The Multidimensional Model of Māori Identity and Cultural Engagement: Measurement Equivalence across Diverse Māori Groups

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The Multidimensional Model of Māori Identity and Cultural Engagement (or MMM-ICE2) is a self-report questionnaire that measures seven distinct dimensions of one's subjective identity as Māori. Prior research indicates that the scale performs well psychometrically and predicts a wide range of outcomes for Māori peoples. However, the measurement equivalence of the MMM-ICE2 is yet to be assessed. That is, the extent to which the scale provides comparable measurement of the same aspects of identity for all Māori, for instance, across different age groups, for Māori men and women, and for Māori living in different urban or rural regions. Here, we address this gap in the validation of the MMM-ICE2 using Multigroup Confirmatory Factor Analysis to assess the configural, metric, and scalar equivalence of the scale across different demographic groups. We test our models using data from Māori participants who completed the MMM-ICE2 as part of the broader New Zealand Attitudes and Values Study (N = 696). Results indicate that the scale has reasonable measurement equivalence over metric, configural, and scalar assessments across most demographic comparisons. In sum, the results indicate that the MMM-ICE2 provides a valid assessment tool for Māori across a range of contexts, but nevertheless points to ways in which the scale could be improved in future.

Keywords: Māori; Identity; Indigenous; Measurement Equivalence

The field of quantitative identity research has undergone somewhat of an *emic* (by the people of the culture, for the people; Berry, 1989) revolution in recent years. The addition of the Pacific Identity and Wellbeing Scale (the PIWBS; Manuela & Sibley, 2013; 2015a), and the Multidimensional Model of Māori Identity and Cultural Engagement - Revised (the MMM-ICE2; Houkamau & Sibley, 2010, 2015a), have allowed researchers to assess identity in a culturally-specific and nuanced way. The MMM-ICE2 is a seven dimension, public domain, quantitative, Likert-style, self-report measure created *for* Māori *by* Māori (Houkamau & Sibley, 2010, 2015a). The purpose of the scale is to measure one's subjective identification as Māori (Houkamau & Sibley, 2010, 2015a). The MMM-ICE2 has shown utility in predicting a wide range of outcomes including: home-ownership (Houkamau & Sibley, 2015b), *Marae* visits and fluency in *Te Reo* Māori (Houkamau & Sibley, 2010), perceptions of National and Personal well-being (Houkamau & Sibley, 2011), self-esteem (Matika, Manuela, Muriwai, Houkamau, & Sibley, 2017), environmental attitudes and values (Cowie, Greaves, Milfont, Houkamau, & Sibley, 2016), and mental health (Muriwai, Houkamau & Sibley, 2015). Here, we aim to test the measurement equivalence of the MMM-ICE2 across urban/rural Māori, gender, "age and" sole-identified versus mixed Māori, to provide evidence that the scale is measuring subjective identification equally across groups.

Development of the MMM-ICE

Initially, Houkamau and Sibley (2010) aimed to create a scale of Māori identity, where identity is defined as: "constituting those aspects of the self-concept (including beliefs/values/attitudes) that pertain to 'who' a person is as Māori, how they 'fit in' with others in the social world and what that means in terms of behaviour" (Houkamau & Sibley, 2010, p.12). The original items were from a broad and detailed review of the literature on Māori identity and the international literature on ethnic identity. The initial item pool included items based on: identity centrality (Sellers, Smith, Shelton, Rowley, & Chavous, 1998; Luhtanen & Crocker, 1992), collective self-esteem (Luhtanen & Crocker, 1992), cultural efficacy (see Durie, 1995), active identity engagement (based on qualitative research by Houkamau, 2006), spirituality (i.e., Durie, 1994), interdependency/collectivism (Kashima & Hardie, 2000), and essentialist/authenticity based beliefs (based on discussions on the legitimising myth of real "Māoriness" by Borrell, 2005; Chadwick, 1998).

Houkamau and Sibley (2010) then used Exploratory Factor Analysis (EFA) on responses to a pool of 92 items by 270 participants recruited on the internet. EFA is a method used to explore how items cluster together to form a number of latent dimensions. A six-factor solution emerged from the analysis, meaning there were six reliable dimensions which underlie Māori identity over 47 items drawn from the data. Descriptions of the different dimensions can be found in Table 1. The first dimension was called Group Membership Evaluation (GME), which relates to having positive feelings about one's membership in the group 'Māori'. A second aspect of this dimension is how central and important to the self one's identity as a 'Māori' is. Another dimension was named Socio-Political Consciousness (SPC). This dimensions indexes beliefs in the continued importance of colonial history and the injustices experienced by

Māori. This dimension also assess the degree to which the participant feels they actively engage in the political process and 'stand up' for Māori political rights. The dimension of Cultural Efficacy and Active Identity Engagement (CEAIE) measures the extent to which one believes they have the personal resources to engage with other Māori in traditional cultural contexts.

