4-11-2023

Differential Item Functioning of the Revised Multigroup Ethnic Identity Measure (MEIM-R) in Racially and Income Diverse Youth with Type 1 Diabetes

Adora Elise Choquette

DIFFERENTIAL ITEM FUNCTIONING OF THE REVISED MULTIGROUP ETHNIC IDENTITY MEASURE (MEIM-R) IN RACIALLY AND INCOME DIVERSE YOUTH WITH TYPE 1 DIABETES

by

Adora Elise Choquette, B.A.

A Thesis

Submitted in Partial Fulfillment of the

Requirements for the Degree of

Master of Science

Major: Clinical Psychology

The University of Memphis

May 2023

Abstract

Type 1 diabetes (T1D) is a common chronic illness faced by youth in the United States, with rates of TID continuing to rise annually. Individuals with T1D from racially minoritized backgrounds are made vulnerable to disproportionately adverse diabetes-related outcomes compared to white peers due to enduring systems of oppression. It is important to understand modifiable psychosocial factors that may influence health-related outcomes in youth with T1D, particularly for racially minoritized individuals to buffer deleterious effects of racism. One factor meriting exploration is ethnic identity. Current available literature on measures fit to assess ethnic identity in youth with chronic illness broadly is limited. The purpose of the present study is to examine the factor structure, reliability, and validity of the revised Multigroup Ethnic Identity Measure (MEIM-R) in a racially- and income-diverse sample of youth with T1D across sociodemographic and illness-related proxies for one's positionality in oppressive systems.

Methods: 142 youth with type 1 diabetes were recruited from a pediatric endocrinology outpatient clinic as part of a larger study examining resilience in youth with T1D. Youth completed the MEIM-R as well as diabetes specific measures of psychological flexibility, family conflict, non-acceptance, quality of life, and a general of familism. Health-related outcomes such as HbA1c levels and illness duration were extracted from participant medical records at baseline. Information on income was obtained from caregiver reported demographic questionnaires. Confirmatory factor analyses compared the structural validity of competing MEIM-R models, and Uniform and Non-Uniform Differential Item Functioning (DIF) across sociodemographic and illness-related factors. Convergent and divergent validity measures indicated the MEIM-R did not correlate with other psychosocial factors examined in this study.

TABLE OF CONTENTS

List of Tables

Table

DIFFERENTIAL ITEM FUNCTIONING OF THE REVISED MULTIGROUP ETHNIC IDENTITY MEASURE (MEIM-R) IN RACIALLY AND INCOME DIVERSE YOUTH WITH TYPE 1 DIABETES

Type 1 diabetes (T1D) is one of the most common chronic illnesses among youth in the United States, impacting approximately over 190,000 individuals under the age of 19 (Mayer-Davis et al., 2017). The prevalence of T1D continues to rise, increasing from 1.48 per 1,000 youths aged 19 or under in 2001 to 2.1 by 2017 (Lawrence et al., 2021). Both within the United States and globally, new incidences of T1D are also on the rise, with some longitudinal studies evidencing an alarming increase in incidence among Black youth in the United States ages 0-4 and White youth ages 10-14 (Lipman et al., 2013; Mobasseri et al., 2020). Diabetes management and potential adverse outcomes are burdensome and costly for youth and their caregivers, and society; medical care costs of T1D are approximately $16,000 per person annually (American Diabetes, 2018b) which is on average 2.3 times more for individuals with diabetes than those without (American Diabetes, 2008). Within the United States, T1D is estimated to cost $14.4 billion annually in direct and indirect costs associated with diabetes, with a lifetime difference of $813 billion dollars (Sussman et al., 2020).

Diabetes Care and Complications

This extensive and costly maintenance of T1D can be difficult and there is a complex interplay of factors that contributing to thriving and/or languishing in families of youth living with type 1 diabetes (Gonder-Frederick et al., 2002; Wysocki et al., 2018). Treatment for diabetes focuses on maintaining blood glucose within a specific range for as long as possible to avoid complications as elevated glucose values are associated with compounding risk for adverse outcomes over time (i.e. neuropathy, retinopathy, and cardiovascular disease) (DiMeglio et al.,

2018). It is generally recommended to have Hemoglobin A1c (HbA1c, which reflects the average blood glucose levels over the past two to three months) values less than 7-7.5% (which is approximately 154-169 mg/dl on average) and for blood glucose levels to be between 70-180mg/dl 70% of the time (American Diabetes Asssociation, 2018a; DiMeglio et al., 2018). To achieve these recommendations, diabetes care includes working with a healthcare team to coordinate the administration and adjustment of exogeneous insulin doses via multiple daily injections or through an insulin pump, based on varying dietary intake, activity, blood glucose levels (that are frequently monitored), times of day, and other factors.

Disparities in Diabetes: Intersecting Systems of Inequality

Further complicating the care of diabetes are various interconnected systems of oppression/privilege impacting individuals and communities (Velez & Spencer, 2018). The Phenomenological Variance of Ecological Systems Theory (PVEST) posits that individuals from systematically marginalized communities, particularly Black communities, are exposed to high-risk contexts which create greater challenges with normative developmental tasks and increase the likelihood of adversity (Spencer, 1995). This likelihood of adversity is further increased and potentiated given other systems of identity-based marginalization (genders, educational attainment, economic, health/abilities, etc.) that oppress communities and individuals in part by restricting access to resources that may protect against these adverse outcomes (Acker, 2016; Feagin, 2006). Race exists as a socially defined construct within our societal and political systems and is based solely on physical features and cultural differences from the oppressors, which has resulted in systematic oppression, abuse, and disparities (Bryant et al., 2022; Velez & Spencer, 2018).

Within the context of diabetes, disparities within the healthcare system and beyond are the intended result of existing intersectional ecological systems of inequality (Dhaliwal et al., 2022; Ogunwole & Golden, 2020). Inequity caused and perpetuated by racist systems influence both general and health-related outcomes (Feagin, 2013; Spencer, 2006). Individuals holding intersecting minoritized identities, such as with minoritized racial identities and chronic illness, are especially burdened by these systems (Velez & Spencer, 2018). For example, evidence shows that individuals racialized as Hispanic and non-Hispanic Black have a higher prevalence of diabetes, as well as comorbid diabetes and cardiovascular disease, compared to other ethnic groups (Davis et al. 2017). Such consequences are present in youth with T1D identifying as Black, who are made vulnerable to significantly higher HbA1c levels (Keenan et al., 2021; Keenan et al., 2022; Lipman et al., 2021; Willi et al., 2015) and diabetes-related stress (Fegan-Bohm et al., 2020) than their peers privileged as white, even after adjusting for age, sex assigned at birth, income, and illness duration. Youth living with low income and economic marginalization and youth who are uninsured have evidenced higher HbA1c levels even when controlling for factors such as race and caregiver education (Petitti et al., 2009).

Ethnic Identity

Given minoritized ethnic groups continue to be made vulnerable to inequitable outcomes by these systemic barriers and additional identity-based burdens, it is imperative to explore and foster protective factors that can buffer such effects. The American Diabetes Association (2014) emphasizes the importance of psychosocial factors influencing diabetes care. One such factor meriting exploration is the construct of ethnic identity. Ethnicity itself can be operationalized in various ways, though can broadly be defined as being categorized by ancestry or through self-identification with a specific or multiple cultural groups (Clarke, 2008). This subjective nature

can make ethnicity difficult to conceptualize. Some may understand ethnic identity as a form of social identity, encompassing one's own awareness, knowledge, and assessment of one's membership in relation to a particular group (Tafjel, 1981). The scope of this paper understands ethnic identity as described by Umana-Taylor and colleagues (2014) in which ethnic identity is a "multidimensional, psychological construct [reflecting] the beliefs and attitudes that individuals have about their ethnic-racial group memberships, as well as the processes by which these beliefs and attitudes change over time".

Present literature suggests that ethnic identity can serve as an advantageous resource and protective factor. One study evidenced higher levels of ethnic identity (operationalized as closeness and commitment to one's culture) have been found advantageous in mental health, including buffering the effects of stress on mental health in a large sample of Filipino-Americans (Mossakowski, 2003). In a sample of Latino youth, ethnic identity moderated self-esteem with subsequent moderation on depressive levels (Umana-Taylor & Updegraff, 2007). In health, higher levels of reported racial identity have been associated with lower pain and slightly higher health-related quality of life in youth with sickle cell disease (Lim et al., 2012). For diabetes specifically, higher levels of ethnic identity were strongly associated with greater improvement in HbA1c in Black/African-American and Latino adults with type 2 diabetes over time (Murayama et al., 2017). Unfortunately, little research has been conducted in measuring ethnic identity in youth with T1D nor have known efforts been made to ensure the adequacy of this measurement across proxies for these larger systems of oppression (i.e. based on genders, illness duration, HbA1c, income, racialized categories) that are associated with diabetes outcomes.

