Before and After the Collapse Procedure*

MEIM item		Category					Missing
		1	2	3	4	5	
1. Spend time	Original	3.8	15.0	31.9	33.3	15.2	0.8
	Collapsed	18.8	31.9	33.3	15.2		0.8
2. Active in groups	Original	12.3	29.3	34.2	16.0	6.3	1.8
	Collapsed	12.3	29.3	34.2	22.3		1.8
3. Clear sense	Original	1.4	3.8	22.4	44.5	27.1	0.8
	Collapsed	27.7	44.5	27.1			0.8
4. Affected	Original	7.4	20.5	37.0	24.2	9.3	1.6
	Collapsed	28.0	37.0	33.5			1.6
5. Happy	Original	0.7	1.3	16.2	39.8	41.4	0.6
	Collapsed	18.2	39.8	41.4			0.6
6. Sense of belonging	Original	2.6	7.0	31.2	37.5	20.7	0.9
	Collapsed	40.8	37.5	20.7			0.9
7. Understand	Original	1.2	4.1	26.4	43.4	23.4	1.5
	Collapsed	31.8	43.3	23.4			1.5
8. Talk to others	Original	3.5	13.6	30.5	38.0	13.4	1.0
	Collapsed	17.1	30.5	38.0			1.0
9. Pride	Original	1.4	3.1	24.8	37.1	33.1	0.5
	Collapsed	29.4	37.1	33.1			0.5
10. Participate	Original	2.7	7.7	20.2	39.4	29.2	0.7
	Collapsed	10.4	20.2	39.4			0.7
11. Strong attachment	Original	2.2	7.0	32.6	35.9	21.6	0.6
	Collapsed	41.9	35.9	21.6			0.6
12. Feel good	Original	0.8	1.6	14.0	40.6	42.5	0.5
	Collapsed	16.4	40.6	42.5			0.5

*Note.* Frequencies are presented in percentages.

Table 5  
*Category Response Option Frequencies for the Multigroup Ethnic Identity Measure-Revised (MEIM-R) Before and After the Collapse Procedure*

MEIM-R item		Category					Missing
		1	2	3	4	5	
1. Spend time	Original	3.8	15.0	31.9	33.3	15.2	0.8
	Collapsed	18.8	31.9	33.3	15.2		0.8
2. Sense of belonging	Original	2.6	7.0	31.2	37.5	20.7	0.9
	Collapsed	40.8	37.5	20.7			0.9
3. Understand	Original	1.2	4.1	26.4	43.4	23.4	1.5
	Collapsed	31.8	43.3	23.4			1.5
4. Done things	Original	2.9	10.6	31.0	39.7	15.1	0.7
	Collapsed	13.5	31.0	39.7	15.1		0.7
5. Talk to others	Original	3.2	13.3	30.9	38.8	12.9	0.9
	Collapsed	16.5	30.9	38.8	12.9		0.9
6. Strong attachment	Original	2.2	7.0	32.6	35.9	21.6	0.6
	Collapsed	41.9	35.9	21.6			0.6

*Note.* Frequencies are presented in percentages.

Table 6

*Category Response Option Frequencies for the Ethnic Identity Scale (EIS) Before and After the Collapse Procedure*

EIS item		Category					Missing
		1	2	3	4	5	
1. Negative feelings	Original	73.9	15.2	8.0	1.9	0.8	0.3
	Collapsed	73.9	15.2	10.6			0.3
2. No participation	Original	34.1	24.0	23.0	10.1	7.4	1.3
	Collapsed	34.1	24.0	23.0	17.5		1.3
3. Clear	Original	2.7	8.3	22.1	27.6	38.6	0.6
	Collapsed	11.0	22.1	27.6	38.6		0.6
4. Experienced	Original	1.6	4.2	10.7	22.8	60.2	0.5
	Collapsed	16.5	22.8	60.2			0.5
5. Attended events	Original	10.4	14.5	21.9	23.7	28.9	0.5
	Collapsed	10.4	14.5	21.9	23.7	28.9	0.5
6. Read books	Original	11.9	17.5	25.5	23.3	21.0	0.7
	Collapsed	11.9	17.5	25.5	23.3	21.0	0.7
7. Feel negatively	Original	78.4	12.5	6.4	1.7	0.5	0.5
	Collapsed	78.4	21.1				0.5
8. Participated exposed	Original	7.9	14.4	25.2	25.4	26.4	0.7
	Collapsed	22.4	25.2	25.4	26.4		0.7
9. Wish different	Original	76.6	11.2	7.7	2.6	1.1	0.8
	Collapsed	76.6	11.2	11.5			0.8
10. Not happy	Original	75.5	7.7	5.7	2.7	7.1	1.4
	Collapsed	75.5	23.2				1.4
11. Learned	Original	12.0	19.8	27.2	21.9	18.3	0.8
	Collapsed	12.0	19.8	27.2	21.9	18.3	0.8
12. Understand	Original	1.7	5.6	19.6	28.2	44.1	0.8
	Collapsed	26.9	28.2	44.1			0.8
13. Prefer different	Original	75.1	11.9	7.6	3.1	1.5	0.8
	Collapsed	75.1	11.9	12.2			0.8
14. Know	Original	2.2	8.1	22.0	25.7	41.2	0.9
	Collapsed	10.3	22.0	25.7	41.2		0.9
15. Participated taught	Original	8.9	16.3	24.5	25.0	24.5	0.7
	Collapsed	25.2	24.5	25.0	24.5		0.7
16. Dislike	Original	85.4	8.0	4.4	1.1	0.4	0.6
	Collapsed	85.4	14.0				0.6
17. Clear sense	Original	2.2	8.7	22.2	26.0	40.0	0.8
	Collapsed	10.9	22.2	26.0	40.0		0.8

Note. Frequencies are presented in percentages.

Table 7

*Polychoric Correlation of the Multigroup Ethnic Identity Measure (MEIM)*

MEIM item	<i>n</i>	1	2	3	4	5	6	7	8	9	10	11	12
1. Spend time	4771	1											
2. Active in groups	4723	.33	1										
3. Clear sense	4773	.52	.21	1									
4. Affected	4735	.26	.24	.18	1								
5. Happy	4780	.34	.22	.64	.12	1							
6. Sense of belonging	4767	.47	.3	.53	.17	.66	1						
7. Understand	4741	.46	.24	.79	.22	.54	.62	1					
8. Talk to others	4764	.61	.31	.47	.23	.41	.4	.45	1				
9. Pride	4787	.48	.24	.64	.15	.71	.69	.58	.46	1			
10. Participate	4776	.51	.31	.50	.17	.47	.53	.53	.45	.47	1		
11. Strong attachment	4781	.48	.33	.61	.23	.65	.72	.62	.45	.71	.48	1	
12. Feel good	4786	.45	.21	.67	.09	.80	.60	.67	.44	.78	.49	.67	1

Note. *N* = 4811. All pairwise-correlations are significant at  $p < .01$ .

Table 8

*Polychoric Correlation of the Multigroup Ethnic Identity Measure-Revised (MEIM-R)*

MEIM-R item	<i>n</i>	1	2	3	4	5	6
1. Spend time	4771	1					
2. Sense of belonging	4767	.50	1				
3. Understand	4741	.50	.60	1			
4. Done things	4781	.70	.50	.50	1		
5. Talk to others	4777	.60	.40	.50	.40	1	
6. Strong attachment	4766	.50	.70	.60	.60	.60	1

Note. *N* = 4811. All pairwise-correlations are significant at  $p < .01$ .

Table 9

*Polychoric Correlation of the Ethnic Identity Scale (EIS)*

EIS item	<i>n</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
1. Negative feelings	4797	1																	
2. No participation	4750	.22	1																
3. Clear	4780	-.30	-.20	1															
4. Experienced	4788	-.30	-.20	.57	1														
5. Attended events	4785	-.20	-.40	.52	.65	1													
6. Read books	4778	-.20	-.30	.48	.53	.68	1												
7. Feel negatively	4786	.80	-.20	.35	-.30	-.20	-.20	1											
8. Participated exposed	4777	-.20	-.30	.48	.58	.77	.62	-.20	1										
9. Wish different	4774	.60	-.20	.29	-.20	-.20	-.10	.69	-.10	1									
10. Not happy	4746	.47	-.20	.22	-.20	-.10	-.10	.57	-.10	.55	1								
11. Learned	4773	-.10	-.30	.45	.48	.61	.80	-.20	.61	-.10	-.10	1							
12. Understand	4774	-.40	-.20	.69	.50	.44	.42	-.40	.44	-.40	-.20	.43	1						
13. Prefer different	4774	.58	-.20	.29	-.20	-.20	-.20	.67	-.10	.90	.54	-.10	-.40	1					
14. Know	4768	-.30	-.20	.79	.55	.51	.48	-.40	.50	-.40	-.20	.48	.80	-.40	1				
15. Participated taught	4775	-.20	-.40	.51	.59	.83	.69	-.20	.84	-.10	-.10	.68	.46	-.10	.54	1			
16. Dislike	4784	.74	-.20	.35	-.30	-.20	-.20	.85	-.20	.81	.66	-.20	-.40	.81	-.40	-.20	1		
17. Clear sense	4772	-.30	-.30	.80	.55	.52	.49	-.40	.51	-.40	-.20	.49	.82	-.40	.92	.56	-.40	1	

Note. *N* = 4811. All pairwise-correlations are significant at  $p < .01$ .

## Exploratory Factor Analysis

A principal axis factor analysis (PAF) with varimax rotation was conducted in SPSS with the polychoric correlation matrix for each of the three measures: MEIM, MEIM-R, and EIS. An eigenvalue cutoff of 1.00 was used to determine the number of factors. Variables were determined to belong to a factor with loading value of .40 or greater (Tabachnick & Fidell, 2012).

The selection of an orthogonal rotation (i.e., varimax) required the factors to be uncorrelated. This restriction was viewed as an asset provided the expectation for violation of the unidimensionality assumption in the nominal response model. Acknowledging the potential flaws in the approach of this study was an important goal. Varimax rotation exaggerates the factor loadings (e.g., maximizes large loadings and minimizes small loadings; Tabachnick & Fidell, 2012), which created a clear picture of the factor structure.

**Multigroup Ethnic Identity Measure.** For the MEIM, PAF with varimax rotation extracted two factors with 63.08% variance accounted for (see Table 10 for eigenvalues, loadings of variables on the rotated factors, and percentages of variance). Factor loadings follow the subfactor structure detailed in the measure’s instructions (Appendix B), with two exceptions. First, item 4-Affected, was expected to load on the Exploration factor but did not have a sufficient loading (.40 or above; Tabachnick & Fidell, 2012) on either factor. Conversely, item 10-Participate, was expected to only load on the Exploration but loaded on both factors

Table 10  
*Results from a Factor Analysis of the Multigroup Ethnic Identity Measure (MEIM)*

MEIM Item	Factor loading	
	1	2
Factor 1: Affirmation/Belonging		
12. Feel good	<b>.87</b>	.20
5. Happy	<b>.84</b>	.15
9. Pride	<b>.80</b>	.28
11. Strong attachment	<b>.71</b>	.39
6. Sense of belonging	<b>.69</b>	.36
3. Clear sense	<b>.69</b>	.39
7. Understand	<b>.66</b>	<b>.41</b>
Factor 2: Exploration		
10. Participate	<b>.45</b>	<b>.49</b>
8. Talk to others	.34	<b>.62</b>
1. Spend time	.31	<b>.73</b>
2. Active in groups	.15	<b>.43</b>
4. Affected	.06	.37
Eigenvalue	6.30	1.27
% variance	52.47%	10.61%
% cumulative variance	52.47%	63.08%

Note. N = 4811. Bolded numerals indicate factor loading .40 or higher.

(Affirmation/Belonging = .45, Exploration = .49). Otherwise, the factor structure was produced as expected. Additionally, Cronbach's alpha was produced in SPSS with the raw item data for the full scale. Alpha coefficients of Affirmation/Belonging = .87, Exploration = .73 were achieved, indicating good and acceptable internal consistency for the respective factors.

**Multigroup Ethnic Identity Measure-Revised.** The MEIM-R had 75.96% of the variance accounted for by two-factors assessed with PAF with varimax rotation (Table 11). The factor loadings aligned perfectly with that found in the measure's instructions (Appendix C). The Exploration factor includes items 1-Spend time, 4-Done things, 5-Talk to others. The Commitment factor includes items 2-Sense of belonging, 3-Understand, and 6-Strong attachment (see Table 11 for rotated factor loadings, eigenvalues, and percentages of variance). As noted in the MEIM-R instructions, item 3-Understand loads on both factors but, has a stronger association with the Commitment factor (Exploration = .42, Commitment = .60). The raw data in SPSS was then used to calculate Cronbach's alpha. The alpha coefficients: Exploration = .78, Commitment = .77, indicated acceptable internal consistency.

Table 11  
*Results from a Factor Analysis of the Multigroup Ethnic Identity Measure-Revised (MEIM-R)*

MEIM-R item	Factor	
	1	2
Factor 1: Exploration		
1. Spend time	<b>.76</b>	.34
4. Done things	<b>.73</b>	<b>.40</b>
5. Talk to others	<b>.69</b>	.26
Factor 2: Commitment		
2. Sense of belonging	.29	<b>.78</b>
6. Strong attachment	.33	<b>.78</b>
3. Understand	<b>.42</b>	<b>.60</b>
Eigenvalue	3.7	.82
% variance	62.30%	13.66%
% cumulative variance	62.30%	75.96%

*Note.*  $N = 4811$ . Bolded numerals indicate factor loading .40 or higher.

**Ethnic Identity Scale.** PAF with varimax rotation extracted three factors on the EIS. The cumulative variance accounted for by the three factors was 73.46% (see Table 12 for eigenvalues,

loadings of variables on the rotated factors, and percentages of variance). The three subfactors detailed in the EIS (Appendix D) were nearly all identified by this analysis. The only discrepancy is item 2-No participation which was expected to load on the Exploration factor, but did not meet the .40 criteria to qualify for any factor. The highest loading of this item was .18 on the Affirmation factor. Cronbach's alpha for the raw item data evaluated in SPSS indicted the following internal consistencies of the factors: Exploration = .88 (good), Affirmation = .77 (acceptable), Resolution = .89 (good).

Table 12  
*Results from a Factor Analysis of the Ethnic Identity Scale (EIS)*

EIS item	Factor loading		
	1	2	3
Factor 1: Exploration			
15. Participated taught	<b>.89</b>	-.06	.24
5. Attended events	<b>.85</b>	-.09	.23
8. Participated exposed	<b>.82</b>	-.03	.24
6. Read books	<b>.77</b>	-.07	.23
11. Learned	<b>.73</b>	-.05	.25
4. Experienced	<b>.58</b>	-.14	.38
Factor 2: Affirmation			
16. Dislike	-.12	<b>.94</b>	-.18
7. Feel negatively	-.04	<b>.85</b>	-.18
9. Wish different	-.13	<b>.84</b>	-.18
13. Prefer different	-.06	<b>.84</b>	-.16
1. Negative feelings	-.12	<b>.74</b>	-.15
10. Not happy	-.08	<b>.64</b>	-.07
2. No participation	-.38	.18	-.07
Factor 3: Resolution			
17. Clear sense	.36	-.23	<b>.86</b>
14. Know	.35	-.24	<b>.85</b>
12. Understand	.31	-.27	<b>.74</b>
3. Clear	.39	-.20	<b>.71</b>
Eigenvalue	7.66	3.48	1.34
% variance	45.09%	20.48%	7.88%
% cumulative variance	45.09%	65.57%	73.46%

Note.  $N = 4811$ . Bolded numerals indicate factor loading .40 or higher.