The fourth dimension of the scale was named Spirituality, which measures engagement with traditional Māori concepts of spirituality like recognising *tīpuna* (ancestors) and that which is *tapu* (sacred). The fifth dimension was called Interdependent Self-Concept; this assesses the degree to which the participant believes that being Māori is interdependent or independent from their relationships with other Māori. Put more simply, it assesses whether one feels they need to actively engage with other Māori in order to truly be Māori. The final dimension was named Authenticity Beliefs. This dimension assess the degree to which someone believes that Māori have to do certain cultural things or look/act certain ways to be an authentic Māori.

In a later paper, Sibley and Houkamau (2013) examined the scale properties of the MMM-ICE, and assessed the stability of the scale across genders, and across the lifespan. They extended the initial analyses by using item response theory to look at the scale's internal reliability. That is, to check if there were scale reliability differences between people and at different levels of the dimensions. The MMM-ICE tended to be most precise at the mean level range of each dimension, but each dimension showed an acceptable level of reliability across the scale. Examining the dimensions across age cohorts and genders provided interesting comparisons and insights into how identity may change with age (although longitudinal research is needed). Older people tended to have a higher level of identification with the MMM-ICE dimensions and across genders the results were reasonably similar.

Finally, due to feedback from the community and further examination of the literature, Houkamau and Sibley (2015a) updated the original MMM-ICE by adding a seventh factor, Perceived Appearance. Perceived Appearance assesses the extent to which someone believes that they looking prototypically Māori to others. Houkamau and Sibley (2015a) also showed that this new factor, when controlling for the other six dimensions of the MMM-ICE2, predicted unique variation in reported perceived discrimination and that people lower in this dimension were more likely to be of mixed Māori-Pākehā (New Zealand European) descent. However, despite the growing body of research developing the scale, some important questions remain: for example, does the MMM-ICE2 measure identity as '*well*' for urban Māori as it does for rural Māori? What about for men versus women? Or across age groups? And, finally, for those who solely identify as Māori versus those who also identify with other ethnicities?

The aim of this paper is to test the measurement equivalence of the MMM-ICE2 across all of these groups using Multigroup Confirmatory Factor Analysis (MCFA).

Māori Identity: Key Influential Variables

MCFA is a tool that allows us to test the factorial equivalence of the MMM-ICE2 subscales across groups. However, the researchers must still choose suitable groups for comparison. For example, Manuela and Sibley (2015b) chose to compare the Pacific Identity and Wellbeing Scale across the major Pacific Island groups (Samoan, Cook Island, Tongan, and Nuiean). For the study of Māori identity this decision is less clear cut (especially since there are numerous *iwi*). However, several key variables have been identified in past literature as having a role in shaping one's identity as Māori.

Urban and Rural Māori

The distinction between urban and rural Māori has been influential in past research on identity. This distinction has been largely shaped by historical forces (Durie, 1994, Houkamau, 2006, 2010). A

Table 1

Construct definitions for the seven factors indexed by the MMM-ICE2. Adapted from Houkamau and Sibley (2015a).