Measuring Ethnic Identity

Many present measures of ethnic identity are created for specific ethnic groups rather than measures broadly assessing factors related to ethnic identity for a variety of ethnic groups. However, the Multigroup Ethnic Identity Measure (MEIM) was created for such purpose (Phinney, 1992). In its creation, Phinney (1992) considered and employed a variety of shared factors to understand ethnic identity across groups, including the self-identified ethnicity, behaviors and practices (social activities and cultural traditions), affirmation and belonging (pride in ethnicity and sense of belonging), exploration and commitment, and attitudes toward other ethnic groups. The original MEIM consists of 20 items assessing three aspects of ethnic identity: positive ethnic attitudes/sense of belonging, ethnic identity achievement, and ethnic behaviors or practices (Phinney, 1992). Internal validation of this original measure then found one single ethnic identity factor. Psychometric properties of the MEIM and its variations continue to be evaluated across a variety of populations with mixed outcomes (Brown et al., 2014; Dandy et al., 2008; Homma et al., 2014; Musso et al., 2018; Yancey et al., 2001).

A six-item revision of the MEIM (MEIM-R) was created by Phinney and Ong (2007) consisting of two factors: exploration and commitment. The MEIM-R was administered to 241 racially and ethnically diverse university students. Confirmatory Factor Analyses (CFAs) indicated the new two-factor model indicated high factor correlation (r=0.74). However, the extent to which these items tapped into the same construct (e.g. measurement invariance/non differential item functioning, or MI/DIF) across racial and ethnic groups was not assessed between at that time. Subsequent studies of the MEIM-R have found adequate measurement invariance across a variety of racial, ethnic, and age groups (Brown et al., 2014; Homma et al., 2014; Musso et al., 2018). The variation in psychometric outcomes of measurement invariance highlights the importance of continuing to assess potential bias in a variety of population

settings. While the affirmation/belonging subscale of the original MEIM was associated with lower depressive symptomatology and higher health-related quality of life in a study with overweight/obese youth (Lim et al., 2016), there has not been an assessment of differential item functioning with the revised MEIM in a pediatric health context.

Sample size limitations are common in measure validation studies in pediatric health samples and can hinder examination of potential invariance. Dichotomization of grouping variables can result in uneven or inadequate sample sizes, making it difficult to draw conclusions regarding invariance of a measure. Differential item functioning (DIF) is a strategy utilizing item response theory to examine whether distinct groups (e.g. sociodemographic, illness-related) have a different probability of responding to items in a certain way while controlling for latent scores. Latent interactions can reflect whether the factor loadings vary as a function of these groups. Because the grouping variables are not further split into binary categories as in measurement invariance, power is increased, leading some to recommend DIF (over MI) when exploring uniform DIF with smaller samples sizes (Woods, 2009). Present DIF studies with the MEIM-R are limited; in the United States, one study indicated that African-American adults are more likely to report higher scores on the MEIM-R than European-American counterparts, with presence of DIF on only one of the six items (Chakawa et al., 2015).

The present study seeks to (Objective: 1) evaluate the psychometric properties of the MEIM-R in youth with T1D, as well as (Objective: 2) assess potential DIF across sociodemographic factors which may be used as proxies for oppressive systems, such as age, gender, race, and income, and illness-related factors include HbA1c and illness duration. Lastly, this study will (Objective: 3) examine how the MEIM-R may relate to other psychosocial factors

of interest, including familism, diabetes-specific family conflict, quality of life, diabetes non-acceptance, and diabetes-specific psychological flexibility.

Methods

Participants and Procedures

Participants were 142 youth ages 12-18 and their caregivers who were recruited from a pediatric endocrinology outpatient clinic as part of the Predicting Resiliency in Youth with Type 1 Diabetes study (PRYDE; (Rybak et al., 2017). PRYDE is a longitudinal study examining potential psychosocial predictors of treatment adherence, glycemic control, and quality-of-life in youth with type 1 diabetes. Data for PRYDE were collected at for three separate timepoints at baseline, 6-month, and 12-month follow-ups. Study procedures were approved by Institutional Review Boards at Le Bonheur Children's Hospital and the University of Memphis in Memphis, Tennessee prior to data collection. Eligible youth were recruited during standard care visits at Le Bonheur Children's Hospital outpatient endocrinology clinic. Caregivers provided written consent on behalf of themselves and their children, and youth ages 14 and above provided additional written assent.

Youth participating in the PRYDE study were required to meet the following eligibility criteria: being between ages 12 and 18, receiving a diagnosis of type 1 diabetes six or more months prior to consent, currently receiving, intending to receive care at the Le Bonheur Children's Hospital endocrinology outpatient clinic for at least one year, and speaking English. Exclusion criteria included participant diagnosis of a severe developmental disability, legal guardian being unable to provide consent, or if the youth was pregnant at the time. If eligibility criteria were met and the child and their caregiver consented, participants completed paper

questionnaires at baseline and subsequent 6- and 12-month follow-ups. Questionnaires were either completed in-person or sent and returned via mail.

Of 220 families that were approached to participate in PRYDE, 195 provided informed consent. PRYDE participants include 183 youth and their caregivers who consented and completed baseline measures. The MEIM-R was added to the PRYDE study approximately 13 months after data collection began. Of this original PRYDE sample, the present study examines 142 youth who first completed the Multigroup Ethnic Identity Measure – Revised version at either baseline, 6-month, or their 12-month follow-up. The average age of participants was 14.66 years (*SD*=1.62), with 52.5% of the sample identifying as female. 55.6% identified as Black/African-American and 44.4% identified as White. The average illness duration in the sample was 4.34 years (*SD*=3.49). Nearly half (49.1%) of the sample had an annual income less than $22,500. The average HbA1c level recorded at baseline was 10.51% (*SD*=2.14%).

Measures

Demographics. Youth participants completed a self-report measure examining demographic information including race, gender, age, and illness duration. Caregivers reported household income. Illness duration was calculated through obtaining date of diagnosis from participant medical records. HbA1c levels were also obtained from participant medical records at baseline, 6-, and 12-month timepoints. HbA1c levels reported in this study were selected from baseline given most youth completed baseline questionnaires.

Ethnic identity. Participants completed a revised version of the Multigroup Ethnic Identity Measure (MEIM-R). The original MEIM was developed by Phinney (1992) to measure aspects of ethnic identity across a variety of ethnicities. The 6-item MEIM-R is a cross-sectional, self-report measure proposing a two-factor model of ethnic identity: *commitment* to one's ethnic

identity and *exploration* of one's ethnic identity (Phinney & Ong, 2007). Each factor consists of three statements that participants then rate on a five-point Likert-style scale ranging from 1 ("strongly disagree") to 5 ("strongly agree"). Cronbach's alpha for the overall MEIM-R in this sample was 0.87.

Quality of life. The Pediatric Quality of Life – Diabetes Module (PedsQL-DM) 3.0 was utilized to assess diabetes-related quality of life. The PedsQL-DM is a self-report measure prompting how problematic or difficult various domains of diabetes care have been for the respondent in the past month, such as diabetes, treatment, worry, and communication (Varni et al., 2003). Participants rated the difficulty on a scale of 0 ("never") to 4 ("always"). Items in the PedsQL-DM are summed and transformed to a scale of 0-100, with higher scores indicating higher diabetes-related quality of life. Cronbach's alpha for the PedsQL-DM3.0 in this sample was 0.88.

Familism. Youth completed a 5-item scale broadly assessing familism utilizing items from two other scales (Gaines et al., 1997; Gil et al., 2000) consistent with previous literature (Villarreal et al., 2005) assessing perceptions of family importance and reflecting ideological beliefs about family. Youth rated how much they agree with statements about their family on a scale of 1 ("strongly disagree") to 5 ("strongly agree"), with higher scores reflecting higher degree of perceived familism. Cronbach's alpha for the 5-item familism scale in this sample was 0.93.

Diabetes-specific family conflict. The present study utilized the Diabetes Family Conflict Scale (DFCS) assesses the impact of diabetes management on the caregiver-child relationship over the past month (Hood et al., 2007). The DFCS is a 19-item scale yielding subscales representing direct diabetes-related conflict ("I have argued with my parents about

remembering to give shots") and indirect diabetes-related conflict ("I have argued with my parents about what to eat when away from home"). Scores on the DFCS can range from 19-57, with higher scores indicating higher reported conflict within the family. Cronbach's alpha in this sample was 0.96.