## NRM Assessment

The nominal response model estimated parameters for each of the three measures: MEIM, MEIM-R, and EIS. As expected, items were dropped, and categories were collapsed among the scales. Many items had significant Wald tests in the original run. However, if an item did not also

have well-functioning categories, it was dropped during the revision process. The results from the first run (original) and final run (proposed) are presented (Tables 13-15).

**Multigroup Ethnic Identity Measure.** The MEIM underwent multiple revisions until a satisfactory solution was achieved. The MEIM retained seven of the twelve items in the proposed model. Table 13 lists the original parameters estimates and Wald results for each item and includes those values for proposed model for the applicable items.

Figures 1 and 2 display the category response curves (CRC) for example items. CRC's are the graphical representation of the parameters estimated by the item response theory model. Here, the primary interest is in the category boundary discrimination (CBD) parameter as this is the metric which distinguishes the utility of adjacent categories.

Figure 1 plots the CRC for Item 4-Affected in its original state (original meaning after the category collapse procedure). This item was not eligible to continue in the model, as the CBDs were near zero ( $CBD_1 = 0.16$ ,  $CBD_2 = 0.39$ ) and the Wald test was non-significant,  $\chi^2(1, N = 4,811) = 0.1, p = 0.76$ . The plot illustrates the severity of the item's problematic properties. The three categories (represented by red = 1, green = 2 and blue = 3) are shallow curves which span the length of theta and overlap. There is very little discrimination between selecting a response (1, 2, 3) depending on theta.

Figure 2 provides a nice contrast to Figure 1. This plot displays an example of a well-functioning item: item 9-Pride from the proposed model. With CBD values above 1.00 ( $CBD_1 = 2.44$ ,  $CBD_2 = 3.17$ ) and a significant Wald test,  $\chi^2(1, N = 4,811) = 13.99, p < .01$ , this item displays steep discrimination between response options along the latent trait continuum. Respondents low on ethnic identity have the highest probability of responding in the first category (considered to be the disagree valanced option). Whereas respondents who are highly

ethnically-identified have no probability of responding in that category. These clear distinctions between categories give confidence the item is capturing useful information for the measure to evaluate the latent trait. Removing poor-functioning items effectively removes noise from the model, which leaves a clearer picture painted from the well-functioning items.

A comparison of Figures 3 (original model) and 4 (proposed model) demonstrates the increase in information revealed by the scale revision exercise. The area under the curve in Figure 4 is denser compared to Figure 3, signifying greater information. Note the width of the curve does not expand. This is a fixture of the process: relative information (a probability) may be affected by collapsing response options and removing poor-functioning items, but the range of theta that is estimated does not. The MEIM is most informative for respondents within roughly two standard deviations below and above the mean. Marginal reliability was .87, indicating good internal consistency for the response pattern scores.

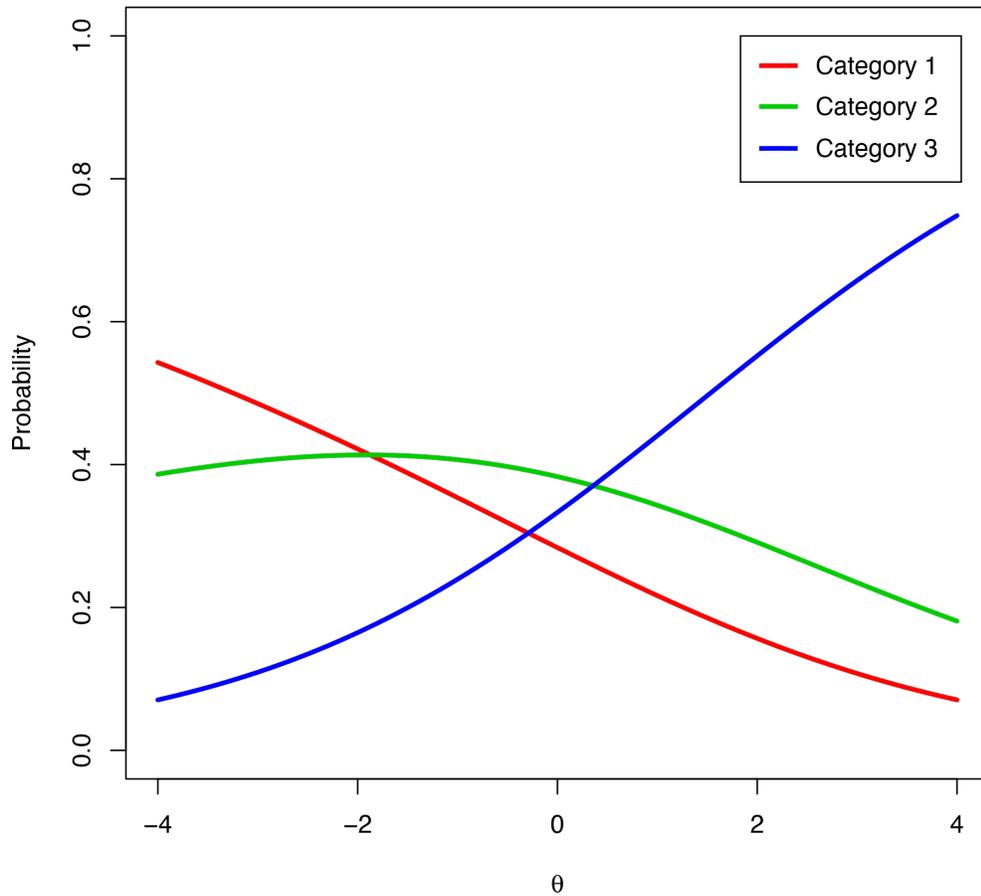
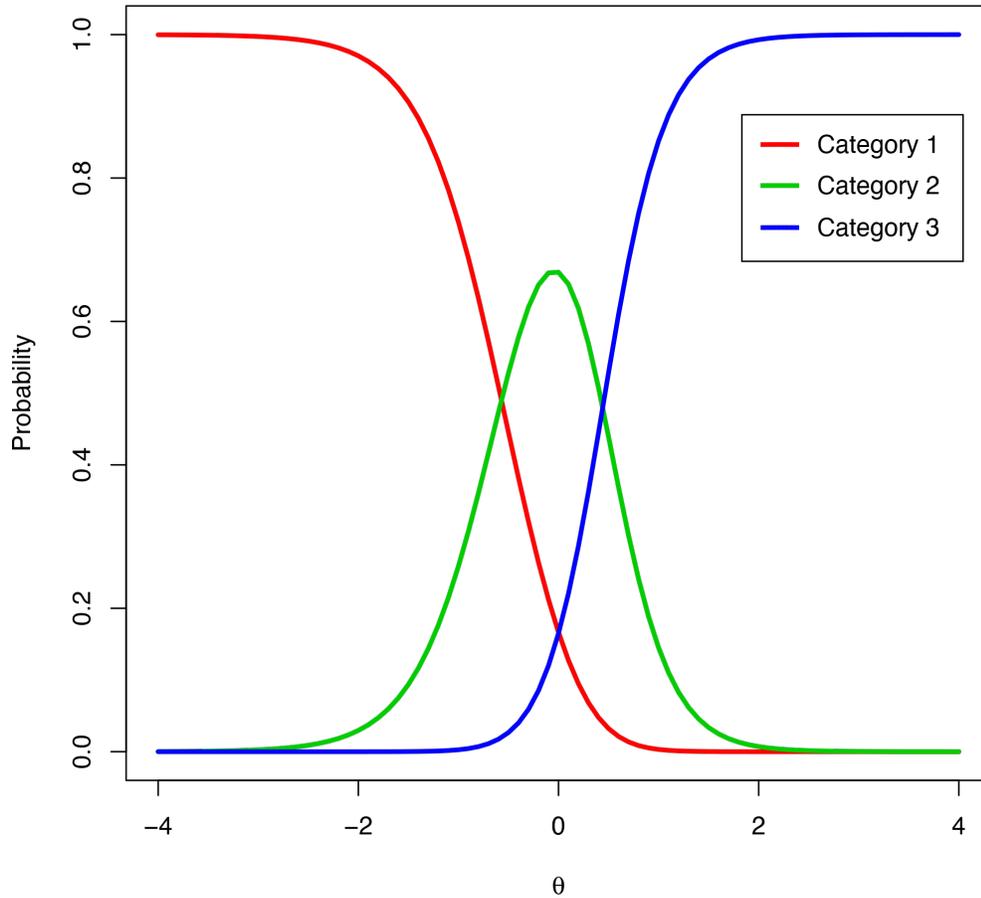


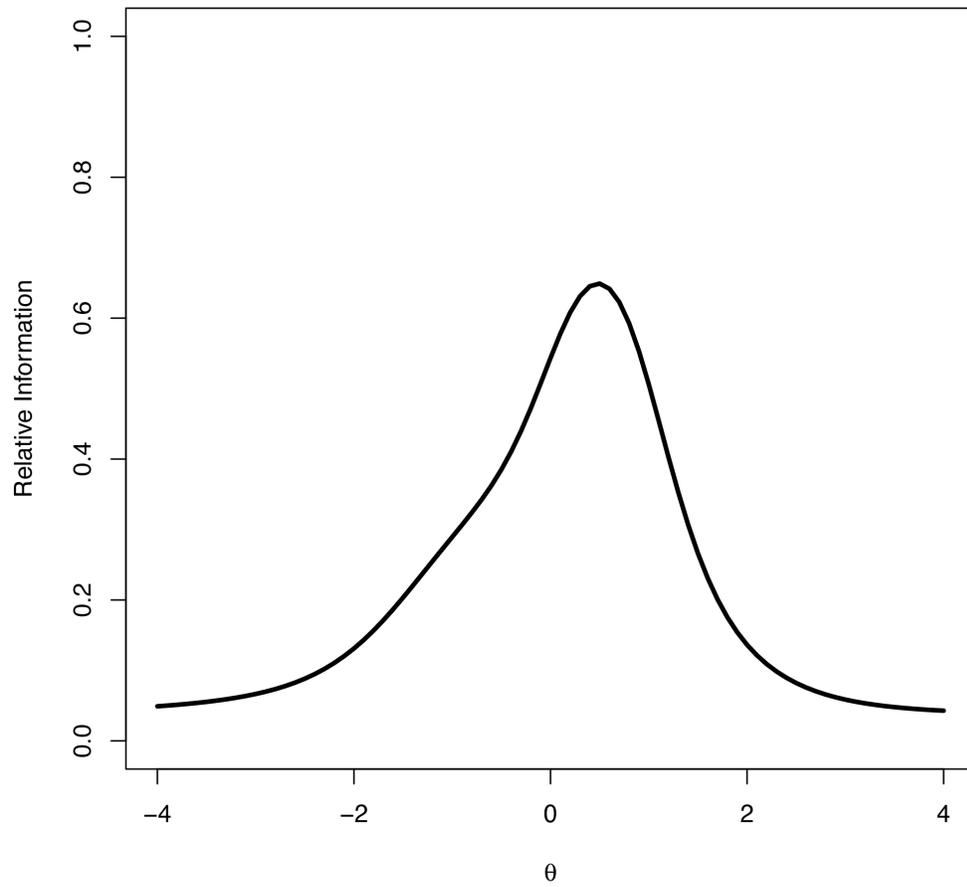
Figure 1. Category response curves for Multigroup Ethnic Identity Measure (MEIM) item 4 in the original model

Note. Item is modeled with the nominal response model with category boundary discrimination parameters of:  $CBD_1 = 0.16$ ,  $CBD_2 = 0.39$ .



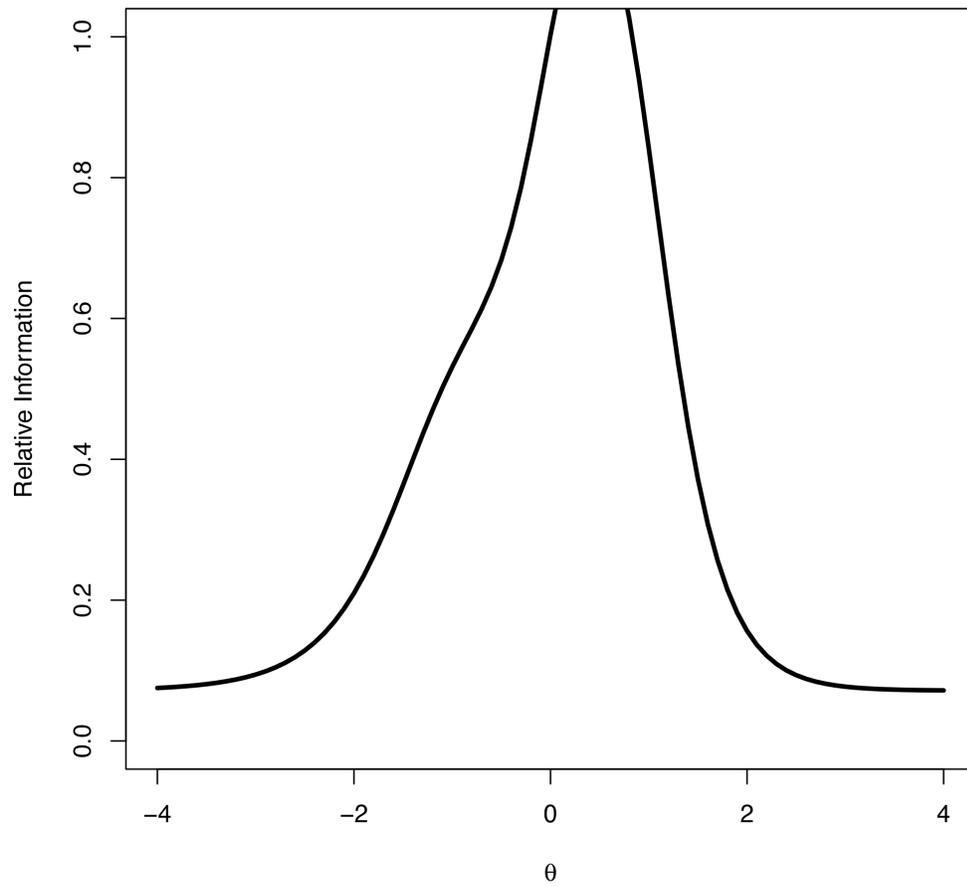
*Figure 2.* Category response curves for Multigroup Ethnic Identity Measure (MEIM) item 9 in the proposed model

*Note.* Item is modeled with the nominal response model with category boundary discrimination parameters of:  $CBD_1 = 2.44$ ,  $CBD_2 = 3.17$ .