Group Membership Evaluation (GME) The extent to which the individual positively evaluates their membership in the social category Māori and views their membership as Māori as a personally important or central aspect of their self-concept versus the extent to which the individual negatively evaluates their membership in the social category Māori and views their membership as Māori as peripheral or irrelevant to their self-concept
Cultural Efficacy and Active Identity Engagement (CEAIE) The extent to which the individual perceives that they have the personal resources required (i.e., the personal efficacy) to engage appropriately with other Māori in Māori social and cultural contexts versus the extent to which the individual perceives that they lack the personal resources and ability to engage appropriately with other Māori in Māori social and cultural contexts
Interdependent Self-Concept (ISC) The extent to which the concept of the self-as-Māori is defined by virtue of relationships with other Māori people versus the extent to which the concept of the self-as-Māori is viewed as being defined as solely unique and independent to the individual rather than as part of the social group.
Spirituality (S) The extent to which the individual is engaged with, and has a belief in, certain Māori concepts of spirituality, including a strong connection with ancestors, Māori traditions, the sensation and experience of *waahi tapu* (sacred places), and a strong spiritual attachment and feeling of connectedness with the land versus the extent to which the individual is disengaged from or does not believe in Māori concepts of spirituality.
Socio-Political Consciousness (SPC) The extent to which the individual perceives historical factors as being of continued importance for understanding contemporary intergroup relations between Māori and other ethnic groups in New Zealand; and how actively engaged the individual is in promoting and defending Māori rights given the context of the Treaty of Waitangi versus the extent to which the individual perceives historical factors and injustices experienced by Māori as being irrelevant in contemporary society.
Authenticity Beliefs (AB) The extent to which the individual believes that to be a 'real' or 'authentic' member of the social category Māori one must display specific (stereotypical) features, knowledge and behaviour versus the extent to which the individual believes that Māori identity is fluid rather than fixed, and produced through lived experience.
Perceived Appearance (PA) The extent to which people subjectively evaluate their appearance as having clear and visible features that signalling their ethnicity and ancestry as Māori (or high Māori prototypicality) versus the extent to which people evaluate their appearance as less indicative of having Māori ancestry (low Māori prototypicality).

key time period in the shaping of modern Māori identity is said to have occurred in the middle of the 20th century, where there was a mass migration away from (rural) ancestral lands to urban areas for economic opportunities (Taonui, 2012). This transition meant that assimilation of Māori into Pākehā culture became a reality of Māori life for some. For example, it was official policy to 'pepper pot' state housing (meaning dispersing Māori families throughout Pākehā ones). Additionally, speaking *te reo* Māori in schools became a punishable offense and the amount of land owned by Māori shrunk to the point that the remaining Māori-owned lands could only support one quarter of the Māori population (Belgrave, 2005; Walker, 1990). The distinction between rural and urban Māori was pronounced through this time in history as many who resided in urban areas adapted to Pākehā culture as they had reduced access to Māori cultural resources. Whereas rural Māori were said to still be engaged in *Te Ao Māori,* or the traditional Māori world/way of life (Houkamau, 2006, 2010).

However, these events led to 'the Māori Renaissance', a phrase used to refer to a period in New Zealand history from approximately the late 1960s through until the 1990s where Māori fought back against the forces of assimilation (Derby, 2014; Taonui, 2012). As a consequence, the Government responded with policies promoting Māori culture and biculturalism, and established the Waitangi Tribunal to address Treaty violations (Belgrave, 2005; Derby, 2014). The urbanization that contributed to a weakening of traditional Māori identity (Durie, 1994; Houkamau, 2006, 2010) also aided in the creation of this movement, as over the years, Māori became more concentrated in urban centers (Taonui, 2012).

Although, through this period Māori culture became more easily accessible to urban Māori than it had in the past, there still remains the possibility that Māori from rural areas have different conceptualizations of Māori identity than urban Māori. That being said, recent research with the MMM-ICE2 has found no differences between the urban/rural divide across common patterns of Māori identity (Greaves, Houkamau, & Sibley, 2015). In contrast, Chapple (2000) argues that the urban/rural divide exists and now may be more of a class distinction comprising an urban, educated, working class of Māori, versus rural Māori that have few employment prospects. Other research has found that there are differences in health risk factors across rural and urban Māori (Hodgkin, Hamlin, Ross, & Peters, 2010; Robson, Cormack, & Purdie, 2010), including that urban Māori youth are at a higher risk of developing depression (Clarke, & Jensen, 1997). Therefore, due to the possible different experiences that rural and urban Māori may have, it is beneficial to test the measurement equivalence of the MMM-ICE2 over this divide.

Gender

Life experiences and how people perceive one another typically differ depending on one's gender; of course this is no different for the experiences of Māori. Although, research using the MMM-ICE2 rarely finds gender differences across the scale. The most thorough investigation of gender differences being Sibley and Houkamau's (2013) examination of the stability of the scale across the lifespan by gender. They used item response theory to check if there were scale reliability differences between people, and at different levels of the dimensions. The MMM-ICE2 tended to be most precise at the mean level range of each dimension, but each dimension showed an acceptable level of reliability across the scale. Importantly, across genders the results were reasonably similar.