Diabetes non-acceptance. Participants also completed the Acceptance and Action Diabetes Questionnaire (AADQ) as a measure of diabetes non-acceptance. The measure consists of 9 items assessing how frequently the respondent engages in avoidance behaviors related to their diabetes (Gregg et al., 2007). Participants rate these items on a scale from 1 ("never") to 5 ("always"). Items on the AADQ are then averaged, with higher scores reflecting higher non-acceptance of diabetes-related thoughts. Cronbach's alpha for the AADQ in this sample was 0.87.

Diabetes-specific psychological flexibility. Originally developed by Greco and Hart (2005), the Diabetes Acceptance and Action Scale (DAAS-22; (Berlin et al., 2020) is a 22-item scale adapted for measuring diabetes-specific psychological flexibility. Youth utilize a 5-point Likert scale (0="never true", 4="always true") to reflect their beliefs about statements regarding diabetes impairing their ability to engage with their values, engaging in diabetes-related avoidance behaviors, and diabetes-related cognitive fusion. To obtain the total score on the DAAS-22, items are reverse-scored and averaged. Cronbach's alpha in this sample was 0.92.

Analytic Plan

Model fit. To assess which factor structure best fit the MEIM-R (objective 1), confirmatory factor analyses (CFA) were conducted to assess the degree to which the variables are measuring the latent construct of ethnic identity with this population (Brown, 2013). The validated two-factor model can be found in Figure 1. Competing factor structures were analyzed

to best examine model fit. The one-factor consisted of all MEIM-R items, whereas the two-factor structure featured the *Exploration* and *Commitment* factors, with each factor consisting of the questions listed for each respective grouping in Table 1. Two bifactor models were also examined (Reise et al., 2010). The first was "general" ethnic identity factor plus two "specific" factors using the exploration and commitment items, and the second one general and one specific factor (using all six items as indicators). Analyses were conducted utilizing MPlus Version 8. Model structures were compared as both categorical using weighted least mean squares (WLSMV) and continuous utilizing maximum likelihood with robust standard error (MLR). The data were examined for missingness, outliers, normality, and multicollinearity. Multiple imputation was used to account for missingness.

A variety of measures can be examined to determine model fit, with four indices being recommended to be reported (Kline, 2015). One such method includes chi-square values, which should be insignificant to indicate no significant differences between the observed and model implied covariance matrices (Kline, 2015). Root mean square estimates of approximation (RMSEA) values and 90% confidence interval (CI) reflect how poorly a model fits, with values of 0.05 or below indicating good fit, and values between 0.08 and 0.10 indicating mediocre fit. RMSEA values should be interpreted cautiously with smaller sample sizes (West et al., 2012). Confirmatory factor indexes (CFI) compares the fit of the model to the fit of a null model, with values between 0.90 to 0.94 indicate marginal fit, and a good fit being greater than 0.95. (Hu & Bentler, 1999). The Standard Root Mean Square Residual (SRMR) represents the square root of the difference between residuals in the sample covariance matrix and a hypothesized model should ideally be below 0.08 to be acceptable, though sample sizes smaller than 200 can cause the SRMR to perform poorly (Asparouhov & Muthén, 2018). Consistent with recommendations

by Marsh and Hau (1999), standardized factor loadings should be relatively high at >0.6 due to the smaller sample size.

In potential consideration of a bifactor model structure with general (ethnic identity) and specific (exploration and commitment) factors, further indices warrant consideration for appropriateness of factor structure. An example of the bifactor MEIM-R can be found in Figure 2. Explained common variance (ECV) represents the proportion of shared variance explained by that factor, with ECVS representing the strength of the specific factors in comparison to the explained variance of items loading onto the factor (Stuckey & Edelen, 2015; Rodriguez et al., 2016). Omega is a measure of internal reliability, with all items considered for the general factor and OmegaS representing only the items loading into the specific factors (Rodriguez et al., 2016). Omega hierarchical (OmegaH) indicates the percent of systematic variance in raw scores that can be attributed to individual differences on the general factor, with higher OmegaH scores (>0.8) reflecting unidimensionality; Omega HS reflects the proportion of systematic variance of the specific factors after accounting for variability attributed to the general factor (Rodriguesz et al., 2016). Relative omega is calculated by dividing OmegaH (or OmegaHS) by Omega (or OmegaS); for the general factor, this indicates the proportion of variance in the multidimensional composite driven by the general factor; for specific factors, this is this proportion of variance not explained by the general factor (Rodriguez et al., 2016). “H” represents construct replicability and is a correlation between the factor and an optimally-weighted composite, with higher values (>0.8) indicating a well-defined latent variable (Hancock & Mueller, 201; Rodriguez et al., 2016). Lastly, factor determinacy (FD) represents the correlation between factor scores and the factors, with values of >0.9 being recommended for use (Gorsuch, 1983).

Differential item functioning. To examine potential bias, differential item functioning (DIF) analyses were conducted using CFA with covariates variables (objective 2). DIF analyses examine patterns of item-level responses among different sub-groups or variables via regression of the item on the categorical grouping variable and/or continuous "covariates." DIF was explored within this sample across race, age, grade, gender, income, HbA1c levels, and illness duration. This examines whether differences in item-level responses are a function of respondent characteristics. If bias is present, significant direct effects of these proxies on each item while controlling for latent total scores may be observed at all levels along the latent trait (uniform DIF, analogous to differences in intercepts or thresholds/proportions in MI), or significant latent interactions which reflect whether factor loadings vary as a function of these socio-demographic or illness-related proxies in which DIF does not occur equally at all points (non-uniform DIF, analogous differences in factor loadings in MI).

Validity. In addition, bivariate correlations of MEIM-R total scores will be run with psychosocial outcomes to explore convergent validity with ethnic identity (objective 3). Psychosocial factors of interest include familism, diabetes-specific family conflict, diabetes non-acceptance, diabetes-specific psychological flexibility, and health-related quality of life. It is expected that ethnic identity will be positively associated with familism, diabetes-specific psychological flexibility, and health-related quality of life, and negatively associated with diabetes-specific family conflict and diabetes non-acceptance.

Results

Factor analysis. Model fit comparisons among tested models can be found in Table 2. Of the one- and two-factor, continuous and categorical model comparisons, a two-factor continuous model evidenced decent fit; however, the model fit improved substantially through examination

of bifactor models. In the bifactor models, the correlation of the general ethnic identity factor to the specific factors was by definition set to 0, allowing the interpretation of the specific factor(s) to be understood as latent variables representing the shared residual variances among the MIEM-R items unrelated to the general factor. The continuous bifactor model with one general ethnic identity factor and two specific factors that were allowed to correlate with the general factor strongest model fit. The continuous bifactor model with one general and one specific factor evidenced similar yet slightly poorer fit; however, it boasted a stronger, well-defined general factor (e.g. strong factor loadings on the general factor) as well as stronger bifactor indices (Table 3, Figure 3; Objective: 1). Comparison of the bifactor indices for both bifactor models can be found in Table 3. Consistent with recommendations by Marsh & Hau (1999), all standardized item factor loadings on the general ethnic identity factor were >0.6 except for item 1 (0.575; Table 4).

Bifactor indices and Evaluation. Because a bifactor model demonstrated best fit, further evaluation of bifactor indices is warranted. ECV values indicate the general ethnic identity factor to explain most of the shared variance (0.870). Omega values for the general ethnic identity factor indicate high levels of reliability (0.905), with omega values for the specific factor also boasting strong reliability (0.905). Because the OmegaH value for the general factor is above 0.8 (0.905), this indicates ethnic identity to be a unidimensional construct. The OmegaHS value for the specific factor (0.000) indicates that it does not account for systematic variance. The general ethnic identity factor achieved an H value of 0.903, meaning the latent construct is well-defined; however, the specific factor was not above the 0.8 threshold. The factor determinacy (FD) values for the general as well as the specific factor were all $\geq$0.9, indicating that each factor score is appropriate for interpretation. In summary and as appropriate for this intended bifactor model,

the standardized factor loadings and the bifactor indices of the specific factor were not strong, suggesting the presence of a "nuisance" factor (e.g. factors that arise because of content, method etc.) that potentially interferes with the measurement of the intended target construct (Reise et al., 2010).