*Figure 3.* Relative test information for the Multigroup Ethnic Identity Measure (MEIM) in the original model

*Note.* Item is modeled with the nominal response model.



*Figure 4.* Relative test information for the Multigroup Ethnic Identity Measure (MEIM) in the proposed model

*Note.* Item is modeled with the nominal response model.

**Table 13**

*Category Boundary Discrimination and Wald Test from Scale Revision of the Multigroup Ethnic Identity Measure (MEIM)*

MEIM item	CBD Parameter			Intersection			Wald Test		
	CBD <sub>1</sub>	CBD <sub>2</sub>	CBD <sub>3</sub>	Int <sub>1</sub>	Int <sub>2</sub>	Int <sub>3</sub>	$\chi^2$	df	<i>p</i>
1. Spend time									
Original	0.71	0.64	1.44	-1.24	-0.08	1.16	18.93	2	0
2. Active in groups									
Original	0.21	0.36	0.53	-4.48	-0.53	1.09	0.52	2	0.77
3. Clear sense									
Original	1.74	2.53		-0.71	0.66		22.52	1	0
Proposed	1.61	2.45		-0.73	0.66		25.88	1	0
4. Affected									
Original	0.16	0.39		-1.88	0.36		0.10	1	0.76
5. Happy									
Original	1.73	2.56		-1.13	0.21		19.15	1	0
Proposed	1.96	2.79		-1.09	0.21		19.33	1	0
6. Sense of belonging									
Original	1.57	2.89		-0.20	0.83		42.6	1	0
Proposed	1.56	2.98		-0.21	0.84		54.04	1	0
7. Understand									
Original	1.65	2.66		-0.55	0.77		29.26	1	0
Proposed	1.53	2.58		-0.57	0.78		36.54	1	0
8. Talk to others									
Original	0.68	0.57	1.57	-1.34	-0.44	1.3	22.75	2	0
9. Pride									
Original	2.39	3.03		-0.56	NA		8.6	1	0.003
Proposed	2.44	3.17		-0.57	0.44		13.99	1	0
10. Participate									
Original	0.58	0.54	1.5	-1.84	-1.50	0.54	14.12	2	0.001
11. Strong attachment									
Original	1.84	2.80		-0.16	0.80		19.24	1	0
Proposed	1.75	2.77		-0.16	0.81		32.76	1	0
12. Feel good									
Original	2.63	3.52		-1.14	0.19		11.59	1	0.001
Proposed	2.33	3.19		-1.11	0.19		14.09	1	0

**Multigroup Ethnic Identity Measure-Revised.** The MEIM-R did not require any scale revision (Table 14). The required metrics were met on the first run. That is, all CBDs were above 1.00 and each Wald test returned a significant result. While this scale had at least one category collapsed per item in preparation for the NRM (Table 5), the resulting categories for each of the 6-items performed very well when assessed under the NRM. The marginal reliability was .83, indicating good internal consistency for the response pattern scores.

Figure 5 displays an example item, item 1-Spend time. Each of the four categories have a decent probability of being selected by a respondent who falls within the bounds of its location on theta. There are clear transitions from one category to the next, as indicated by the good CBD values:  $CBD_1 = 1.27$ ,  $CBD_2 = 1.07$ ,  $CBD_3 = 2.07$ .

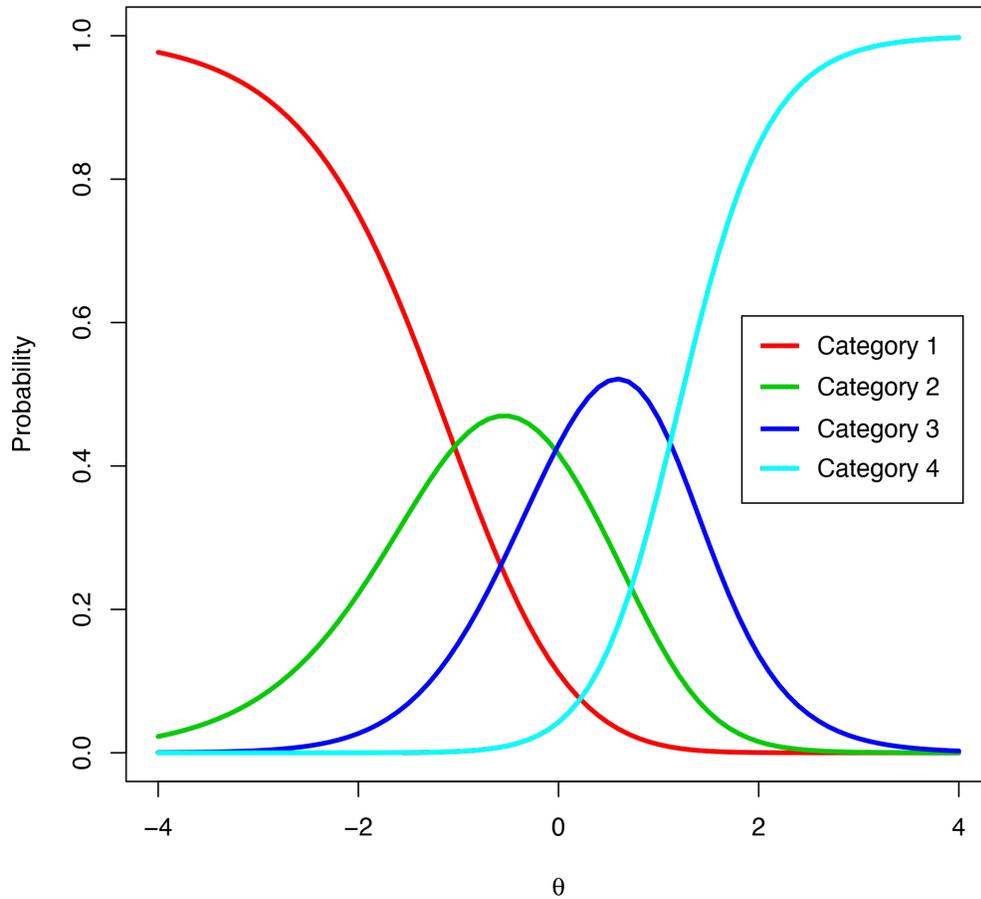
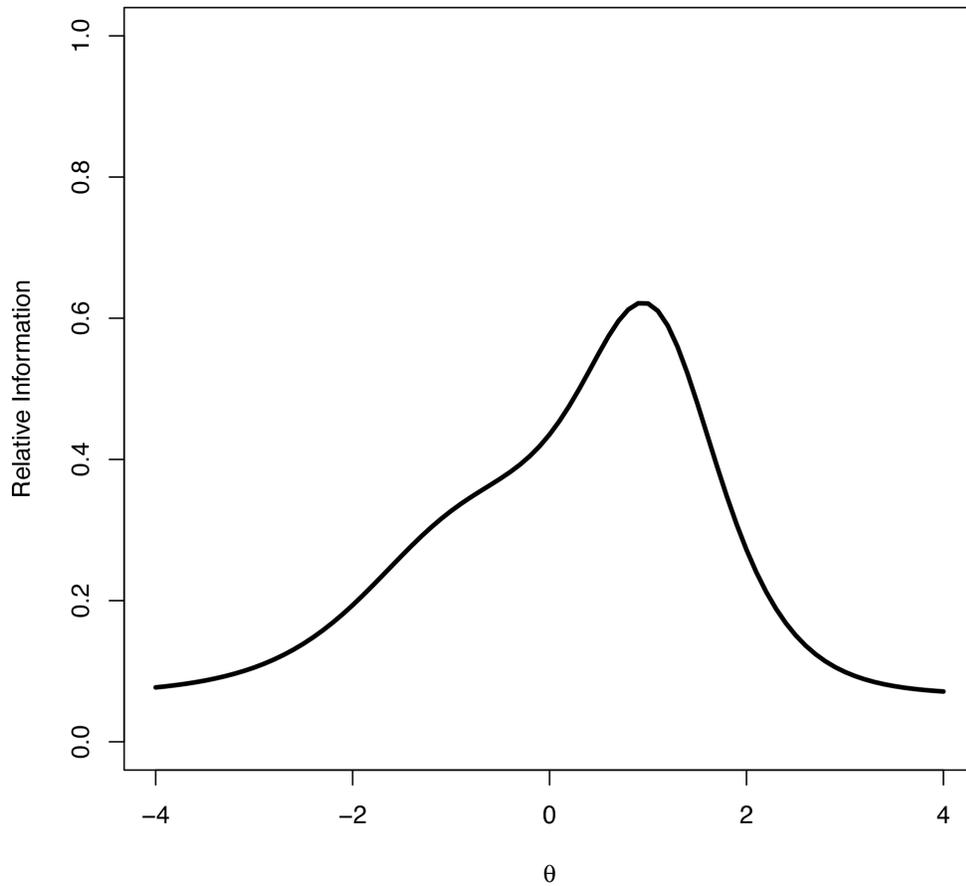


Figure 5. Category response curves for Multigroup Ethnic Identity Measure-Revised (MEIM-R) Item 1

Note. Item is modeled with the nominal response model with category boundary discrimination parameters of:  $CBD_1 = 1.27$ ,  $CBD_2 = 1.07$ ,  $CBD_3 = 2.07$ .

Figure 6 plots the test information for the MEIM-R. Notice a drop off in the slope of the curve around 2 standard deviations above the mean, this indicated this measure is not especially informative for respondents who are very high on the ethnic identity trait.



*Figure 6.* Relative test information for the Multigroup Ethnic Identity Measure-Revised (MEIM-R)  
*Note.* Item is modeled with the nominal response model.

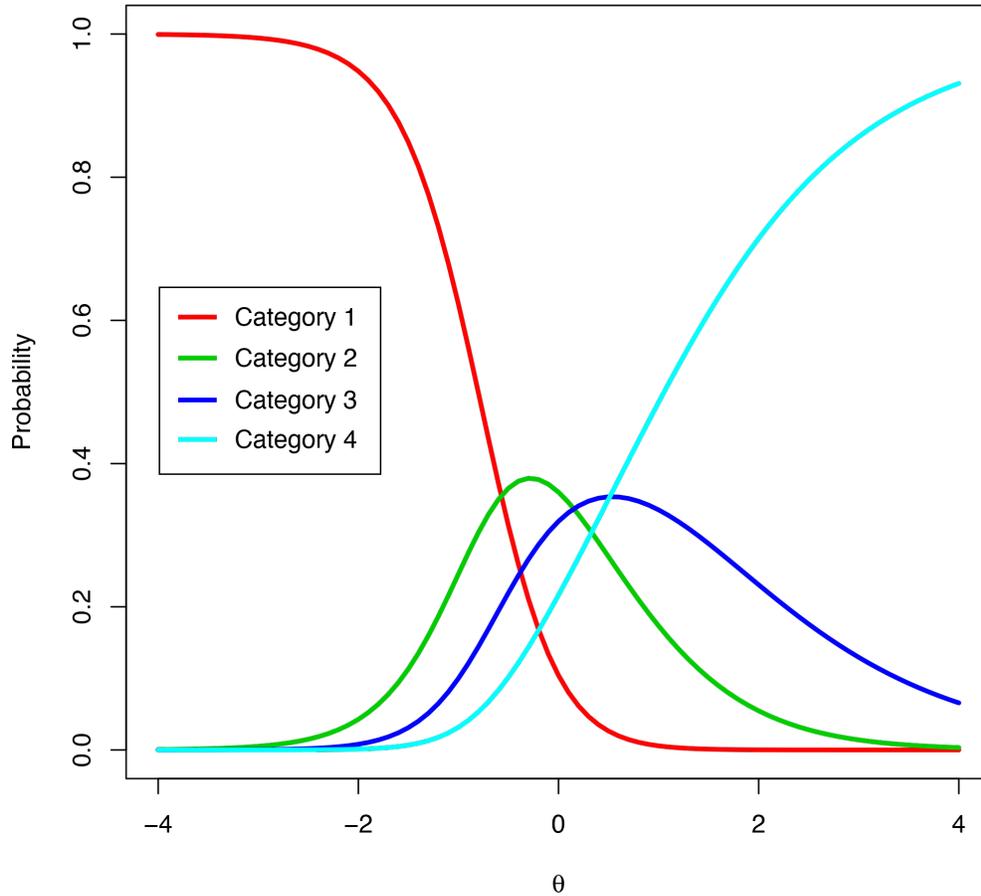
**Table 14**

*Category Boundary Discrimination and Wald Test from Scale Revision of the Multigroup Ethnic Identity Measure-Revised (MEIM-R)*

MEIM-R item	CBD Parameter			Intersection			Wald Test		
	CBD <sub>1</sub>	CBD <sub>2</sub>	CBD <sub>3</sub>	Int <sub>1</sub>	Int <sub>2</sub>	Int <sub>3</sub>	$\chi^2$	df	<i>p</i>
1. Spend time	1.27	1.07	2.07	-1.04	-0.03	1.12	23	2	0
2. Sense of belonging	1.21	2.00		-0.18	0.88		17.99	1	0
3. Understand	1.43	1.82		-0.57	0.84		6.11	1	0.01
4. Done things	1.69	1.52	2.62	-1.31	-0.22	1.13	18.54	2	0
5. Talk to others	1.17	1.03	1.8	-1.19	-0.23	1.35	13.24	2	0.001
6. Strong attachment	1.39	1.93		-0.13	0.84		10.01	1	0.002

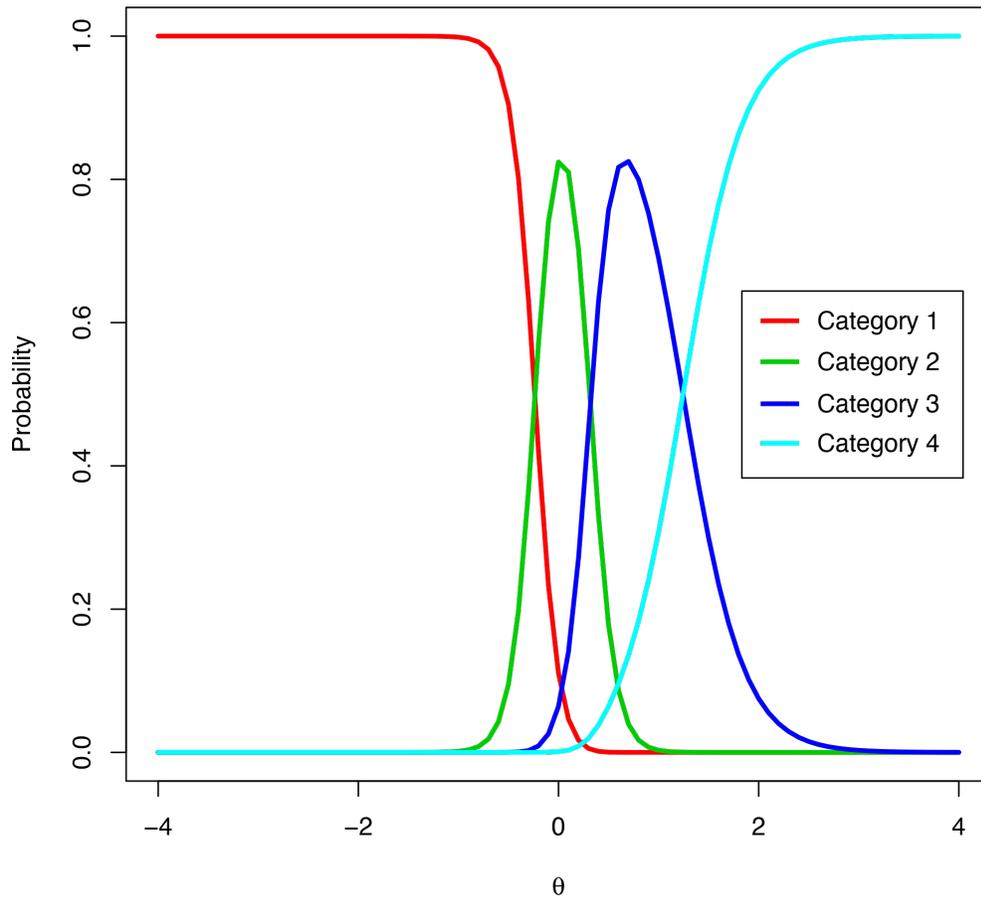
**Ethnic Identity Scale.** Similar to the 12-item MEIM, the EIS iterated through multiple revisions before the proposed model was achieved. The EIS began with several weak loadings either at or near zero across whole items (e.g., Table 15: item 1-Negative feelings, item 2-No participation, item 4-Experienced). Items such as these were dropped early in the revision process as collapsing categories could not build up enough information to come near the 1.00 CBD threshold. Of the original seventeen items, only four remained in the proposed model. However, among those four items were the highest CBD ratings of any item assessed across the three measures (e.g., Table 15, items 14-Know and 17-Clear sense proposed CBD parameters). Despite the reduction in item count by over three quarters, the marginal reliability of the response pattern was boosted from 0.82 in the original model, to 0.91 in the final (a 0.09 increase).