While there is little quantitative work focusing on Māori women's identity, a body of qualitative work recognises that Māori women's experience and identity have been greatly shaped by their gender. Work completed under the mana wahine framework of kaupapa Māori research challenges the idea that women have held, or hold, a lower status position in Māori society (Pihama, 2001). Mana wahine provides a framework for research that acknowledges issues that impact specifically on Māori women and girls (Pihama, 2001; Simmonds, 2011). For example, experiences of reproduction alone are inherently life- and identity- shaping for Māori women (Le Grice, 2014). Thus, although there is little quantitative research on Māori identity and gender, extant research, combined with the qualitative and theoretical literature suggest that gender is an important category to assess the MMM-ICE2 across.

Age

Historical events have been found to be very influential in shaping Māori identity. Houkamau (2006, 2010) showed that identity is linked to socio-historical contexts in that cultural, social, political and historical processes shape identity over time and across generations. As such, age cohort groups may have had very different experiences relating to their identities. Houkamau (2006, 2010) interviewed 35 Māori women, and found that three key periods of events in New Zealand history were salient in their descriptions of identity. These three key periods of events influenced the identity development for these three distinct age cohort groups. Firstly, there was an older group who felt positive about their Māori Identity and engaged in the traditional Māori world. Secondly, there was a middle-aged group who grew up in a time when Māori Identity was devalued, who struggled to form a sense of identity, and felt removed from their culture. This group were the least likely to feel that they could confidently rebut racism and negative views of Māori. Thirdly, there was a younger group who grew up during the Māori Renaissance, and so were able to learn how to act competently as Māori and were also able to navigate a colonised or 'Pākehā' world.

Quantitative research has also shown age differences in Māori identity, although it is as yet unclear whether these were cohort effects or if identity changes as one ages. Sibley and Houkamau (2013) investigated the stability of the MMM-ICE2 across the lifespan and found that older people tended to have higher scores across MMM-ICE2 dimensions. Greaves and colleagues (2015) also found that those with an enculturated (higher scoring) identity profile tended to be older. Thus, keeping in mind the historical influences on identity and the higher level of identification that past research has found with older people, age may have an influence on MMM-ICE2 scale scores. Therefore, we aim to test the measurement equivalence of the MMM-ICE2 across three age cohorts

based on Houkamau (2006, 2010): those aged under 40 (post-Māori Renaissance and may have benefitted from policies for increased biculturalism), 41-54 (formative years during the Māori Renaissance) and over 55 (pre-Māori Renaissance).

Sole and Mixed Māori

Another key variable that influences ethnic identity is whether one identifies solely as Māori or also identifies with another ethnicity (typically Pākehā). In 1974, being officially 'Māori' first legally moved beyond a Western blood-quantum based framework, which assumes that Māori identity and culture have a strict biological basis, to one of identification and affiliation (Cormack & Robson, 2010; Durie, 1994; Kukutai, 2004). A blood-quantum based system meant that one had to have a minimum level of Māori ancestry to identify as Māori. For example, one had to be at least half Māori (i.e. have one Māori parent) to identify their ethnicity as Māori. However, post-1974 anyone with *whakapapa* (with a Māori ancestor) could be counted officially as Māori on birth certificates and documentation, on the electoral roll (from 1975), and on the census if they wished (from 1986). Even though, in reality, Māori had been doing this for years (Durie, 1994). The 1991 national census even allowed people to identify with their *iwi* and distinguished between a) having a Māori ancestor and b) choosing to identify as Māori under ethnicity (including mixed- and sole-Māori). These changes to the official conception of ethnicity in New Zealand meant that being Māori moved from being about the Western and outdated concept of 'race' and toward ethnic identity or affiliation.

In the present day one in seven New Zealanders (14.9%) identify as Māori (although a further 100,000 New Zealanders report Māori ancestry but do not identify as Māori), with almost half (46.5%) of these individuals identifying solely as Māori (Statistics New Zealand, 2013). The experiences of mixed and sole identified Māori may differ as those who identify with another ethnicity may be able to draw upon the 'cultural resources' of the other ethnicity (Houkamau & Sibley, 2014). This effect is particularly pronounced for those who also identify as Pākehā, who are the majority of the population in New Zealand. These individuals may have a broader repertoire of psychosocial resources that can help them interact effectively with Pākehā and Māori (Houkamau & Sibley, 2014; Kukutai, 2007, 2013; Kukutai & Callister, 2009; Kukutai & Zealand, 2008; Muriwai et al., 2015).