Differential item functioning. Using the chosen bifactor CFA model, differential item functioning of the general factor was examined by using HbA1c, age, income, race, gender, and illness duration as item predictors (Objective: 2). DIF Models were run to examine the influence of each of these demographic and illness-related variables controlling for the general and specific. Standardized results were used for interpretation and can be found in Table 6. Upon examination of the direct effects of sociodemographic variables on item-level responses, evidence of uniform DIF was present by race on items 4 and 5 of the MEIM-R following Holm's procedure, with individuals identifying as Black/African-American being more likely to rate these items higher than White participants even when controlling for the general and specific factors. In examining the presence of non-uniform DIF, the moderating effect of sociodemographic factors on the relation of the general ethnic identity with the items was tested. Non-uniform DIF was found to be present on item 4 for gender following Holm's procedure, whereby the factor loading for those identifying as male was 0.677 higher relative to those who identified as female (see Table 6).

Validity. Using a model that controlled for Uniform DIF by to race on items 4 and 5, and Non-Uniform DIF by gender on item 4 latent correlations were determined between the latent general ethnic identity factor and the observed total scores of the PedsQL-DM 3.0, a familism scale, the DFCS, the AADQ, and the DAAS to determine whether ethnic identity relates to other psychosocial factors known to relate to diabetes-related outcomes (Objective: 3)., As can be seen

in table 5, the general ethnic identity factor had small associations that were not significantly different that zero with any other socio-demographic or illness-related variable except race, with youth identifying as Black scoring higher total MEIM-R scores (r=0.244, p<.001, d = 0.503; Table 5).

Discussion

Our results indicate that a bifactor model with one general ethnic identity and one specific factor for the MEIM-R provides the best model fit in this sample of diverse youth with type 1 diabetes given model fit and bifactor indices. The high OmegaH value for the general factor indicates MEIM-R ethnic identity to be a unidimensional construct, and the collection of bifactor indices and factor loadings for the specific factor suggest that the uncorrelated specific factor may be a useful strategy to disentangle construct-irrelevant variance in the MEIM-R items. A bifactor model has previously been found appropriate in a sample of college-aged individuals using the original MEIM (Yap et al., 2014), yet there does not appear to be present literature examining a bifactor model of the revised MEIM. Previous literature with the MEIM-R has favored a two-factor model (Homma et al., 2014; Musso et al., 2018); however, no presently published study has examined the psychometric properties of the MEIM-R among youth with type 1 diabetes. These findings initially support the bifactor structure of the MEIM-R among this sample.

The significant direct effect of racialized category on items 4 and 5 indicated that youth with T1D identifying as Black/African-American scored higher on these items than their White peers even when controlling for the effect of the general factor on these items. One prior explanation for these findings is that White youth being the dominant ethnic group may not have as much experience with racial socialization than their Black peers, with White peers rewarded

for silence on their own ethnic identity in the service of promoting the status quo, yielding a lower overall sense of ethnic identity toward their own ethnic group (Knowles et al., 2014; Moffitt & Rogers, 2022). Moreover, previous research indicates that youth with minoritized ethnic identities are more likely to mention ethnicity when describing themselves compared to White peers (Akiba & Garcia Coll, 2003; Akiba et al., 2004). Meanwhile, because racially minoritized youth are exposed to higher levels of racism and discrimination at the hands of White peers, they are more likely to discuss topics related to race and meaning-making surrounding their experiences with oppression (Moffitt & Rogers, 2022; Rogers et al., 2021). Critical consciousness, comprised of reflection, motivation, and action against oppression, is one potential area of further exploration in its association with ethnic identity and how it may protect against adverse psychosocial and health-related outcomes in minoritized youth facing oppression (Castro et al., 2022). Critical motivation, operationalized as one's combined perceived ability and desire to advance equity and justice as a collective or individual (Rapa et al., 2020), has been found to be particularly associated with improved well-being in youth facing racial/ethnic marginalization (Castro et al., 2022).

Similar findings were found for the significant moderating effect of gender on path between Ethnic Racial Identity and item 4 ("I have often done things that will help me understand my ethnic background better"; i.e. non-uniform DIF), whereby indicating it was a significantly stronger predictor for those who identified as "male" compared to those identifying as "female". Interestingly, previous research posits that women and girls may typically be expected to carry on cultural traditions and values, with adolescent Black girls reporting higher in ethnic identity search relative their adolescent Black boy peers (Phinney, 1990; Phinney & Tarver, 1988). In fact, research by Umana-Taylor and colleagues has observed that Latina

adolescents experience earlier developmental progression of ethnic identity relative to Latino adolescents (Umana-Taylor et al., 2009). Research by Spears & Brown (2007) indicates that White youth report heightened focus on their gender identity in their self-conceptualization relative to their ethnic identity, whereas youth holding minoritized ethnic identities consider both their gender and ethnic identity to hold equal weight in their self-conceptualization. However, little research overall has examined gender differences in ethnic identity, especially present-day. It is worth considering other areas of oppression due to intersecting identity that may impact women and girls' ability to engage in tasks related to ethnic identity; for example, perhaps men and boys may be more "privileged" with opportunities related to ethnic identity exploration. Further research is needed to better understand potential gender differences in ethnic identity and their subsequent mechanisms.

There are a few limitations to this study warranting consideration. First, while there were no observed differences in any of the factors by age, the cross-sectional nature of this study design limits the ability to observe potential developmental changes in ethnic identity over time. Previous longitudinal research indicates that racial ethnic identity development increases over time in minoritized youth, and that exposure to racism can stimulate further ethnic identity development (Quintana, 2007; Umana-Taylor et al., 2009). Once a set of MEIM questions can be established without the presence of DIF, it will be important to examine longitudinal invariance over time and developmental periods in youth.

Second, contrary to what was hypothesized, the MEIM-R did not significantly correlate with other psychosocial or demographic measures utilized in this study aside from race. Thus, support for convergent/divergent validity of the MEIM-R in this sample could not be determined. It is unclear at this time whether the MEIM-R relates to other psychosocial factors associated

with diabetes-related outcomes. Previous studies utilized cultural indicators such as comparison by acculturation factors (Homma et al., 2014), and Lim and colleagues (2016) found that the Affirmation/Belonging subscale of the 12-item MEIM correlated significantly with health-related quality-of-life outcomes. No studies to date have examined diabetes-specific psychosocial measures and outcomes (e.g. diabetes family conflict, HbA1c). However, prior literature has supported the role of ethnic identity in improving diabetes-related outcomes (Murayama et al., 2017). Consistent with previous literature, our results suggest that ethnic identity may serve in a moderating role in the relation between constructs and items, which may suggest a broader moderating role between psychosocial or sociodemographic variables of interest (Mossakowski, 2003; Umana-Taylor & Updegraff, 2007). As such, complex and/or non-linear relations (e.g. quadratic and/or higher order interactions with gender, income etc.) may be present and provide a better statistical and conceptual match to theory (i.e. role as moderator in the context of an intersectional framing), seeking evidence of validity, and exploring the potential role of ethnic identity in the lives of youth with T1D and their families. (Clauss-Ehlers et al., 2019; Liese et al., 2022; Maker Castro et al., 2022; Velez & Spencer, 2018).

While the present study contributes to previous literature by supporting a bifactor approach with the addition of a general ethnic identity factor in the MEIM-R, DIF analyses indicate that use of the MEIM-R as a total "sum" score may not likely be appropriate without utilizing quantitative strategies to account for DIF. The present study informs the field of potential differences in response patterns by racialized/ethnic groups. Future studies examining psychometric properties of the MEIM-R could reconsider returning to the full length MEIM, developing a new item pool, examining DIF among other racialized/ethnic groups not included

in this study, as well as consideration of a longitudinal study design to explore how patterns of MEIM-R responses (and potential DIF) may change over development.

References

Acker, J. (2016). Inequality Regimes. *Gender & Society*, *20*(4), 441-464. https://doi.org/10.1177/0891243206289499

Akiba, D., & Garcia Coll, C. (2003). Effective interventions with children of color and their families. *Practicing multiculturalism: Affirming diversity in counseling and psychology. Boston: Allyn & Bacon*.

Akiba, D., Szalacha, L. A., & García Coll, C. T. (2004). Multiplicity of ethnic identification during middle childhood: Conceptual and methodological considerations. *New Directions for Child and Adolescent Development*, *2004*(104), 45-60.