Figure 7 plots item 15-Participated taught from the original model of the scale. This is an example of an adequate item which meets some of the cut-off criteria. It has a significant Wald test,  $\chi^2(2, N = 4,811) = 911.26, p < .01$ , however, not all CBD's are above 1.00 (CBD<sub>1</sub> = 2.26, CBD<sub>2</sub> = 0.83, CBD<sub>3</sub> = 0.80). During the revision process, collapsing adjacent categories with CBDs under 1.00 together did not improve the item and resulted in a non-significant Wald test. Therefore, the item was ineligible to continue in this exercise and was removed from the model. In practice, however, leniency towards the CBD thresholds would have allowed for this item to remain in the proposed model.

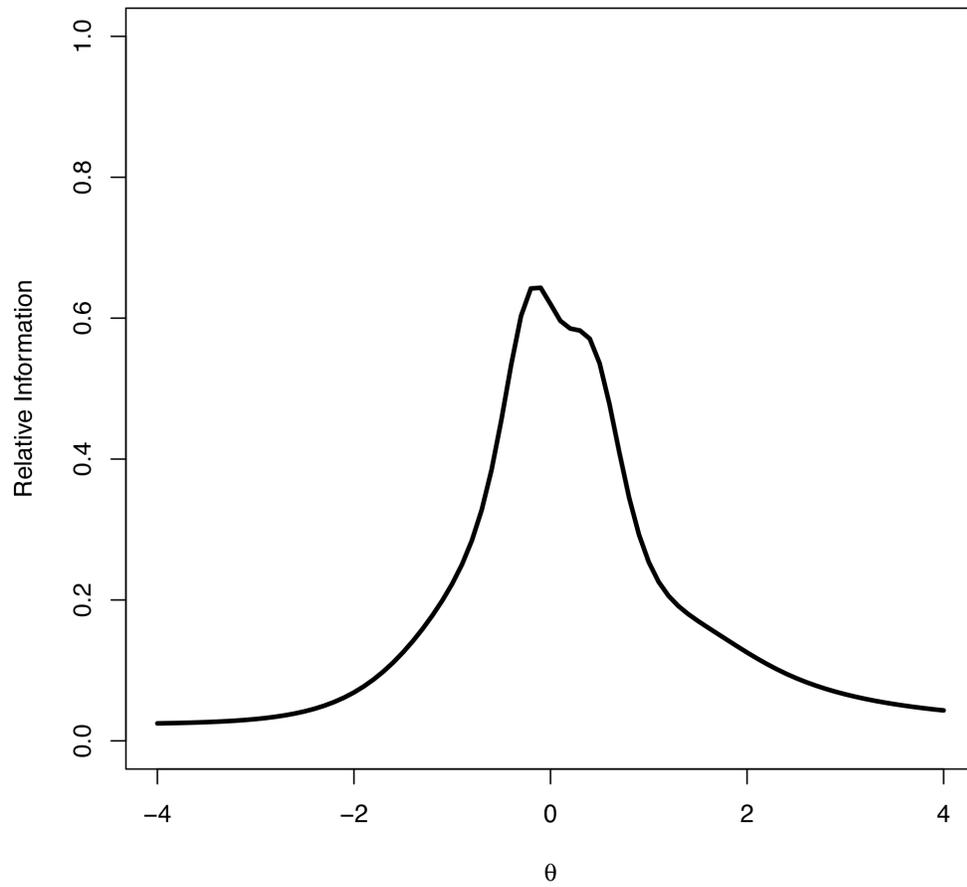


*Figure 7. Category response curves for Ethnic Identity Scale (EIS) item 15 in the original model*  
*Note.* Item is modeled with the nominal response model with category boundary discrimination parameters of:  $CBD_1 = 2.26$ ,  $CBD_2 = 0.83$ ,  $CBD_3 = 0.80$ .

Figure 8 plots a powerhouse item which displays highly discriminating categories with high probabilities: item 14-Know from the proposed scale. The CBDs were:  $CBD_1 = 8.53$ ,  $CBD_2 = 7.99$ ,  $CBD_3 = 3.32$ ; and Wald test,  $\chi^2(2, N = 4,811) = 123.13, p < .01$ .

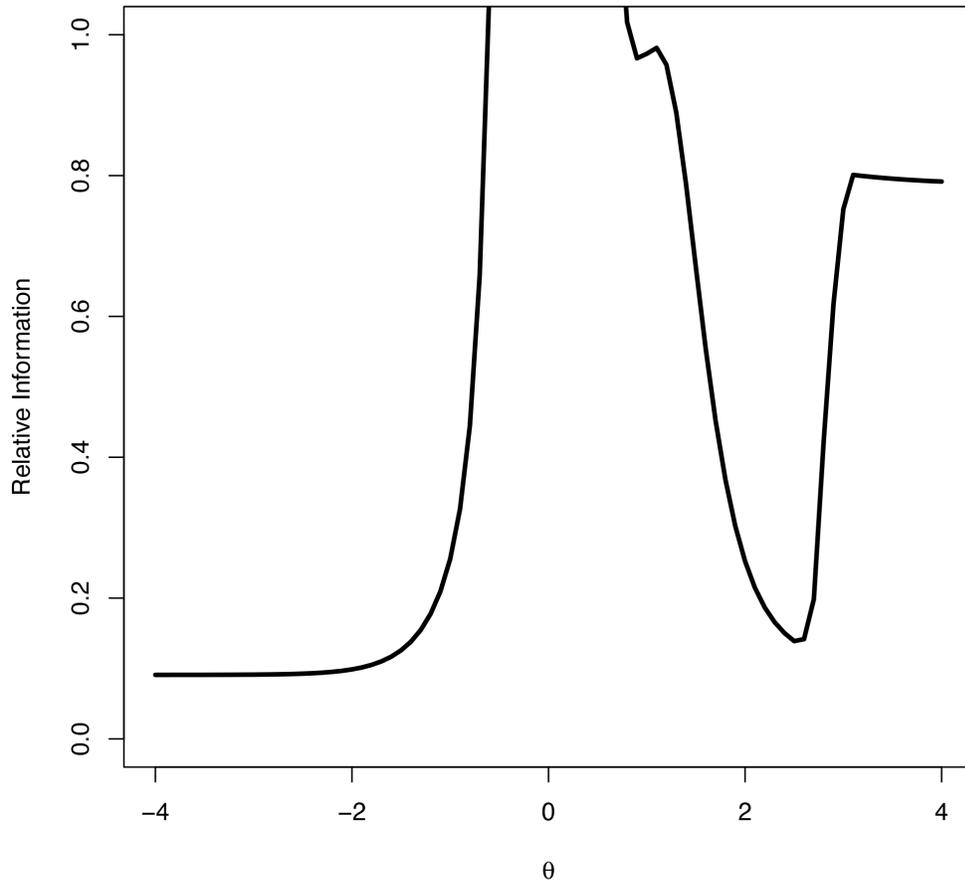


*Figure 8.* Category response curves for Ethnic Identity Scale (EIS) item 14 in the proposed model  
*Note.* Item is modeled with the nominal response model with category boundary discrimination parameters of:  $CBD_1 = 8.53$ ,  $CBD_2 = 7.99$ ,  $CBD_3 = 3.32$ .



*Figure 9.* Relative test information for the Ethnic Identity Scale (EIS) in the original model.  
*Note.* Item is modeled with the nominal response model.

Figure 10 illustrates the sharp increase in information for the proposed scale when compared to the information in the original scale in Figure 9.



*Figure 10.* Relative Test Information for the Ethnic Identity Scale (EIS) in the Proposed Model  
*Note.* Item is modeled with the nominal response model.

Table 15

*Category Boundary Discrimination and Wald Test from Scale Revision of the Ethnic Identity Scale (EIS)*

EIS Items		CBD Parameter				Intersection				Wald Test		
		CBD <sub>1</sub>	CBD <sub>2</sub>	CBD <sub>3</sub>	CBD <sub>4</sub>	Int <sub>1</sub>	Int <sub>2</sub>	Int <sub>3</sub>	Int <sub>4</sub>	$\chi^2$	df	<i>p</i>
1. Negative feelings	original	0	-0.61			NA	2.84			0.00	1	0.96
2. No participation	original	0.28	0.19			-0.79	0.21			NA	2	NA
3. Clear	original	2.63	2.04	1.20		-0.23	0.46	1.55		118.64	2	0
	proposed	3.19	2.13	1.27		-0.28	0.40	1.42		441.59	2	0
4. Experienced	original	1.31	0.81			0.72	1.06			20.68	1	0
5. Attended events	original	1.97	0.65	0.46	0.25	-0.37	0.31	1.37	2.08	1055.35	3	0
6. Read books	original	1.90	0.50	0.59	0.27	-0.66	-0.16	1.00	2.11	1063.87	3	0
7. Feel negatively	original	0				NA				0.00	0	0
8. Participated exposed	original	1.85	0.68	0.61		-0.49	0.16	0.72		482.76	2	0
9. Wish different	original	0	-0.57			NA	3.65			0.00	1	0.98
10. Not happy	original	0.89	-1.03			0.01	1.98			1438.66	1	0
11. Learned	original	1.70	0.68	0.51	0.28	-0.81	-0.34	0.96	2.36	568.33	3	0
	proposed	2.54	2.40			-0.09	0.55			0.67	1	0.42
13. Prefer different	proposed	2.80	2.80			-0.15	0.48			0.000	1	1
	original	0	-0.63			NA	3.17			0.01	1	0.93
14. Know	original	5.23	4.97	2.18		-0.21	0.41	1.44		42.84	2	0
	prop.	8.53	7.99	3.32		-0.24	0.32	1.24		123.13	2	0
15. Participated taught	original	2.26	0.83	0.80		-0.59	0.12	0.49		911.26	2	0
16. Dislike	original	0				NA				0.00	0	0
17. Clear sense	original	5.63	5.34	2.84		-0.24	0.38	1.34		34.47	2	0
	proposed	9.16	8.22	4.43		-0.27	0.29	1.16		1248.31	2	0

Note. When a CBD = 0, the Intersection cannot be calculated, denoted by "NA."

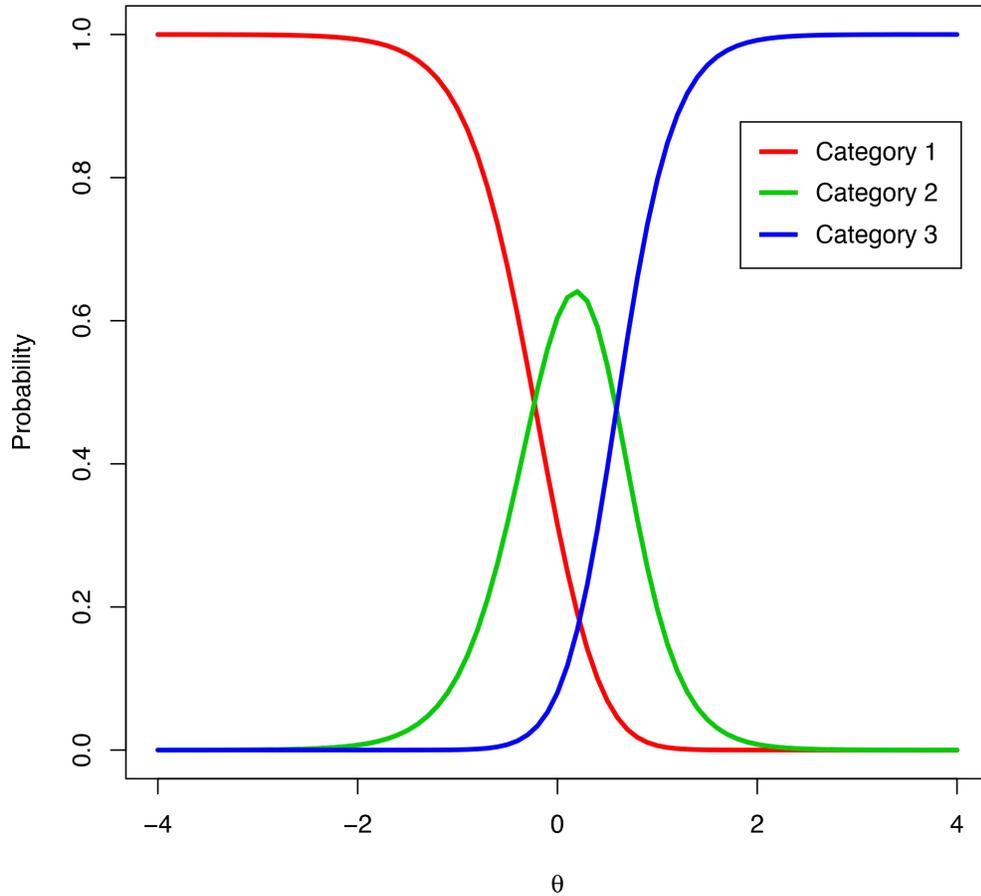
## DIF Assessment

The proposed version of each scale generated in the NRM assessment process (the previous step) was assessed for differential item functioning (DIF) for two ethnic subsamples: Caucasian (n = 821) and Hispanic (n = 2636).