As a result, research has found differences between sole-identifying and mixed- identifying Māori. It may be due to higher levels of racism that sole-identified Māori are more likely to experience exclusion (Houkamau & Sibley, 2015a; Nairn & McCreanor, 1991; Pihama, 2001; Thomas & Nikora, 1996) which can lead to a range of negative psychological outcomes (Houkamau & Sibley, 2014; Muriwai et al., 2015). Houkamau and Sibley (2014) have also shown that mixed and sole identifying Māori differ in some political attitudes: sole identifying Māori showed higher support for the Māori party, more warmth towards Māori and more support for policies benefitting Māori (Houkamau & Sibley, 2014). Due to these consistent findings of differences between sole- and mixed-identifying Māori over a range of outcomes, it is important to test the measurement equivalence of the MMM-ICE2 across these groups.

Testing Measurement Equivalence

A key goal in the development of the MMM-ICE was to create a scale to assess one's subjective Māori identity. Māori, however, are a diverse and changing group. In earlier Māori identity research, Durie (1995) recognized this as a key assumption when creating a Māori identity scale for the Te Hoe Nuku Roa study of Māori households. Furthermore, research with the MMM-ICE2 has also shown that Māori identity can be expressed in a number of diverse patterns (Greaves et al., 2015). This previous research highlights the need to test the factor equivalence of the MMM-ICE2 over a diverse number of groups within Māoridom to ensure that the scale can serve each sector of the Māori community equally. For example, if Māori residing in rural areas interpret items from the MMM-ICE2 differently to those who reside in cities/urban areas then the sub-scales are referring to different concepts. Meaning, that the whole point of the scale – to measure certain factors within, and specific to, Māori ethnic identity – is compromised. Manuela and Sibley (2015b) liken this to the problems researchers have using Western scales, like self-esteem, across different cultural contexts and languages. That is, the scale could potentially lose its meaning when items do not 'translate' across contexts and therefore the scale may not actually measure the construct that researchers had intended to measure.

A Multigroup Confirmatory Factor Analysis (MCFA) extends typical Confirmatory Factor Analysis (CFA) and tests factorial equivalence by estimating a CFA model for separate groups at the same time. This allows the researcher to test measurement equivalence (sometimes called measurement invariance) or whether the scale assesses the same constructs across the different groups (for more on MCFA see Cheung & Rensvold, 2002; Steenkamp & Baumgartner, 1998; for a review of measurement invariance see Vandenberg & Lance, 2000). In our case, one model we aim to test is the MMM-ICE2 across age cohort groups. Thus, we would estimate fit across the three theoretically different *a priori* specified age categories (40 and under, 41-54, and 55 plus), the goal being that the model fits equally well across groups. There are three levels at which this can be assessed: configural, metric, and scalar equivalence (see Milfont & Fischer, 2015).

Configural equivalence is the least conservative measure of factor equivalence. A key purpose of configural equivalence is to establish a baseline model for more stringent tests of measurement equivalence (Vandenberg & Lance, 2000). Good configural equivalence would indicate that different groups are interpreting the construct the researcher is testing for in the same way, or that the items are measuring the same underlying concepts across groups. If researchers do not find configural equivalence, then the measure represents different constructs in different groups, and so it becomes pointless to assess metric or scalar equivalence (Vandenberg & Lance, 2000). In MCFA, the test of metric equivalence examines the extent to which the factor loadings are the same across the groups. Metric

equivalence assesses whether the strength of the relationship between the indicators (Likert items, in our case) and the underlying latent construct are the same across different groups. If the tests of metric equivalence are satisfied then the groups can be compared with the confidence that the measurement units (in our case, the intervals of the Likert scale) are comparable across groups.

The third and most demanding test of factorial equivalence is that of scalar equivalence. Scalar equivalence extends the other model by estimating the extent to which the intercepts for the indicators are similar across groups. To return to our example of testing the scale across age cohorts, scalar equivalence would tell us if the mean scores (intercepts) of the different survey items are comparable across everyone regardless of age. For example, two people from different age groups (e.g., one under 40 and one aged 55 plus) have conceptually the same level of belief in the continued importance of the Treaty of Waitangi and both actively stand up for Māori political rights (indexed as part of the MMM-ICE2 by the subscale/construct of Socio-Political Consciousness). These two individuals should have a similar mean score on any given question in the Socio-Political Consciousness subscale. In other words, we would hope that the average construction of Māori identity for one group is not dramatically different from another when using the MMM-ICE2 scale, except when there are real mean differences between groups.