American Diabetes Association. (2008). Economic costs of diabetes in the U.S. In 2007. *Diabetes Care*, *31*(3), 596-615. https://doi.org/10.2337/dc08-9017

American Diabetes Association. (2018a). 6. Glycemic Targets: Standards of Medical Care in Diabetes-2018. *Diabetes Care*, *41*(Suppl 1), S55-S64. https://doi.org/10.2337/dc18-S006

American Diabetes Association. (2018b). Economic Costs of Diabetes in the U.S. in 2017. *Diabetes Care*, *41*(5), 917-928. https://doi.org/10.2337/dci18-0007

Asparouhov, T., & Muthén, B. (2010). Weighted least squares estimation with missing data. *Mplus technical appendix*, *2010*, 1-10.

Asparouhov, T., & Muthén, B. (2018). SRMR in Mplus. In.

Berlin, K. S., Keenan, M. E., Cook, J. L., Ankney, R. L., Klages, K. L., Semenkovich, K., Rybak, T. M., Banks, G. G., Alemzadeh, R., & Eddington, A. R. (2020). Measuring psychological flexibility in youth with type 1 diabetes. *Pediatric Diabetes*, *21*(8), 1566-1574.

Brown, S. D., Unger Hu, K. A., Mevi, A. A., Hedderson, M. M., Shan, J., Quesenberry, C. P., & Ferrara, A. (2014). The multigroup ethnic identity measure-revised: measurement invariance across racial and ethnic groups. *J Couns Psychol*, *61*(1), 154-161. https://doi.org/10.1037/a0034749

Bryant, B. E., Jordan, A., & Clark, U. S. (2022). Race as a Social Construct in Psychiatry Research and Practice. *JAMA Psychiatry*, *79*(2), 93-94. https://doi.org/10.1001/jamapsychiatry.2021.2877

Castro, E.M., Wray-Lake, L., & Cohen, A.K. (2022). Critical consciousness and well-being in adolescents and young adults: A systematic review. *Adolescent Research Review, 7(*4), 499-522.

Chakawa, A., Butler, R. C., & Shapiro, S. K. (2015). Examining the psychometric validity of the Multigroup Ethnic Identity Measure-Revised (MEIM-R) in a community sample of African American and European American adults. *Cultural Diversity and Ethnic Minority Psychology*, *21*(4), 643.

Clarke, D. E., Colantonio, A., Rhodes, A.E., & Escobar, M. (2008). Ethnicity and mental health: Conceptualization, definition, and operationalization of ethnicity from a Canadian context. *Chronic Diseases in Canada*, *28*(4), 128-147.

Clauss-Ehlers, C. S., Chiriboga, D. A., Hunter, S. J., Roysircar, G., & Tummala-Narra, P. (2019). APA Multicultural Guidelines executive summary: Ecological approach to context, identity, and intersectionality. *American Psychologist*, *74*(2), 232-244. https://doi.org/10.1037/amp0000382

Dandy, J., Durkin, K., McEvoy, P., Barber, B. L., & Houghton, S. (2008). Psychometric properties of multigroup ethnic identity measure (MEIM) scores with Australian adolescents from diverse ethnocultural groups. *Journal of Adolescence*, *31*(3), 323-335. https://doi.org/10.1016/j.adolescence.2007.06.003

Dhaliwal, R., Pereira, R. I., Diaz-Thomas, A. M., Powe, C. E., Yanes Cardozo, L. L., & Joseph, J. J. (2022). Eradicating Racism: An Endocrine Society Policy Perspective. *The Journal of Clinical Endocrinology & Metabolism*, *107*(5), 1205-1215. https://doi.org/10.1210/clinem/dgab896

Diabetes Control and Complications Trial Group (1995). The relationship of glycemic exposure (HbA1c) to the risk of development and progression of retinopathy in the diabetes control and complications trial. *Diabetes*, *44*(8), 968-983.

DiMeglio, L. A., Acerini, C. L., Codner, E., Craig, M. E., Hofer, S. E., Pillay, K., & Maahs, D. M. (2018). ISPAD Clinical Practice Consensus Guidelines 2018: Glycemic control targets and glucose monitoring for children, adolescents, and young adults with diabetes. *Pediatr Diabetes*, *19 Suppl 27*, 105-114. https://doi.org/10.1111/pedi.12737

Feagin, J. R. (2006). *Systemic racism: A theory of oppression*. Routledge/Taylor & Francis Group.

Feagin, J. R. (2013). *Systemic Racism: A Theory of Oppression*. Routledge.

Fegan-Bohm, K., Minard, C. G., Anderson, B. J., Butler, A. M., Titus, C., Weissberg-Benchell, J., & Hilliard, M. E. (2020). Diabetes distress and HbA1c in racially/ethnically and socioeconomically diverse youth with type 1 diabetes. *Pediatr Diabetes*, *21*(7), 1362-1369. https://doi.org/10.1111/pedi.13108

Gaines, S. O., Jr., Marelich, W. D., Bledsoe, K. L., Steers, W. N., Henderson, M. C., Granrose, C. S., Barájas, L., Hicks, D., Lyde, M., Takahashi, Y., Yum, N., Ríos, D. I., García, B. F., Farris, K. R., & Page, M. S. (1997). Links between race/ethnicity and cultural values as mediated by racial/ethnic identity and moderated by gender. *J Pers Soc Psychol*, *72*(6), 1460-1476. https://doi.org/10.1037//0022-3514.72.6.1460

Gil, A. G., Wagner, E. F., & Vega, W. A. (2000). Acculturation, familism, and alcohol use among Latino adolescent males: Longitudinal relations. *Journal of Community Psychology*, *28*, 443-458.

Gonder-Frederick, L. A., Cox, D. J., & Ritterband, L. M. (2002). Diabetes and behavioral medicine: the second decade. *J Consult Clin Psychol*, *70*(3), 611-625. https://doi.org/10.1037//0022-006x.70.3.611

Greco, L. A., & Hart, T. A. (2005). *The diabetes acceptance and action scale for children and adolescents (DAAS)*. https://contextualscience.org/diabetes_acceptance_and_action_scale_for_children_and_adolescents_daas

Gregg, J. A., Callaghan, G. M., Hayes, S. C., & Glenn-Lawson, J. L. (2007). Improving diabetes self-management through acceptance, mindfulness, and values: a randomized controlled trial. *J Consult Clin Psychol, 75*(2), 336-343. https://doi.org/10.1037/0022-006X.75.2.336

Homma, Y., Zumbo, B. D., Saewyc, E. M., & Wong, S. T. (2014). Psychometric Evaluation of the Six-Item Version of the Multigroup Ethnic Identity Measure with East Asian Adolescents in Canada. *Identity, 14*(1), 1-18. https://doi.org/10.1080/15283488.2013.858227

Homma, Y., Zumbo, B. D., Saewyc, E. M., & Wong, S. T. (2014). Psychometric Evaluation of the Six-Item Version of the Multigroup Ethnic Identity Measure with East Asian Adolescents in Canada. *Identity, 14*(1), 1-18. https://doi.org/10.1080/15283488.2013.858227

Hood, K. K., Butler, D. A., Anderson, B. J., & Laffel, L. M. (2007). Updated and revised Diabetes Family Conflict Scale. *Diabetes Care, 30*(7), 1764-1769. https://doi.org/10.2337/dc06-2358

Hu, L. t., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural equation modeling: a multidisciplinary journal, 6*(1), 1-55.

Keenan, M. E., Berlin, K. S., Cook, J. L., Ankney, R. L., Klages, K. L., Semenkovich, K. A., Rybak, T. M., Banks, G. G., Choquette, A. E., Alemzadeh, R., & Eddington, A. R. (2021). Predictors of HbA1c Trajectories in Predominantly Black Adolescents With Type 1 Diabetes. *J Pediatr Psychol, 46*(3), 241-250. https://doi.org/10.1093/jpepsy/jsaa124

Keenan, M. E., Berlin, K. S., Cook, J. L., Choquette, A. E., Ankney, R. L., Klages, K. L., Semenkovich, K. A., Rybak, T. M., Banks, G. G., Alemzadeh, R., & Eddington, A. R. (2022). Brief assessment of diabetes-specific psychological flexibility in racially and income diverse youth with type 1 diabetes. *Pediatr Diabetes*. https://doi.org/10.1111/pedi.13321

Kline, R. B. (2015). *Principles and practice of structural equation modeling*. Guilford publications.

Knowles, E. D., Lowery, B. S., Chow, R. M., & Unzueta, M. M. (2014). Deny, distance, or dismantle? How white Americans manage a privileged identity. *Perspectives on Psychological Science, 9*(6), 594-609.