**Multigroup Ethnic Identity Measure.** For the selected seven (of twelve) items from the MEIM, the Wald test found DIF for five (Table 16). Item 3, "I have a clear sense of my ethnic background and what it means for me," was one such non-DIF item,  $\chi^2(4, N = 3,457) = 8.3, p = .082$ . For this item, the expected item response from respondents of either ethnic group would be in accordance with their position on theta.

Item 9, "I have a lot of pride in my ethnic group," is an example of an item found to have DIF,  $\chi^2(4, N = 3,457) = 42.4, p = .0001$ . Figures 11 and 12 contain the Category Response Curves (CRCs) for Caucasian and Hispanic respondents, respectively. Comparing the two sets of CRCs can be helpful to understand the magnitude of the shifts in category responses. An

interpretation of what may be the source of the DIF could be to consider how this item is understood by the respondent. Internalizing and expressing pride is one's ethnic group has different cultural implications depending on group membership (Devos & Mohamed, 2014). In this case, Hispanic respondents have a higher probability of moving from the negatively valenced end (*disagree*) of the scale to the positively valenced side (*agree*) at lower levels of theta. In reference to the intersection parameters detailed in Table 17, Hispanic respondents move from the first response category to the second at the location -0.77. Caucasian respondents make this transition at -0.55. Therefore, Caucasian respondents must be higher on the latent trait (more ethnically identified) to obtain equal probability of responding in the second, as opposed to the first, category compared to Hispanic respondents. The discrepancy between the two ethnic groups and predicted category response narrows for the second intersection; there the shift from responding in the second category to the third is assessed. Hispanics transition at 0.71 and Caucasians at 0.69.



*Figure 11.* Category response curves for Caucasian respondents on item 9 of the Multigroup Ethnic Identity Measure (MEIM) in the proposed model

*Note.* Item is modeled with the nominal response model with intersections of:  $Int_1 = -0.23$ ,  $Int_2 = 0.59$ .

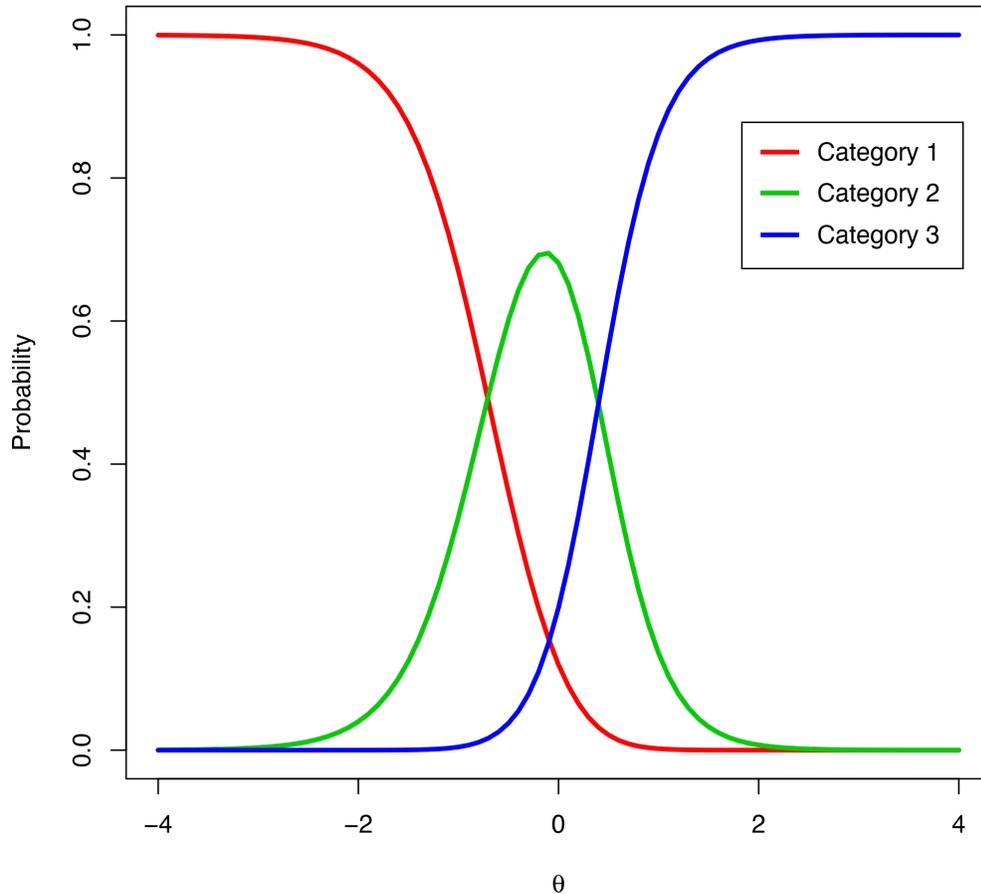


Figure 12. Category response curves for Hispanic respondents on item 9 of the Multigroup Ethnic Identity Measure (MEIM) in the proposed model

Note. Item is modeled with the nominal response model with intersections of:  $Int_1 = -0.71$ ,  $Int_2 = 0.4$ .

Table 16

DIF Detection Results by Lord's Wald Statistic with the Nominal Response Model for the Multigroup Ethnic Identity Measure (MEIM)

MEIM Items	Wald Test			DIF
	$\chi^2$	df	<i>p</i>	
3. Clear sense	8.3	4	.082	No
5. Happy	25.1	4	.0001	Yes
6. Sense of belonging	26.8	4	.0001	Yes
7. Understand	7.8	4	.1001	No
9. Pride	42.2	4	.0001	Yes
11. Strong attachment	55.8	4	.0001	Yes
12. Feel good	49.3	4	.0001	Yes

Note. The two groups assessed for differential item functioning (DIF) were Caucasian ( $n = 821$ ) and Hispanic ( $n = 2636$ ).

Table 17

*Multigroup Ethnic Identity Measure (MEIM) Category Boundary Discrimination and Intersections for Caucasian and Hispanic Samples*

MEIM item	CBD Parameters		Intersections	
	CBD <sub>1</sub>	CBD <sub>2</sub>	Int <sub>1</sub>	Int <sub>2</sub>
3. Clear sense				
Caucasian	1.72	2.44	-0.55	0.69
Hispanic	1.68	2.55	-0.77	0.71
5. Happy				
Caucasian	2.04	3.02	-0.84	0.38
Hispanic	1.84	2.79	-1.26	0.14
6. Sense of belonging				
Caucasian	1.90	3.46	0.01	0.83
Hispanic	1.50	2.74	-0.34	0.85
7. Understand				
Caucasian	1.73	2.84	-0.45	0.71
Hispanic	1.56	2.6	-0.62	0.81
9. Pride				
Caucasian	2.81	3.42	-0.23	0.59
Hispanic	2.46	3.08	-0.71	0.4
11. Strong attachment				
Caucasian	2.05	3.66	0.18	0.86
Hispanic	1.80	2.61	-0.33	0.79
12. Feel good				
Caucasian	3.02	4.93	-0.75	0.37
Hispanic	2.63	3.3	-1.27	0.13

Note. Caucasian  $n = 821$ , Hispanic  $n = 2636$ .

**Multigroup Ethnic Identity Measure-Revised.** Five of the six items of the MEIM-R were determined to have DIF through the Wald test (Table 18). Item 3, “I understand pretty well what my ethnic group membership means to me,” was the sole item to be found not to have DIF,  $\chi^2(4, N = 3,457) = 7.9, p = .099$ . This item also appears on the MEIM (item 7-Understand) and was also non-significant in that model. CBDs and intersections are presented in Table 19. Figure 13 plots the CRC for this item for Caucasian respondents and Figure 14 for Hispanic respondents.

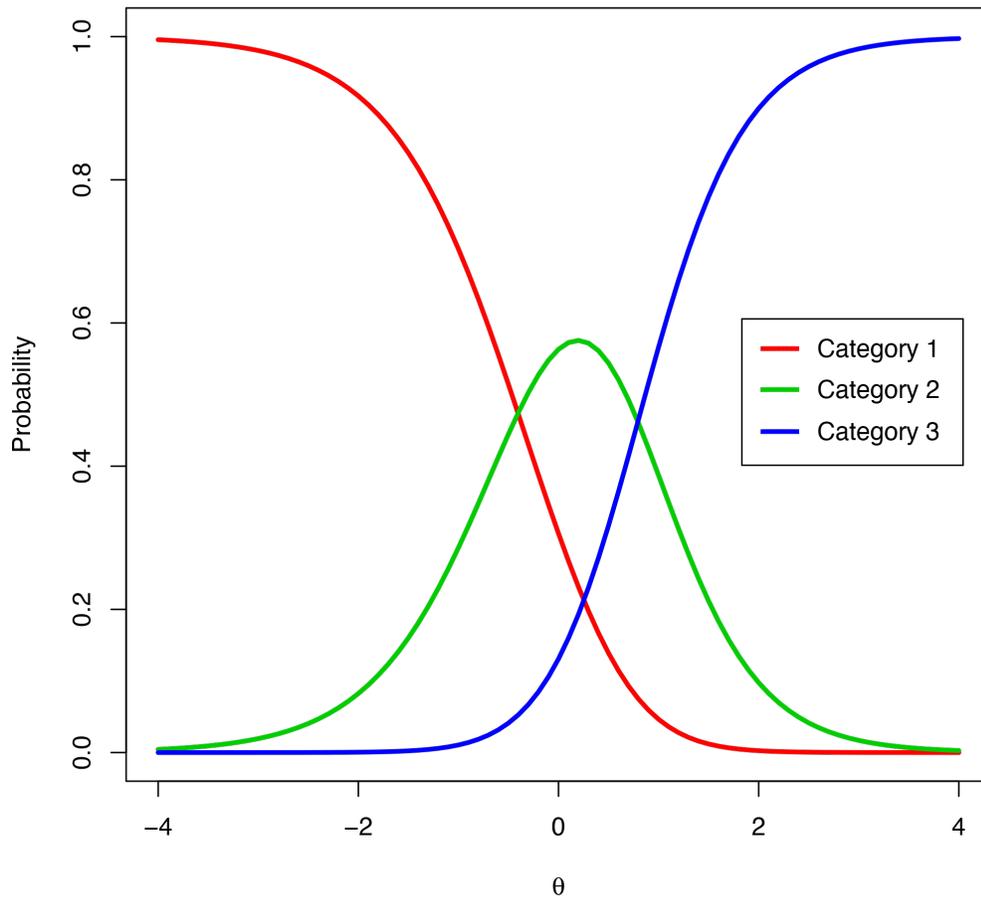


Figure 13. Category response curves for Caucasian respondents on item 3 of the Multigroup Ethnic Identity Measure-Revised (MEIM-R) in the proposed model

Note. Item is modeled with the nominal response model with intersections of:  $Int_1 = -0.40$ ,  $Int_2 = 0.79$ .

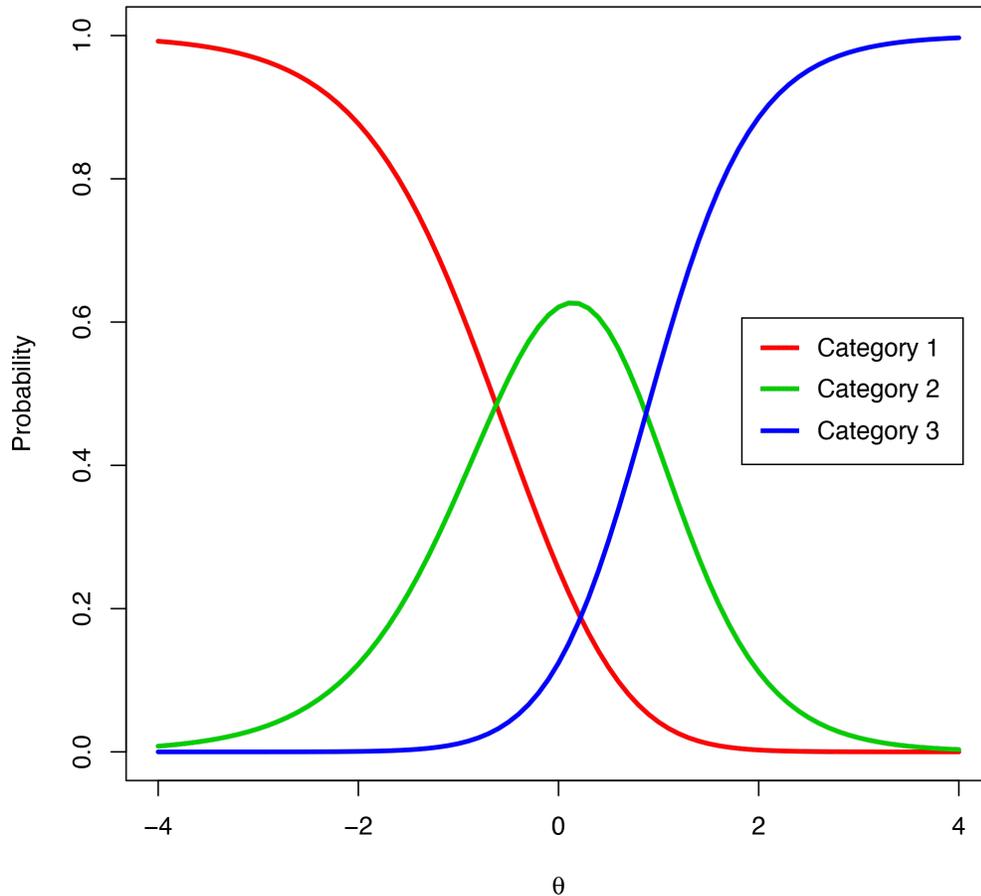


Figure 14. Category response curves for Hispanic respondents on item 3 of the Multigroup Ethnic Identity Measure-Revised (MEIM-R) in the proposed model

Note. Item is modeled with the nominal response model with intersections of:  $Int_1 = -0.62$ ,  $Int_2 = 0.87$ .

Table 18

DIF Detection Results by Lord's Wald Statistic with the Nominal Response Model for the Multigroup Ethnic Identity Measure-Revised (MEIM-R)

MEIM-R Items	Wald Test			DIF
	$\chi^2$	df	<i>p</i>	
1. Spend time	23	6	.0008	Yes
2. Sense of belonging	31	4	.0001	Yes
3. Understand	7.8	4	.099	No
4. Done things	48.5	6	.0001	Yes
5. Talk to others	66.2	6	.0001	Yes
6. Strong attachment	64.5	4	.0001	Yes

Note. The two groups assessed for differential item functioning (DIF) were Caucasian ( $n = 821$ ) and Hispanic ( $n = 2636$ ).