Lawrence, J. M., Divers, J., Isom, S., Saydah, S., Imperatore, G., Pihoker, C., Marcovina, S. M., Mayer-Davis, E. J., Hamman, R. F., Dolan, L., Dabelea, D., Pettitt, D. J., Liese, A. D., & Group, S. f. D. i. Y. S. (2021). Trends in Prevalence of Type 1 and Type 2 Diabetes in Children and Adolescents in the US, 2001-2017. *JAMA, 326*(8), 717-727. https://doi.org/10.1001/jama.2021.11165

Liese, A. D., Reboussin, B. A., Kahkoska, A. R., Frongillo, E. A., Malik, F. S., Imperatore, G., Saydah, S., Bellatorre, A., Lawrence, J. M., Dabelea, D., & Mendoza, J. A. (2022). Inequalities in Glycemic Control in Youth with Type 1 Diabetes Over Time: Intersectionality Between Socioeconomic Position and Race and Ethnicity. *Annals of Behavioral Medicine, 56*(5), 461-471. https://doi.org/10.1093/abm/kaab086

Lim, C. S., Gowey, M. A., Silverstein, J., Dumont-Driscoll, M., & Janicke, D. M. (2016). Depressive Symptoms, Ethnic Identity, and Health-Related Quality of Life in Obese Youth. *Journal of Pediatric Psychology*, *41*(4), 441-452. https://doi.org/10.1093/jpepsy/jsv014

Lim, C. S., Welkom, J. S., Cohen, L. L., & Osunkwo, I. (2012). Evaluating the protective role of racial identity in children with sickle cell disease. *J Pediatr Psychol*, *37*(8), 832-842. https://doi.org/10.1093/jpepsy/jss059

Lipman, T. H., Levitt Katz, L. E., Ratcliffe, S. J., Murphy, K. M., Aguilar, A., Rezvani, I., Howe, C. J., Fadia, S., & Suarez, E. (2013). Increasing incidence of type 1 diabetes in youth: twenty years of the Philadelphia Pediatric Diabetes Registry. *Diabetes Care*, *36*(6), 1597-1603.

Lipman, T. H., Smith, J. A., Patil, O., Willi, S. M., & Hawkes, C. P. (2021). Racial disparities in treatment and outcomes of children with type 1 diabetes. *Pediatr Diabetes*, *22*(2), 241-248. https://doi.org/10.1111/pedi.13139

Maker Castro, E., Wray-Lake, L., & Cohen, A. K. (2022). Critical Consciousness and Wellbeing in Adolescents and Young Adults: A Systematic Review. *Adolescent Research Review*, *7*(4), 499-522. https://doi.org/10.1007/s40894-022-00188-3

Marsh, H. W., & Hau, K. T. (1999). Confirmatory factor analysis: Strategies for small sample sizes. In R. H. Hoyle (Ed.), *Statistical Issues for Small Sample Research* (pp. 251-284). Sage Publishing.

Mayer-Davis, E. J., Lawrence, J. M., Dabelea, D., Divers, J., Isom, S., Dolan, L., Imperatore, G., Linder, B., Marcovina, S., Pettitt, D. J., Pihoker, C., Saydah, S., Wagenknecht, L., & Study, S. f. D. i. Y. (2017). Incidence Trends of Type 1 and Type 2 Diabetes among Youths, 2002-2012. *N Engl J Med*, *376*(15), 1419-1429. https://doi.org/10.1056/NEJMoa1610187

Mobasseri, M., Shirmohammadi, M., Amiri, T., Vahed, N., Hosseini Fard, H., & Ghojazadeh, M. (2020). Prevalence and incidence of type 1 diabetes in the world: a systematic review and meta-analysis. *Health Promot Perspect*, *10*(2), 98-115. https://doi.org/10.34172/hpp.2020.18

Moffitt, U., & Rogers, L. O. (2022). Studying Ethnic-Racial Identity among White Youth: White Supremacy as a Developmental Context. *Journal of Research on Adolescence*, *32*(3), 815-828.

Mossakowski, K. N. (2003). Coping with perceived discrimination: Does ethnic identity protect mental health? *Journal of Health and Social Behavior*, *44*(3), 318-331.

Mossakowski, K. N. (2003). Coping with perceived discrimination: Does ethnic identity protect mental health? *Journal of Health and Social Behavior*, *44*(3), 318-331.

Murayama, H., Spencer, M. S., Sinco, B. R., Palmisano, G., & Kieffer, E. C. (2017). Does Racial/Ethnic Identity Influence the Effectiveness of a Community Health Worker Intervention for African American and Latino Adults With Type 2 Diabetes? *Health Educ Behav*, *44*(3), 485-493. https://doi.org/10.1177/1090198116673821

Murayama, H., Spencer, M. S., Sinco, B. R., Palmisano, G., & Kieffer, E. C. (2017). Does Racial/Ethnic Identity Influence the Effectiveness of a Community Health Worker Intervention for African American and Latino Adults With Type 2 Diabetes? *Health Educ Behav*, *44*(3), 485-493. https://doi.org/10.1177/1090198116673821

Musso, P., Moscardino, U., & Inguglia, C. (2018). The Multigroup Ethnic Identity Measure – Revised (MEIM-R): Psychometric evaluation with adolescents from diverse ethnocultural groups in Italy. *European Journal of Developmental Psychology*, *15*(4), 395-410. https://doi.org/10.1080/17405629.2016.1278363

Ogunwole, S. M., & Golden, S. H. (2020). Social Determinants of Health and Structural Inequities—Root Causes of Diabetes Disparities. *Diabetes Care*, *44*(1), 11-13. https://doi.org/10.2337/dci20-0060

Petitti, D. B., Klingensmith, G. J., Bell, R. A., Andrews, J. S., Dabelea, D., Imperatore, G., Marcovina, S., Pihoker, C., Standiford, D., Waitzfelder, B., Mayer-Davis, E., & Group, S. f. D. i. Y. S. (2009). Glycemic control in youth with diabetes: the SEARCH for diabetes in Youth Study. *J Pediatr*, *155*(5), 668-672 e661-663. https://doi.org/10.1016/j.jpeds.2009.05.025

Phinney, J. S. (1990). Ethnic identity in adolescents and adults: A review of research. *Psychological Bulletin*(108), 499-514.

Phinney, J. S. (1992). The Multigroup Ethnic Identity Measure. *Journal of Adolescent Research*, *7*(2), 156-176. https://doi.org/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. https://doi.org/10.1037/0022-0167.54.3.271

Phinney, J. S., & Tarver, S. (1988). Ethnic identity search and commitment in Black and White eighth graders. *The Journal of Early Adolescence*, *8*(3), 265-277.

Quintana, S. M. (2007). Racial and ethnic identity: Developmental perspectives and research. *Journal of Counseling Psychology*, *54*(3), 259-270. https://doi.org/10.1037/0022-0167.54.3.259

Rapa, L.J., Bolding, C.W., & Jamil, F.M. (2020). Development and initial validation of the short critical consciousness scale (CCS-S). *Journal of Applied Developmental Psychology, 70*, 101164. https://doi.org/10.1016/j.appdev.2020.101164

Reise, S. P., Moore, T. M., & Haviland, M. G. (2010). Bifactor Models and Rotations: Exploring the Extent to Which Multidimensional Data Yield Univocal Scale Scores. *Journal of Personality Assessment, 92*(6), 544-559. https://doi.org/10.1080/00223891.2010.496477

Rogers, L. O., Moffitt, U., & Foo, C. (2021). "Martin Luther King fixed it": Children making sense of racial identity in a colorblind society. *Child Development*, *92*(5), 1817-1835.

Rybak, T. M., Ali, J. S., Berlin, K. S., Klages, K. L., Banks, G. G., Kamody, R. C., Ferry, R. J., Alemzadeh, R., & Diaz-Thomas, A. M. (2017). Patterns of Family Functioning and Diabetes-Specific Conflict in Relation to Glycemic Control and Health-Related Quality of Life Among Youth With Type 1 Diabetes. *Journal of Pediatric Psychology*, jsw071. https://doi.org/10.1093/jpepsy/jsw071

Spencer, M. B. (1995). Old issues and new theorizing about African American youth: A phenomenological variant of ecological systems theory. *African American youth: their social and economic status in the United States*, 37-69.

Spencer, M. B., Harpalani, V., Cassidy, E., Jacobs, C. Y., Donde, S., Goss, T. N., Muñoz-Miller, M., Charles, N., & Wilson, S. (2006). Understanding vulnerability and resilience from a normative developmental perspective: Implications for racially and ethnically diverse youth. In D. C. D. J. Cohen (Ed.), *Developmental psychopathology: Theory and method* (pp. 627-672). John Wiley & Sons, inc.

Sussman, M., Benner, J., Haller, M. J., Rewers, M., & Griffiths, R. (2020). Estimated Lifetime Economic Burden of Type 1 Diabetes. *Diabetes Technology & Therapeutics*, *22*(2), 121-130. https://doi.org/10.1089/dia.2019.0398

Tafjel, H. (1981). *Human groups & social categories: Studies in social psychology.* Cambridge University Press.

Tao, B., Pietropaolo, M., Atkinson, M., Schatz, D., & Taylor, D. (2010). Estimating the cost of type 1 diabetes in the U.S.: a propensity score matching method. *PLoS One*, *5*(7), e11501. https://doi.org/10.1371/journal.pone.0011501

Umana-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. *J Adolesc*, *30*(4), 549-567. https://doi.org/10.1016/j.adolescence.2006.08.002

Umana-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. *J Adolesc*, *30*(4), 549-567. https://doi.org/10.1016/j.adolescence.2006.08.002

Umana-Taylor, A. J., Gonzales-Backen, M. A., & Guimond, A. B. (2009). Latino Adolescentsâ€ ™ Ethnic Identity: Is There a Developmental Progression and Does Growth in Ethnic Identity Predict Growth in Self-Esteem? *Child Development*, *80*(2), 391-405. https://doi.org/10.1111/j.1467-8624.2009.01267.x

Umaña-Taylor, A. J., Quintana, S. M., Lee, R. M., Cross, W. E., Rivas-Drake, D., Schwartz, S. J., Syed, M., Yip, T., & Seaton, E. (2014). Ethnic and Racial Identity During Adolescence and Into Young Adulthood: An Integrated Conceptualization. *Child Development*, *85*(1), 21-39. https://doi.org/10.1111/cdev.12196

Varni, J. W., Burwinkle, T. M., Jacobs, J. R., Gottschalk, M., Kaufman, F., & Jones, K. L. (2003). The PedsQL™ in Type 1 and Type 2 Diabetes. *Diabetes Care*, *26*(3), 631-637. https://doi.org/10.2337/diacare.26.3.631

Velez, G., & Spencer, M. B. (2018). Phenomenology and Intersectionality: Using PVEST as a Frame for Adolescent Identity Formation Amid Intersecting Ecological Systems of Inequality. *New Directions for Child and Adolescent Development*, *2018*(161), 75-90. https://doi.org/10.1002/cad.20247

Velez, G., & Spencer, M. B. (2018). Phenomenology and Intersectionality: Using PVEST as a Frame for Adolescent Identity Formation Amid Intersecting Ecological Systems of

Inequality. *New Directions for Child and Adolescent Development*, *2018*(161), 75-90. https://doi.org/https://doi.org/10.1002/cad.20247

Villarreal, R., Blozis, S. A., & Widaman, K. F. (2005). Factorial Invariance of a Pan-Hispanic Familism Scale. *Hispanic Journal of Behavioral Sciences*, *27*(4), 409-425. https://doi.org/10.1177/0739986305281125

West, S. G., Taylor, A. B., & Wu, W. (2012). Model fit and model selection in structural equation modeling. *Handbook of structural equation modeling*, *1*, 209-231.

Willi, S. M., Miller, K. M., DiMeglio, L. A., Klingensmith, G. J., Simmons, J. H., Tamborlane, W. V., Nadeau, K. J., Kittelsrud, J. M., Huckfeldt, P., Beck, R. W., Lipman, T. H., & Network, T. D. E. C. (2015). Racial-ethnic disparities in management and outcomes among children with type 1 diabetes. *Pediatrics*, *135*(3), 424-434. https://doi.org/10.1542/peds.2014-1774

Woods, C. M. (2009). Evaluation of MIMIC-Model Methods for DIF Testing With Comparison to Two-Group Analysis. *Multivariate behavioral research*, *44*(1), 1-27. https://doi.org/10.1080/00273170802620121

Wysocki, T., Buckloh, L. M., & Pierce, J. (2018). The Psychological Context of Diabetes Mellitus in Youth. In M. C. Roberts & R. G. Steele (Eds.), *The Handbook of Pediatric Psychology* (5 ed., pp. 256-268). Guildford Press.

Yancey, A. K., Aneshensel, C. S., & Driscoll, A. K. (2001). The Assessment of Ethnic Identity in a Diverse Urban Youth Population. *Journal of Black Psychology*, *27*(2), 190-208. https://doi.org/10.1177/0095798401027002003

Yap, S. C., Donnellan, M. B., Schwartz, S. J., Kim, S. Y., Castillo, L. G., Zamboanga, B. L., Weisskirch, R. S., Lee, R. M., Park, I. J., & Whitbourne, S. K. (2014). Investigating the structure and measurement invariance of the Multigroup Ethnic Identity Measure in a multiethnic sample of college students. *Journal of Counseling Psychology*, *61*(3), 437.

Index

Table 1. *Revised Multigroup Ethnic Identity Measure (MEIM-R).*

Factor	Items (item number)	Response Options
Exploration	I have spent time trying to find out more about my ethnic group, such as its history, traditions, and customs. (1) I have often done things that will help me understand my ethnic background better. (4) I have often talked to other people in order to learn more about my ethnic group. (5)	*1 = strongly disagree* *2 = disagree* *3 = neutral* *4 = agree* *5 = strongly agree*
Commitment	I have a strong sense of belonging to my own ethnic group. (2) I understand pretty well what my ethnic group membership means to me. (3) I feel a strong attachment towards my own ethnic group. (6)	

Table 2. *Model Fit Comparisons.*

Model	**BIC**	χ^2	***p***	***df***	***Parameters Est. (#)***	***RMSEA* [90% *CI*]**	***CFI***	***SRMR***
1-Factor Continuous	2431.528	54.73	<.001	9	18	0.19 [0.14, 0.24]	0.89	0.05
1-Factor Categorical	-	68.85	<.001	9	30	0.22 [0.17, 0.27]	0.94	0.04
2-Factor Continuous	2400.181	23.08	0.574	8	17	0.10 [0.04, 0.15]	0.96	0.03
2-Factor Categorical	-	33.76	<.001	8	29	0.15 [0.10, 0.20]	0.98	0.03
Bifactor Continuous (1 General and 2 Specific Factors)	2412.456	0.913	0.633	2	25	0.00 [0.00, 0.13]	1.00	0.007
Bifactor Categorical (1 General and 2 Specific Facotrs)	-	996.57	<.001	15	37	0.00 [0.00, 0.16]	1.00	0.01
Bifactor Continuous (1 General and 1 Specific Factor)	2412.685	6.013	.198	4	23	0.00 [0.00, 0.15]	0.992	0.025

Note: BIC values only used to compare continuous models.

Table 3. *Bifactor indices.*

Model	Factor	ECV	Omega/ OmegaS	OmegaH/ OmegaHS	Relative Omega	H	FD
1 general, 2 specific							
	General	0.502	0.902	0.626	0.693	0.831	0.900
	Specific 1	0.223	0.879	0.339	0.385	0.734	0.944
	Specific 2	0.275	0.838	0.465	0.555	0.784	0.945
1 general, 1 specific							
	General	0.870	0.905	0.905	1.000	0.903	0.981
	Specific	0.130	0.905	0.000	0.000	0.392	0.948

Table 4. *Standardized factor loadings of the general and specific factors.*

Item	Item Text	General Factor	Specific Factor
1	I have spent time trying to find out more about my ethnic group, such as its history, traditions, and customs.	0.575**	0.220*
2	I have a strong sense of belonging to my own ethnic group.	0.740**	-0.141
3	I understand pretty well what my ethnic group membership means to me.	0.850**	-0.526**
4	I have often done things that will help me understand my ethnic background better.	0.772**	0.108
5	I have often talked to other people in order to learn more about my ethnic group.	0.850**	0.389**
6	I feel a strong attachment towards my own ethnic group.	0.689**	0.016

*Note: *p<.05, **p<.001*

Table 5. *Descriptives and correlations.*

Factor	**1.**	**2.**	**3.**	**4.**	**5.**	**6.**	**7.**	**8.**	**9.**	**10.**	**11.**	**12.**
1. HbA1c	-											
2. Income	-0.33*	-										
3. Race (Black/AA)	0.51*	-0.37*	-									
4. Gender (male)	-0.06	0.18*	-0.10	-								
5. Illness duration	0.25*	-0.17*	0.41*	-0.28*	-							
6. Age (years)	-0.11	-0.03	0.07	-0.05	0.13	-						
7. DSQ	0.30*	-0.10	0.20*	-0.18*	0.16*	-0.09	-					
8. FS	-0.14	0.10	0.07	0.13	0.01	-0.05	-0.12	-				
9. DFCS	0.20*	-0.27*	0.27*	-0.06	0.12	-0.03	0.44*	-0.12	-			
10. AADQ	-0.28*	0.13	-0.26*	-0.04	-0.25*	0.003	-0.55*	0.13	-0.43*	-		
11. DAAS	0.22*	-0.08	0.19	0.01	0.16*	-0.05	0.57*	0.59	-0.56*	0.22*	-	