Table 19

*Multigroup Ethnic Identity Measure-Revised (MEIM-R) Category Boundary Discrimination for Caucasian and Hispanic Samples*

Items	CBD parameters			Intersections		
	CBD <sub>1</sub>	CBD <sub>2</sub>	CBD <sub>3</sub>	Int <sub>1</sub>	Int <sub>2</sub>	Int <sub>3</sub>
1. Spend time						
Caucasian	1.63	1.49	2.45	-0.69	0.06	1.03
Hispanic	1.02	1.11	2.08	-1.27	-0.01	1.24
2. Sense of belonging						
Caucasian	1.27	2.41		0.13	0.83	
Hispanic	1.15	1.73		-0.34	0.92	
3. Understand						
Caucasian	1.51	1.84		-0.40	0.79	
Hispanic	1.43	1.84		-0.62	0.87	
4. Done things						
Caucasian	2.03	2.00		-0.90	0.20	1.17
Hispanic	1.46	1.39		-1.53	-0.32	1.19
5. Talk to others						
Caucasian	1.27	1.33		-0.69	0.24	1.6
Hispanic	1.01	0.96		-1.51	-0.33	1.38
6. Strong attachment						
Caucasian	1.21	2.36		0.40	0.86	
Hispanic	1.50	1.79		-0.32	0.84	

Note. Caucasian  $n = 821$ , Hispanic  $n = 2636$ .

**Ethnic Identity Scale.** The Wald test found all four of the assessed items from the EIS to have DIF (Table 20). The differences in the probability of responding in particular categories are depicted in Figure 15 (Caucasian) and 16 (Hispanic) for Item 3, “I am clear about what my ethnicity means to me.” The intersections for item 3-Clear are more spread out for the Hispanic group (Int<sub>1</sub> = -0.33, Int<sub>2</sub> = 0.40, Int<sub>3</sub> = 1.52) than the Caucasian group (Int<sub>1</sub> = -0.21, Int<sub>2</sub> = 0.31, Int<sub>3</sub> = 1.16). This spread indicates a greater change in theta is required for a respondent to shift from one category response option to the next. Notice the density under each curve in the Figures: Caucasian respondents tend to be on one end of the scale or the other, whereas Hispanic respondents are more likely to use all response options. Table 21 presents the CBDs and intersections for each item and ethnic group.

Table 20

*DIF Detection Results by Lord's Wald Statistic with the Nominal Response Model for the Ethnic Identity Scale (EIS)*

EIS items	Wald Test			DIF
	$\chi^2$	df	<i>p</i>	
3. Clear	27.4	6	0.0001	Yes
12. Understand	8.7	3	0.0338	Yes
14. Know	15.4	6	0.0176	Yes
17. Clear sense	501.8	6	0.0001	Yes

Note. The two groups assessed for differential item functioning (DIF) were Caucasian (*n* = 821) and Hispanic (*n* = 2636).

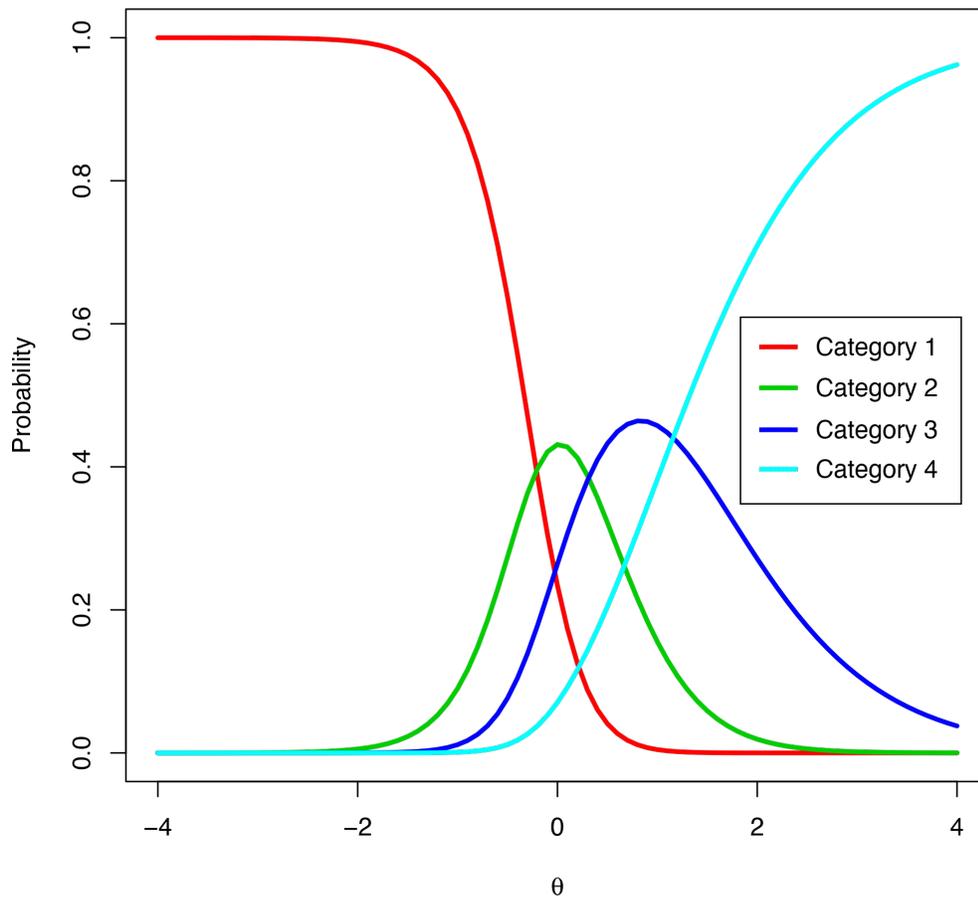
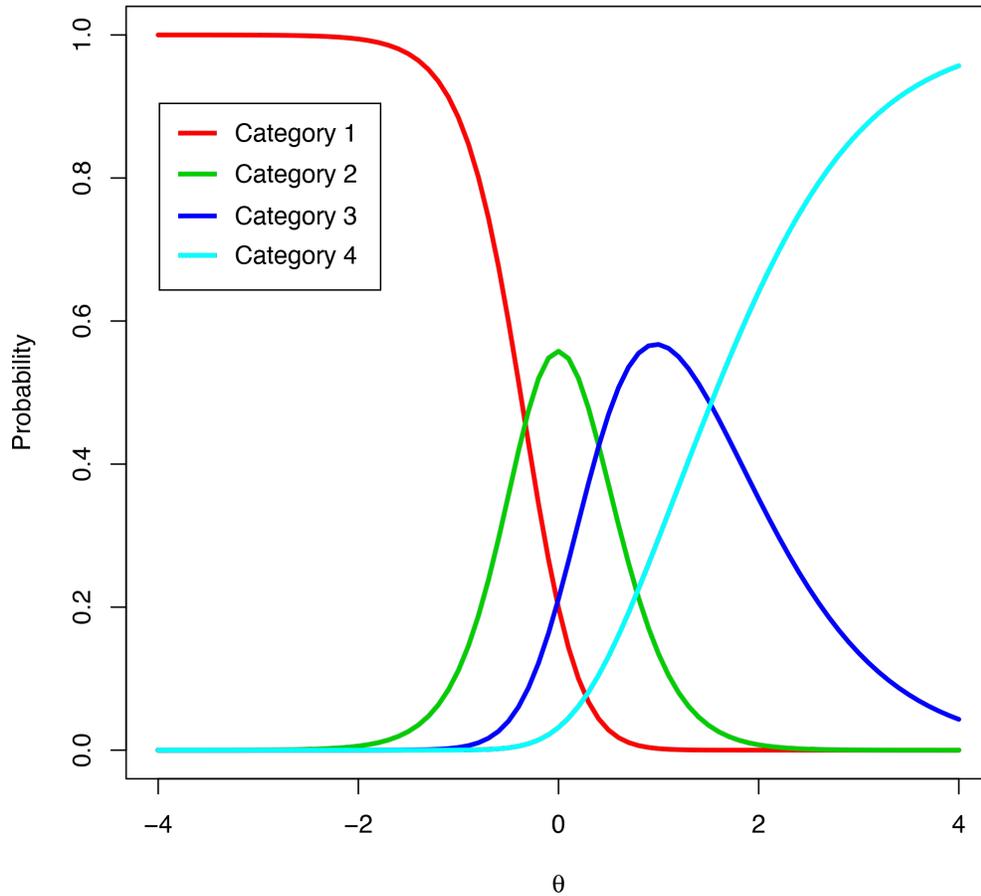


Figure 15. Category response curves for Caucasian respondents on item 3 of the Ethnic Identity Scale (EIS) in the proposed model

Note. Item is modeled with the nominal response model with intersections of:  $Int_1 = -0.21$ ,  $Int_2 = 0.31$ ,  $Int_3 = 1.16$ .



*Figure 16.* Category response curves for Hispanic respondents on item 3 of the Ethnic Identity Scale (EIS) in the proposed model

*Note.* Item is modeled with the nominal response model with intersections of:  $\text{Int}_1 = -0.33$ ,  $\text{Int}_2 = 0.40$ ,  $\text{Int}_3 = 1.52$ .

Table 21

*Ethnic Identity Scale (EIS) Category Boundary Discrimination for Caucasian and Hispanic Samples*

EIS Items	CBD parameters			Intersections		
	CBD <sub>1</sub>	CBD <sub>2</sub>	CBD <sub>3</sub>	Int <sub>1</sub>	Int <sub>2</sub>	Int <sub>3</sub>
3. Clear						
Caucasian	2.91	1.57	1.14	-0.21	0.31	1.16
Hispanic	3.10	2.41	1.25	-0.33	0.40	1.52
12. Understand						
Caucasian	2.79	2.80		-0.05	0.48	
Hispanic	2.99	2.99		-0.2	0.47	
14. Know						
Caucasian	9.39	7.50	4.32	-0.21	0.27	1.07
Hispanic	8.87	8.64	3.62	-0.26	0.32	1.25
17. Clear sense						
Caucasian	10.01	9.55	5.66	-0.25	0.27	1.05
Hispanic	8.39	8.83	4.05	-0.30	0.32	1.18

Note. Caucasian  $n = 821$ , Hispanic  $n = 2636$ .

## Recommendations

The final endeavor of this project was to recommend one of the three scales for future use given the information obtained from the previous steps. Each scale has its own costs and benefits.

The final EIS model had the top performing items at a category-level with CBDs as high as 9.16 (Table 15). Unfortunately, the magnitude of revisions to isolate those top functioning items dwindled the scale from seventeen items to only four. This is largely expected to be a consequence of the violation of unidimensionality for the NRM. In fact, all four items belonged to the same subfactor (Resolution) detailed by Umaña-Taylor et al. (2004; Appendix D). Despite the high performance of the four items, the limitation of them belonging to the same subfactor does not lend the proposed version of the scale to broad application. Additionally, each of the four items were assessed to have DIF. The proposed version of the EIS from the NRM assessment section of this work is an unattractive option for application in future studies.

The MEIM retained seven items in the proposed version from the twelve original items (Table 13). Of the seven proposed items, DIF was detected in five (Table 16). When compared to the EIS, which resulted in a 4-item proposed version, the fact that the MEIM proposed version

retained seven appears to be an accomplishment. However, closer examination reveals that, just as with the EIS, all of the MEIM items belong to the same subfactor (affirmation/belonging; Table 10; Appendix B), providing further evidence of the likely repercussion from a violation to the unidimensionality assumption.

Finally, the MEIM-R retained all of its items without revision by the NRM. While the marginal reliability is the lowest among the three final scales (.83, compared to: MEIM = .87, EIS = .91), the ability to use the full scale as originally designed is a great success. This scale boasts the simplicity of a short version (six items) and retains the original structure without finding loss to psychometric properties. For these reasons, the MEIM-R is found to be the preferred measure for future application.

## DISCUSSION

The results from this study demonstrate psychometric properties of three scales for ethnic identity under a modern measurement theory method, proposed alternative response format of the items, and provided a recommendation for which scale should be employed in future research. The three measures were: Multigroup Ethnic Identity Measure (MEIM; Roberts et al., 1999), the Multigroup Ethnic Identity Measure-Revised (MEIM-R; Phinney & Ong, 2007), and Ethnic Identity Scale (EIS; Umaña-Taylor et al., 2004).

### **Limitations**

The data was collected online along with several other scales for undergraduate course credit. All three measures (MEIM, MEIM-R, and EIS) were presented sequentially (the MEIM and MEIM-R were presented together as viewed in Appendix A, a total of 23-items with the other items from the full scale). With the combination of the 23-items from Phinney (1992) and the 17-item EIS there was 40-items pertaining to the ethnic identity construct. There may be error from respondent fatigue or inattention.

Despite the original scales used in the study (MEIM, MEIM-R, EIS) factor structures to be known (two-factor, two-factor, and three-factor respectively), the nominal response model (NRM) was estimated free of any specified factor structures. The underlying factor structures of the scales are assumed to have influenced the category parameter estimation causing error to an unknown degree.

The current study used the same sample to calibrate the proposed final scale models and to assess DIF. The subsample used for analysis of DIF comprised of a combined 72% of the sample used for calibration. It's possible the influence of the calibration affected the DIF analysis. Ideally, an independent sample would have been used for the DIF assessment.

Although the Caucasian ethnicity is generally accepted as the majority group in the United States, at the particular university from which this sample was drawn Caucasians make up only 22% of the student population. Therefore, respondents in this ethnic group may be especially aware of their ethnicity, beyond what a typical member of the Caucasian ethnic group in the general population may feel. Consequently, responses from these participants may be inflated such that they represent higher ethnic identification than what would otherwise have been evoked by respondents.

### **Implications**

The implications made by the present study were two-fold. First, the utility of item response theory in scale revision was demonstrated. The MEIM and EIS are both well served by the increase in test information as a product of eliminating ineffective items and categories. In fact, the volume of revisions made to these measures point to the usefulness of item response theory in scale development. A new scale measuring this construct could be developed under modern measurement theory to create (1) a short scale (2) which accurately distinguishes respondent differences in theta, and (3) covers the length of the latent trait continuum. Such a measure would create an enjoyable respondent experience and give useful information to the experimenter. It would be a worthwhile endeavor given the great extent to which the MEIM and EIS have been employed.

Secondly, this work raises questions towards differential item functioning (DIF) for all three measures within a narrow scope. Further investigation of the scales in more diverse samples is needed, as well as, recommendations for scoring adjustments for particular ethnic groups. It may be untenable to create a unidimensional scale assessing a complex latent trait such as ethnic identity. However, our methods of evaluating scales may always be improved. Future directions

lie in our ability to evaluate multi-dimensional scales. A need for future research into the Wald test for DIF on nominal response model in item response theory was raised.

## **Conclusion**

The present study evaluated three measures of ethnic identity under the lens of item response theory. The NRM revealed underperforming categories and items in the MEIM and EIS. DIF was found in items for each of the three scales, raising a need for further investigation. Finally, the original MEIM-R scale is recommended for future application studies as the unmodified scale's psychometric properties were comparable to that of the modified versions of the MEIM and EIS. The MEIM and EIS also performed well under psychometric scrutiny and ought to be explored further in studies with fewer limitations than accepted within this work.