Table 5 (Continued)

Factor	**1.**	**2.**	**3.**	**4.**	**5.**	**6.**	**7.**	**8.**	**9.**	**10.**	**11.**	**12.**
12. MEIM-R (Latent)	-0.25	0.16	0.24*	0.04	-0.07	0.12	0.09	0.08	-0.08	-0.06	-0.10	-
Mean	10.51	$20K-25K	55.6	52.5	4.96	14.66	1.16	4.07	1.76	3.81	4.76	19.58
SD	2.14				0.32	1.62	0.63	0.98	0.64	0.81	1.98	5.39

Note: HbA1c = % Hemoglobin A1c at time 1, AA = African-American, DSQ = Diabetes Stress Questionnaire, FS = Familism Scale, DFCS = Diabetes Family Conflict Scale, AADQ = Diabetes Acceptance and Action Questionnaire, MEIM-R = Multigroup Ethnic Identity Measure – Revised, *SD* = Standard Deviation. For gender, female = 1 and male = 0; For race, 0 = White and 1 = Black/African-American; % Frequency presented for binary variables. Median income range presented. *p<.05 or better.

Table 6. *Differential item functioning analysis of the general and specific factors.*

Parameter	**Estimate**	**S.E.**	**Estimate/S.E.**	**Uncorrected P-Value**
MEIMQ1 regressed on				
General (factor loading)	0.465	0.174	2.676	0.007*
Specific (factor loading)	-0.084	0.162	-0.519	0.604
A1C	0.009	0.066	0.143	0.886
Income	-0.01	0.043	-0.232	0.816
Race	0.799	0.334	2.391	0.017*
Gender	-0.153	0.272	-0.562	0.574
Illness Duration	-0.812	0.436	-1.862	0.063
Age	0.05	0.088	0.572	0.567
A1C x General	0.101	0.062	1.619	0.105
Income x General	0.081	0.072	1.125	0.261
Race x General	-0.22	0.289	-0.763	0.446
Gender x General	0.291	0.472	0.618	0.537
Illness Duration X General	1.053	0.6	1.756	0.079
Age x General	-0.184	0.131	-1.406	0.160
MEIMQ2 regressed on				
General (factor loading)	0.248	0.206	1.206	0.228
Specific (factor loading)	-0.774	0.111	-6.985	<.001*
A1C	-0.024	0.073	-0.32	0.749
Income	0.039	0.047	0.839	0.401

Table 6 (Continued)

Parameter	Estimate	S.E.	Estimate/S.E.	Uncorrected P-Value
Race	1.061	0.351	3.027	0.002*
Gender	0.2	0.249	0.801	0.423
Illness Duration	-1.197	0.427	-2.801	0.005*
Age	0.016	0.069	0.229	0.819
A1C x General	0.133	0.086	1.54	0.124
Income x General	0.05	0.066	0.758	0.449
Race x General	-0.787	0.313	-2.514	0.012*
Gender x General	0.043	0.372	0.116	0.907
Illness Duration x General	1.496	0.885	1.69	0.091
Age x General	0.003	0.129	0.021	0.983
MEIMQ3 regressed on				
General (factor loading)	0.438	0.202	2.168	0.030*
Specific (factor loading)	-0.523	0.116	-4.509	<.001*
A1C	-0.069	0.056	-1.233	0.218
Income	-0.014	0.031	-0.466	0.641
Race	0.826	0.266	3.108	0.002*
Gender	0.494	0.235	2.103	0.035
Illness Duration	-0.421	0.413	-1.019	0.308
Age	-0.027	0.057	-0.467	0.640
A1C x General	0.109	0.045	2.402	0.016
Income x General	0.067	0.038	1.754	0.079

Table 6 (Continued)

Parameter	Estimate	S.E.	Estimate/S.E.	Uncorrected P-Value
Race x General	-0.213	0.335	-0.638	0.524
Gender x General	-0.43	0.228	-1.886	0.059
Illness Duration x General	1.137	0.586	1.941	0.052
Age x General	0.006	0.099	0.061	0.952
MEIMQ4 regressed on				
General (factor loading)	0.746	0.148	5.036	<0.001*
Specific (factor loading)	-0.297	0.18	-1.648	0.099
A1C	-0.01	0.047	-0.21	0.834
Income	-0.037	0.035	-1.058	0.290
Race	1.117	0.25	4.463	<.001*
Gender	0.228	0.188	1.215	0.224
Illness Duration	-0.378	0.413	-0.914	0.361
Age	-0.099	0.056	-1.75	0.080
A1C x General	0.102	0.044	2.318	0.020*
Income x General	0.127	0.045	2.834	0.005
Race x General	-0.646	0.308	-2.099	0.036
Gender x General	0.677	0.181	3.747	<.001*
Illness Duration X General	2.233	0.647	3.453	0.001*
Age x General	-0.198	0.064	-3.081	0.002
MEIMQ5 regressed on				
General (factor loading)	0.502	0.138	3.629	<.001*

Table 6 (Continued)

Parameter	Estimate	S.E.	Estimate/S.E.	Uncorrected P-Value
Specific (factor loading)	-0.595	0.108	-5.492	<.001*
A1C	-0.075	0.056	-1.34	0.180
Income	-0.07	0.041	-1.736	0.083
Race	1.127	0.282	3.991	<.001
Gender	0.281	0.267	1.05	0.294
Illness Duration	-0.625	0.403	-1.552	0.121
Age	-0.198	0.071	-2.781	0.005
A1C x General	0.113	0.075	1.512	0.131
Income x General	0.089	0.062	1.428	0.153
Race x General	-0.745	0.406	-1.837	0.066
Gender x General	0.599	0.582	1.03	0.303
Illness Duration X General	0.107	0.959	0.112	0.911
Age x General	0.075	0.128	0.585	0.559
MEIMQ6 regressed on				
General (factor loading)	0.205	0.154	1.338	0.181
Specific (factor loading)	-0.591	0.12	-4.937	<.001*
A1C	0.006	0.066	0.09	0.928
Income	-0.048	0.051	-0.953	0.341
Race	0.601	0.394	1.524	0.128
Gender	0.341	0.288	1.186	0.236

Table 6 (Continued)

Parameter	Estimate	S.E.	Estimate/S.E.	Uncorrected P-Value
Illness Duration	-0.078	0.464	-0.169	0.866
Age	-0.085	0.083	-1.02	0.308
A1C x General	-0.06	0.074	-0.812	0.417
Income x General	0.117	0.065	1.798	0.072
Race x General	0.259	0.499	0.518	0.604
Gender x General	-0.564	0.481	-1.173	0.241
Illness Duration X General	0.311	0.996	0.312	0.755
Age x General	-0.057	0.139	-0.412	0.680

Note: ***indicates significance following Holm's procedure using a target family wise error rate of $p<.05$*

Figure 1. *Two-factor model of the MEIM-R.*

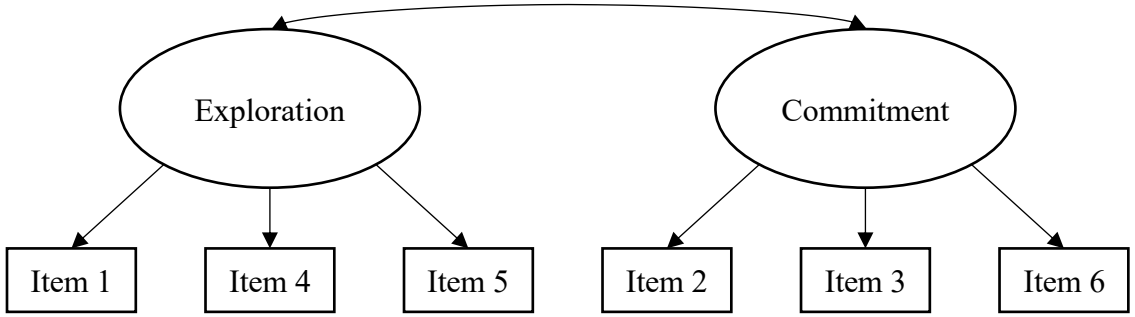

Figure 2. *Bifactor model of the MEIM-R.*