## REFERENCES

- Avery, D. R., Tonidandel, S., Thomas, K. M., Johnson, C. D., & Mack, D. A. (2007). Assessing the Multigroup Ethnic Identity Measure for measurement equivalence across racial and ethnic groups. *Educational and Psychological Measurement, 67*, 877– 888.  
<http://dx.doi.org/10.1177/0013164406299105>
- Bock, R. D. (1972). Estimating item parameters and latent ability when responses are scored in two or more nominal categories. *Psychometrika, 37*, 29–51. doi:10.1007/bf02291411
- Bock, R. D. (1997). The nominal categories model. In W. J. van der Linden & R. K. Hambleton (Eds.), *Handbook of modern item response theory* (pp. 33–49). New York, NY: Springer.
- Brittian, A. S., Kim, S. Y., Armenta, B. E., Lee, R. M., Umaña-Taylor, A. J., Schwartz, S. J., ... Hudson, M. L. (2015). Do dimensions of ethnic identity mediate the association between perceived ethnic group discrimination and depressive symptoms? *Cultural Diversity and Ethnic Minority Psychology, 21*(1), 41–53. doi:10.1037/a0037531
- Brittian, A. S., Umaña-Taylor, A. J., & Derlan, C. L. (2013). An examination of biracial college youths' family ethnic socialization, ethnic identity, and adjustment: Do self-identification labels and university context matter? *Cultural Diversity and Ethnic Minority Psychology, 19*(2), 177–189. doi:10.1037/a0029438
- Cai, L. (2013). *flexMIRT.: Flexible multilevel multidimensional item analysis and test scoring*, (Version 2.0) [Computer software]. Chapel Hill, NC: Vector Psychometric Group.
- Corneille, M., Fife, J. E., Belgrave, F. Z., & Sims, B. C. (2012). Ethnic identity, masculinity, and healthy sexual relationships among African American men. *Psychology of Men & Masculinity, 13*(4), 393–399. doi:10.1037/a0026878

- Crocker, L., & Algina, J. (2008). *Introduction to classical & modern test theory*. Mason, OH: Cengage Learning.
- Cronbach, L.J. (1951) Coefficient alpha and the internal structure of tests. *Psychometrika*, 16, 297–334. doi:10.1007/BF02310555
- de Ayala, R. J. (2013). *The theory and practice of item response theory*. New York, NY: Guilford Publications.
- DeMars, C. E. (2003). Sample size and the recovery of nominal response model item parameters. *Applied Psychological Measurement*, 27(4), 275–288. doi:10.1177/0146621603027004003
- DeMars, C. E. (2011). An analytic comparison of effect sizes for differential item functioning. *Applied Measurement in Education*, 24(3), 189–209. doi:10.1080/08957347.2011.580255
- Devos, T., & Mohamed, H. (2014). Shades of American identity: Implicit relations between ethnic and national identities. *Social and Personality Psychology Compass*, 8(12), 739–754. Retrieved from: <https://doi.org/10.1111/spc3.12149>
- Embretson, S. E., & Reise, S. P. (2000). *Item response theory for psychologists*. Mahwah, NJ: Lawrence Erlbaum.
- Erikson, E. H. (1968). *Identity: Youth and crisis*. New York, NY: Norton.
- Falk, C. F., & Ju, U. (2020). Estimation of response styles using the multidimensional nominal response model: A tutorial and comparison with sum scores. *Frontiers in Psychology*, 11(72). doi:10.3389/fpsyg.2020.0007
- Farver, J. A. M., Narang, S. K., & Bhadha, B. R. (2002). East meets West: Ethnic identity, acculturation, and conflict in Asian Indian families. *Journal of Family Psychology*, 16(3), 338–350. doi:10.1037/0893–3200.16.3.338

- Feitosa, Jennifer, Lacerenza, Christina N, Joseph, Dana L, & Salas, Eduardo. (2017). Ethnic identity: Factor structure and measurement invariance across ethnic groups. *Psychological Assessment, 29*(9), 1129–1141. doi:10.1037/pas0000346
- Galliher, R. V., Jones, M. D., & Dahl, A. (2011). Concurrent and longitudinal effects of ethnic identity and experiences of discrimination on psychosocial adjustment of Navajo adolescents. *Developmental Psychology, 47*(2), 509–526. doi:10.1037/a0021061
- Greene, M. L., Way, N., & Pahl, K. (2006). Trajectories of perceived adult and peer discrimination among Black, Latino, and Asian American adolescents: Patterns and psychological correlates. *Developmental Psychology, 42*(2), 218–236. doi:10.1037/0012-1649.42.2.218
- Harris, D. (1989). Comparison of 1-, 2-, and 3-parameter IRT models. *Educational Measurement: Issues and Practice, 8*(1), 35–41. doi:10.1111/j.17453992.1989.tb00313.x
- Holgado-Tello, Francisco & Moscoso, Salvador & Barbero–García, Isabel & Vila, Enrique. (2010). Polychoric versus Pearson correlations in Exploratory and Confirmatory Factor Analysis with ordinal variables. *Qual Quant, 44*, 153–166. doi:10.1007/s11135-008-9190-y
- Huang, C. Y., & Stormshak, E. A. (2011). A longitudinal examination of early adolescence ethnic identity trajectories. *Cultural Diversity and Ethnic Minority Psychology, 17*(3), 261–270. doi:10.1037/a0023882
- Kline, R. B. (2011). *Principles and practice of structural equation modeling* (3<sup>rd</sup> ed.). New York, NY: The Guilford Press.

- Lord, F. M. (1968). An analysis of the verbal scholastic aptitude test using Birnbaum's three-parameter logistic model. *Educational and Psychological Measurement, 28*, 989–1020. doi:10.1177/001316446802800401
- Marcia, J. E. (1980). Identity in adolescence. In J. Adelson (Ed.), *Handbook of adolescent psychology* (pp. 159–187). New York, NY: Wiley.
- Muraki, E. (1990). Fitting a polytomous item response model to Likert type data. *Applied Psychological Measurement, 14*, 59–71.
- Negy, C., Shreve, T. L., Jensen, B. J., & Uddin, N. (2003). Ethnic identity, self-esteem, and ethnocentrism: A study of social identity versus multicultural theory of development. *Cultural Diversity & Ethnic Minority Psychology, 9*(4), 333–344. doi:10.1037/1099-9809.9.4.333
- Oxford Dictionary. (n.d.). Ethnicity. In Lexico.com dictionary. Retrieved August 12, 2015, from <https://www.lexico.com/definition/ethnicity>
- Park, I. J. K., Schwartz, S. J., Lee, R. M., Kim, M., & Rodriguez, L. (2013). Perceived racial/ethnic discrimination and antisocial behaviors among Asian American college students: Testing the moderating roles of ethnic and American identity. *Cultural Diversity and Ethnic Minority Psychology, 19*(2), 166–176. doi:10.1037/a0028640
- Phinney, J. S. (1992). The multigroup ethnic identity measure a new scale for use with diverse groups. *Journal of Adolescent Research, 7*(2), 156–176. doi:10.1177/074355489272003
- Phinney, J. S., & Ong, A. D. (2007). Conceptualization and measurement of ethnic identity: Current status and future directions. *Journal of Counseling Psychology, 54*(3), 271–281. doi:10.1037/0022-0167.54.3.271

- Piña-Watson, B., Ojeda, L., Castellon, N. E., & Dornhecker, M. (2013). Familismo, ethnic identity, and bicultural stress as predictors of Mexican American adolescents' positive psychological functioning. *Journal of Latina/o Psychology, 1*(4), 204–217.  
doi:10.1037/lat0000006
- Ponterotto, J. G., Gretchen, D., Utsey, S. O., Stracuzzi, T., & Saya, R. (2003). The Multigroup Ethnic Identity Measure (MEIM): Psychometric review and further validity testing. *Educational and Psychological Measurement, 63*(3), 502–515.  
doi:10.1177/0013164403063003010
- Preston, K. (2014, April). *Evaluating the effectiveness of each response option with the nominal response model* [Conference presentation]. WPA 2014 Convention, Portland, OR, United States. Retrieved from: <http://hssfaculty.fullerton.edu/psychology/kpreston/Plotting.txt>;  
<http://hssfaculty.fullerton.edu/psychology/kpreston/Wald.txt>
- Preston, K. S. J., Parral, S. N., Gottfried, A. W., Oliver, P. H., Gottfried, A. E., Ibrahim, S. M., & Delany, D. (2015). Applying the nominal response model within a longitudinal framework to construct the Positive Family Relationships Scale. *Educational and Psychological Measurement*. Advance online publication.  
doi:10.1177/0013164414568717
- Preston, K. S. J., & Reise, S. P. (2013). Estimating the nominal response model under nonnormal conditions. *Educational and Psychological Measurement, 74*(3), 377–399.  
doi:10.1177/0013164413507063

- Preston, K. S. J., Reise, S. P., Cai, L., & Hays, R. D. (2011). Using the nominal response model to evaluate response category discrimination in the PROMIS emotional distress item pools. *Educational and Psychological Measurement, 71*, 523–550.  
doi:10.1177/0013164410382250
- R Core Team. (2014). *R: A language and environment for statistical computing*. Vienna, Austria: R Foundation for Statistical Computing. Retrieved from <http://www.R-project.org/>
- Rakhkovskaya, L. M., & Warren, C. S. (2014). Ethnic identity, thin-ideal internalization, and eating pathology in ethnically diverse college women. *Body Image, 11*(4), 438–445.  
doi:10.1016/j.bodyim.2014.07.003
- Reise, S. P., Ainsworth, A. T., & Haviland, M. G. (2005). Item response theory: Fundamentals, applications, and promise in psychological research. *Current Directions in Psychological Science, 14*, 95–101. doi:10.1111/j.0963-7214.2005.00342.
- Revelle, W. (2015). *Psych package* [Computer software]. Retrieved from <http://personality-project.org/r/psych>
- Roberts, R. E., Phinney, J. S., Mase, L. C., Chen, Y. R., Roberts, C. R., & Romero, A. (1999). The structure of ethnic identity of young adolescents from diverse ethnocultural groups. *The Journal of Early Adolescence, 19*(3), 301–322. doi:10.1177/0272431699019003001
- Schiefer, D., & Krahe, B. (2013). Ethnic identity and orientation to White American culture are linked to well-being among American Indians – But in different ways. *Social Psychology, 45*(1), 1–14. doi:10.1027/1864-9335/a000155
- Sireci, S., Thissen, D. & Wainer, H. (2005). On the reliability of Testlet-based tests. *Journal of Educational Measurement, 28*. 237–247. doi:10.1111/j.1745-3984.1991.tb00356.x.

- Smith, E. P., Walker, K., Fields, L., Brookins, C. C., & Seay, R. C. (1999). Ethnic identity and its relationship to self-esteem, perceived efficacy and prosocial attitudes in early adolescence. *Journal of Adolescence*, 22(6), 867–880. doi:10.1006/jado.1999.0281
- Stein, G. L., Kiang, L., Supple, A. J., & Gonzalez, L. M. (2014). Ethnic identity as a protective factor in the lives of Asian American adolescents. *Asian American Journal of Psychology*, 5(3), 206–213. doi:10.1037/a0034811
- Stepney, C. T., Sanchez, D. T., & Handy, P. E. (2015). Perceptions of parents' ethnic identities and the personal ethnic-identity and racial attitudes of biracial adults. *Cultural Diversity and Ethnic Minority Psychology*, 21(1), 65–75. doi:10.1037/a0037542
- Supple, A. J., Ghazarian, S. R., Frabutt, J. M., Plunkett, S. W., & Sands, T. (2006). Contextual influences on Latino adolescent ethnic identity and academic outcomes. *Child Development*, 77(5), 1427–1433. doi:10.1111/j.1467-8624.2006.00945.x
- Syed, M., & Juang, L. P. (2014). Ethnic identity, identity coherence, and psychological functioning: Testing basic assumptions of the developmental model. *Cultural Diversity and Ethnic Minority Psychology*, 20(2), 176–190. doi:10.1037/a0035330
- Tabachnick, B. G., & Fidell, L. S. (2013). *Using multivariate statistics* (6th ed.). Boston, MA: Pearson.
- Tajfel, H. (1981). *Human groups and social categories*. Cambridge, England: Cambridge University.
- Tummala-Narra, P. (2015). Ethnic identity, perceived support, and depressive symptoms among racial minority immigrant-origin adolescents. *American Journal of Orthopsychiatry*, 85(1), 23–33. doi:10.1037/ort0000022

- Tynes, B. M., Umaña-Taylor, A. J., Rose, C. A., Lin, J., & Anderson, C. J. (2012). Online racial discrimination and the protective function of ethnic identity and self-esteem for African American adolescents. *Developmental Psychology, 48*(2), 343–355.  
doi:10.1037/a0027032
- Umaña-Taylor, A. J. (2004). Ethnic identity and self-esteem: examining the role of social context. *Journal of Adolescence, 27*(2), 139–146. doi:10.1016/j.adolescence.2003.11.006
- Umaña-Taylor, A. J., Alfaro, E. C., Bámaca, M. Y., & Guimond, A. B. (2009). The central role of familial ethnic socialization in Latino adolescents' cultural orientation. *Journal of Marriage and Family, 71*(1), 46–60. doi:10.1111/j.1741-3737.2008.00579.x
- Umaña-Taylor, A. J., Bhanot, R., & Shin, N. (2006). Ethnic Identity Formation During Adolescence: The Critical Role of Families. *Journal of Family Issues, 27*(3), 390–414.  
doi:10.1177/0192513X05282960
- Umaña-Taylor, A. J., & Fine, M. A. (2004). Examining Ethnic Identity among Mexican-Origin Adolescents Living in the United States. *Hispanic Journal of Behavioral Sciences, 26*(1), 36–59. doi:10.1177/0739986303262143
- Umaña-Taylor, A. J., Gonzales-Backen, M. A., & Guimond, A. B. (2009). Latino adolescents' ethnic identity: Is there a developmental progression and does growth in ethnic identity predict growth in self-esteem? *Child Development, 80*(2), 391–405. doi:10.1111/j.1467-8624.2009.01267.x
- Umaña-Taylor, A. J., & Guimond, A. B. (2010). A longitudinal examination of parenting behaviors and perceived discrimination predicting Latino adolescents' ethnic identity. *Developmental Psychology, 46*(3), 636–650. doi:10.1037/a0019376

- Umaña-Taylor, A. J., & Shin, N. (2007). An examination of ethnic identity and self-esteem with diverse populations: Exploring variation by ethnicity and geography. *Cultural Diversity and Ethnic Minority Psychology, 13*(2), 178–186. doi:10.1037/1099-9809.13.2.178
- Umaña-Taylor, A. J., & Updegraff, K. A. (2007). Latino adolescents' mental health: Exploring the interrelations among discrimination, ethnic identity, cultural orientation, self-esteem, and depressive symptoms. *Journal of Adolescence, 30*(4), 549–567. doi:10.1016/j.adolescence.2006.08.002
- Umaña-Taylor, A. J., Vargas-Chanes, D., Garcia, C. D., & Gonzales-Backen, M. (2008). A longitudinal examination of Latino adolescents' ethnic identity, coping with discrimination, and self-esteem. *The Journal of Early Adolescence, 28*(1), 16–50. doi:10.1177/0272431607308666
- Umaña-Taylor, A. J., Yazedjian, A., & Bámaca-Gómez, M. (2004). Developing the ethnic identity scale using Eriksonian and social identity perspectives. *Identity, 4*(1), 9–38. doi:10.1207/s1532706xid0401\_2
- Umaña-Taylor, A. J., Zeiders, K. H., & Updegraff, K. A. (2013). Family ethnic socialization and ethnic identity: A family-driven, youth-driven, or reciprocal process? *Journal of Family Psychology, 27*(1), 137–146. doi:10.1037/a0031105
- Walker, R. L., Wingate, L. R., Obasi, E. M., & Joiner, T. E. (2008). An empirical investigation of acculturative stress and ethnic identity as moderators for depression and suicidal ideation in college students. *Cultural Diversity and Ethnic Minority Psychology, 14*(1), 75–82. doi:10.1037/1099-9809.14.1.75

- White, R. M. B., Umaña-Taylor, A. J., Knight, G. P., & Zeiders, K. H. (2011). Language measurement equivalence of the Ethnic Identity Scale with Mexican American early adolescents. *The Journal of Early Adolescence, 31*(6), 817–852.  
doi:10.1177/0272431610376246
- Whitehead, K. A., Ainsworth, A. T., Wittig, M. A., & Gadino, B. (2009). Implications of ethnic identity exploration and ethnic identity affirmation and belonging for intergroup attitudes among adolescents. *Journal of Research on Adolescence, 19*(1), 123–135.  
doi:10.1111/j.1532-7795.2009.00585.x
- Woods, C., Cai, L., & Wang, M. (2012). The Langer-improved Wald test for DIF testing with multiple groups: Evaluation and comparison to two-group IRT. *Educational and Psychological Measurement, 73*(3), 532–547. doi:10.1177/0013164412464875
- Worrell, F. C. (2000). A validity study of scores on the Multigroup Ethnic Identity Measure based on a sample of academically talented adolescents. *Educational and Psychological Measurement, 60*(3), 439–447. doi:10.1177/00131640021970646
- Yetter, G., & Foutch, V. (2013). Investigation of the structural invariance of the Ethnic Identity Scale with Native American youth. *Cultural Diversity and Ethnic Minority Psychology, 19*(4), 435–444. doi:10.1037/a0032564
- Yoo, H. C., & Lee, R. M. (2005). Ethnic identity and approach-type coping as moderators of the racial discrimination/well-being relation in Asian Americans. *Journal of Counseling Psychology, 52*(4), 497–506. doi:10.1037/0022-0167.52.4.497
- Yoo, H. C., & Lee, R. M. (2009). Does ethnic identity buffer or exacerbate the effects of frequent racial discrimination on situational well-being of Asian Americans? *Asian American Journal of Psychology, 5*(1), 70–87. doi:10.1037/1948-1985.s.1.70

Zhang, X., Noor, R., & Savalei, V. (2016). Examining the effect of reverse worded items on the factor structure of the Need for Cognition Scale. *PloS one*, *11*(6), e0157795.

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## APPENDIX A

### The Multigroup Ethnic Identity Measure Phinney (1992)

In this country, people come from a lot of different cultures and there are many different words to describe the different backgrounds or *ethnic groups* that people come from. Some examples of the names of ethnic groups are Mexican-American, Hispanic, Black, Asian-American, American Indian, Anglo-American, and White. Every person is born into an ethnic group, or sometimes two groups, but people differ on how important their *ethnicity* is to them, how they feel about it, and how much their behavior is affected by it. These questions are about your ethnicity or your ethnic group and how you feel about it or react to it.

Please fill in: In terms of ethnic group, I consider myself to be \_\_\_\_\_

Use the numbers given below to indicate how much you agree or disagree with each statement.

(4) Strongly agree; (3) Somewhat agree; (2) Somewhat disagree; (1) Strongly disagree

1. I have spent time trying to find out more about my own ethnic group, such as its history, traditions, and customs.
2. I am active in organizations or social groups that include mostly members of my own ethnic group.
3. I have a clear sense of my ethnic background and what it means for me.
4. I like meeting and getting to know people from ethnic groups other than my own.
5. I think a lot about how my life will be affected by my ethnic group membership.
6. I am happy that I am a member of the group I belong to.
7. I sometimes feel it would be better if different ethnic groups didn't try to mix together.
8. I am not very clear about the role of my ethnicity in my life.
9. I often spend time with people from ethnic groups other than my own.
10. I really have not spent much time trying to learn more about the culture and history of my ethnic group.
11. I have a strong sense of belonging to my own ethnic group.
12. I understand pretty well what my ethnic group membership means to me, in terms of how to relate to my own group and other groups.
13. In order to learn more about my ethnic background, I have often talked to other people about my ethnic group.
14. I have a lot of pride in my ethnic group and its accomplishments.
15. I don't try to become friends with people from other ethnic groups.
16. I participate in cultural practices of my own group, such as special food, music, or customs.
17. I am involved in activities with people from other ethnic groups.
18. I feel a strong attachment towards my own ethnic group.
19. I enjoy being around people from ethnic groups other than my own.
20. I feel good about my cultural or ethnic background.

Write in the number that gives the best answer to each question.

21. My ethnicity is
  - (1) Asian, Asian American, or Oriental
  - (2) Black or African American
  - (3) Hispanic or Latino
  - (4) White, Caucasian, European, not Hispanic
  - (5) American Indian
  - (6) Mixed; parents are from two different groups
  - (7) Other (write in): \_\_\_\_\_
22. My father's ethnicity is (use numbers above)
23. My mother's ethnicity is (use numbers above)

*Note.* In administering the measure, the title is not included, and the response options are repeated at the top of each page. Ethnic identity: The total score is derived by reversing negative items (indicated by "R"), summing across items, and obtaining the mean (Items 1, 2, 3, 5, 6, 8R, 10R, 11, 12, 13, 14, 16, 18, and 20). Subscales are as follows: Affirmation and Belonging (Items 6, 11, 14, 18, and 20); Ethnic Identity Achievement (Items 1, 3, 5, 8R, 10R, 12, and 13); and Ethnic Behaviors (Items 2 and 16). Ethnic self-identification (open-ended response), ethnicity (Item 21), and parents' ethnicity (Items 22 and 23) are not scored but are used as background information. Other-group orientation: Scored as above (Items 4, 7R, 9, 15R, 17, and 19).

## APPENDIX B

### Revised (12-item) Multigroup Ethnic Identity Measure

**Roberts, Phinney, Masse, Chen, Roberts, Romero (1999)**

In this country, people come from a lot of different cultures and there are many different words to describe the different backgrounds or ethnic groups that people come from. Some examples of the names of ethnic groups are Hispanic, Black, Asian American, Native American, Irish American, and White. These questions are about your ethnicity or your ethnic group and how you feel about it or react to it.

Please fill in: In terms of ethnic group, I consider myself to be -----

Use the numbers below to indicate how much you agree or disagree with each statement.

(4) Strongly agree; (3) Agree; (2) Disagree; (1) Strongly disagree

1. I have spent time trying to find out more about my ethnic group, such as its history, traditions, and customs.
2. I am active in organizations or social groups that include mostly members of my own ethnic group.
3. I have a clear sense of my ethnic background and what it means for me.
4. I think a lot about how my life will be affected by my ethnic group membership.
5. I am happy that I am a member of the group I belong to.
6. I have a strong sense of belonging to my own ethnic group.
7. I understand pretty well what my ethnic group membership means to me.
8. To learn more about my ethnic background, I have often talked to other people about my ethnic group.
9. I have a lot of pride in my ethnic group and its accomplishments.
10. I participate in cultural practices of my own group, such as special food, music, or customs.
11. I feel a strong attachment towards my own ethnic group.
12. I feel good about my cultural or ethnic background.

*Note.* The measures should also include an appropriate list from which participants can select a self-label for themselves and each parent. The affirmation/belonging subscale includes items 3, 5, 6, 7, 9, 11, and 12. The exploration subscale includes items 1, 2, 4, 8, and 10. (Item 3 loads on both subscales.)

## APPENDIX C

### **Multigroup Ethnic Identity Measure-Revised (MEIM-R)**

#### **Phinney and Ong (2007)**

1. I have spent time trying to find out more about my ethnic group, such as its history, traditions, and customs.
2. I have a strong sense of belonging to my own ethnic group.
3. I understand pretty well what my ethnic group membership means to me.
4. I have often done things that will help me understand my ethnic background better.
5. I have often talked to other people in order to learn more about my ethnic group.
6. I feel a strong attachment towards my own ethnic group.

*Note.* In administering the measure, these items should be preceded by an open-ended question that elicits the respondent's spontaneous ethnic self-label. It should conclude with a list of appropriate ethnic groups that the respondent can check to indicate both their own and their parents' ethnic backgrounds (see Phinney, 1992). Items 1, 4, and 5 assess exploration; Items 2, 3, and 6 assess commitment. The usual response options are on a 5-point scale, from strongly disagree (1) to strongly agree (5), with 3 as a neutral position. The score is calculated as the mean of items in each subscale (Exploration and Commitment) or of the scale as a whole. Cluster analysis may be used with the two subscales to derive ethnic identity statuses. Items were adapted from Phinney, J. S. (1992). The multigroup ethnic identity measure a new scale for use with diverse groups. *Journal of Adolescent Research*, 7(2), 156–176. doi:10.1177/074355489272003

## APPENDIX D

### Ethnic Identity Scale (EIS)

#### Umaña-Taylor, Yazedjian, and Bámaca-Gómez (2004)

1. My feelings about my ethnicity are mostly negative (–A).
2. I have not participated in any activities that would teach me about my ethnicity (–E).
3. I am clear about what my ethnicity means to me (+R).
4. I have experienced things that reflect my ethnicity, such as eating food, listening to music, and watching movies (+E).
5. I have attended events that have helped me learn more about my ethnicity (+E).
6. I have read books/magazines/newspapers or other materials that have taught me about my ethnicity (+E).
7. I feel negatively about my ethnicity (–A).
8. I have participated in activities that have exposed me to my ethnicity (+E).
9. I wish I were of a different ethnicity (–A).
10. I am not happy with my ethnicity (–A).
11. I have learned about my ethnicity by doing things such as reading (books, magazines, newspapers), searching the internet, or keeping up with current events (+E).
12. I understand how I feel about my ethnicity (+R).
13. If I could choose, I would prefer to be of a different ethnicity (–A).
14. I know what my ethnicity means to me (+R).
15. I have participated in activities that have taught me about my ethnicity (+E).
16. I dislike my ethnicity (–A).
17. I have a clear sense of what my ethnicity means to me (+R).

*Note.* Response options are: Does not describe me at all (1), Describes me a little (2), Describes me well (3), and Describes me very well (4). The notation after each item indicates the relevant subscale (i.e., A = affirmation, E = exploration, and R = resolution); + indicates a positively worded item; – indicates a negatively worded item. Negatively worded items should be reverse scored so that higher scores indicate higher levels of affirmation, exploration, and resolution.

## APPENDIX E

### California State University, Northridge

#### CONSENT TO ACT AS A HUMAN RESEARCH PARTICIPANT

##### **Ethnic Identification**

You are being asked to participate in a research study, “Ethnic Identification” conducted by Katelyn M. Cerneka as part of the requirements for the M.A. degree in General/Experimental Psychology. Participation in this study is completely voluntary. Please read the information below and ask questions about anything that you do not understand before deciding if you want to participate. A researcher listed below will be available to answer your questions.

##### **RESEARCH TEAM**

###### **Researcher:**

Katelyn M. Cerneka  
Department of Psychology  
katelyn.cerneka.448@my.csun.edu

###### **Faculty Advisor:**

Andrew T. Ainsworth, PhD  
Department of Psychology  
18111 Nordhoff St.  
Northridge, CA 91330-8255  
andrew.ainsworth@csun.edu

##### **PURPOSE OF STUDY**

The purpose of this research study is to explore the degree of college students’ identification with his/her ethnicity.

##### **SUBJECTS**

###### **Inclusion Requirements**

You are eligible to participate in this study if you are at least 18 years of age or older.

###### **Time Commitment**

This study will involve approximately 10 minutes of your time.

##### **PROCEDURES**

The following procedure will occur: You will complete an online survey about your ethnicity, ethnic identification and exploration.

##### **RISKS AND DISCOMFORTS**

The possible risks and/or discomforts associated with the procedures described in this study include: fatigue, boredom, and mild emotional discomfort from reading and responding to questions on a computer about your ethnic identity exploration. This study involves no more than minimal risk. There are no known harms or discomforts associated with this study beyond those encountered in normal daily life.

##### **BENEFITS**

###### **Subject Benefits**

You may not directly benefit from participation in this study. However, there may be specific benefits that you may expect as a result of participation in this study, such as realizing a domain in which you may further explore your ethnicity.

###### **Benefits to Others or Society**

There are no direct benefits for participating in the study. However, your participation will help add to the literature on ethnic identity.

##### **ALTERNATIVES TO PARTICIPATION**

The only alternative to participation in this study is not to participate.

## **COMPENSATION, COSTS AND REIMBURSEMENT**

### **Compensation for Participation**

You will not be paid for your participation in this research study.

## **WITHDRAWAL OR TERMINATION FROM THE STUDY AND CONSEQUENCES**

You are free to withdraw from this study at any time. **If you decide to withdraw from this study you should notify the research team immediately.** The research team may also end your participation in this study if you do not follow instructions, miss scheduled visits, or if your safety and welfare are at risk.

## **CONFIDENTIALITY**

### **Subject Identifiable Data**

We are utilizing the SONA identity codes that are randomly assigned to participants, so that there is no identifiable information collected from participants.

### **Data Storage**

All research data will be stored on a desktop computer that is password protected.

### **Data Access**

The researcher and faculty advisor named on the first page of this form will have access to your anonymous responses, therefore publications and/or presentations that result from this study will not include identifiable information about you.

### **Data Retention**

The researchers intend to keep the research data in a repository indefinitely. Other researchers will have access to your anonymous data for the purpose of selecting you into research studies for which you qualify.

### **Mandated Reporting**

Under California law, the researchers are required to report known or reasonably suspected incidents of abuse or neglect of a child, dependent adult or elder, including, but not limited to, physical, sexual, emotional, and financial abuse or neglect. If any researcher has or is given such information, he or she may be required to report it to the authorities.

## **IF YOU HAVE QUESTIONS**

If you have any comments, concerns, or questions regarding the conduct of this research please contact the research team listed on the first page of this form.

If you have concerns or complaints about the research study, research team, or questions about your rights as a research participant, please contact Research and Sponsored Projects, 18111 Nordhoff Street, California State University, Northridge, Northridge, CA 91330-8232, or phone 818-677-2901.

## **VOLUNTARY PARTICIPATION STATEMENT**

You should not sign this form unless you have read it and been given a copy of it to keep. **Participation in this study is voluntary.** You may refuse to answer any question or discontinue your involvement at any time without penalty or loss of benefits to which you might otherwise be entitled. Your decision will not affect your relationship with California State University, Northridge. Your signature below indicates that you have read the information in this consent form and have had a chance to ask any questions that you have about the study.