Overview

In this paper we aim to test the measurement equivalence of the MMM-ICE2 with four Multigroup Confirmatory Factor Analyses looking across the urban/rural divide, gender (male or female), three age cohort groups (under 40, 41-54, and 55+) based largely on work by Houkamau (2006, 2010), and sole-Māori or mixed-Māori ethnic identification. Additionally, this paper presents the first Confirmatory Factor Analysis of the MMM-ICE2 (revised) scale. The MMM-ICE2 is a scale of Māori identity that was created based on the recognition that Māori are a broad and diverse group (Houkamau & Sibley, 2010). As such, we hypothesise that the MMM-ICE2 will display fairly good measurement equivalence across all groups.

Method

Participant Details

Participants were 436 women, 260 men with a mean age of 44.01 (*SD*=13.03; note that sample sizes varied across analyses due to missing data). We sampled participants that identified as Māori, however, 55% also identified as Pākehā (NZ European; *n*=383), 5.6% as Pasifika (*n*=39), 1.3% as Asian (*n*=9), and 1.4% as another ethnicity (*n*=10). Participants were asked if they identified with a religion or spiritual group, 44.4% of the sample identified as religious (*n*=309). In regards to education, 25.1% did not report their highest level of education or reported no education (*n*=175), 33.3% reported at least some high school (*n*=232), 18.0% reported having studied towards a diploma or certificate (*n*=125), 17.1% reported having studied at the undergraduate level (*n*=119), and 6.5% reported having pursued post-graduate study (*n*=45).

Participants' postal addresses were used to identify the levels of material deprivation for each participant's immediate neighbourhood area based on census data (Atkinson, Salmond, & Crampton, 2014). The sample had a mean NZ Deprivation 2013 score of 6.77 (*SD*=2.78). The index is decile ranked (each unit represents 10% of the population) from 1 to 10 (low-high), therefore a mean score of 6.77 indicates a moderate level of deprivation relative to others in New Zealand. We also used participant addresses to determine whether each participant lived in either a rural or urban unit as defined by the Local Government Act 2002 (Statistics New Zealand, 2014). People living in urban areas constituted 52.8% of the sample (*n*=366), and those in rural areas were 47.2% of the sample (*n*=327).

Sampling Procedure

As part of the Time 4 New Zealand Attitudes and Values Study (NZAVS) sampling design, we included a booster sample aimed specifically at recruiting Māori participants (Frame 5 of the Time 4 NZAVS). This sample frame consisted of 9,000 people randomly selected from those who indicated on the 2012 Electoral Roll that they were of Māori descent. A total of 690 participants responded to this booster sample.

Adjusting for the overall address accuracy of the electoral roll as a whole, this represents a response rate of 7.78%. It should be noted that this response rate is lower than that observed for the main (full random probability) sample frames used in the NZAVS, which give responses rates of up to approximately 16%. The low response rate for this sample likely indicates many factors, among the most influential being the overall reduced likelihood of Māori participants to respond to postal surveys in general, combined with the possibility that contact details for Māori in the electoral roll may, on average, have a lower level of accuracy. It is likely that this relatively low response rate was also partially affected by the fact that people were opting into a 15-year longitudinal study. Thus, providing their contact details indicated that they were willing to be contacted by us to complete similar questionnaires for the next 15 years.

The questionnaire administered to the NZAVS Māori booster sample was similar in format and content to the standard NZAVS questionnaire, except it included questions specifically designed for Māori, and the cover letter introduced the survey as a "The NZAVS – Māori Identity Focus Questionnaire." The lead researcher and point of contact for this sample frame was of Māori descent, and was introduced to participants in the cover letter by listing *iwi* affiliations. Participants were informed that they had been randomly sampled for this study from among those who indicated that they were of Māori descent on the electoral roll.

Questionnaire Measures

Participants completed the full 54 item MMM-ICE-Revised including reverse-scored items and subscales for all seven subscales (Houkamau & Sibley, 2015a). A full copy of the scale is presented in the Appendix. Group Membership Evaluation (GME) was assessed by eight items (α=.843), example items include "I love the fact I am Māori" and "Being Māori is NOT important to who I am as a person" (reverse coded). The Cultural Efficacy and Active Identity Engagement (CEAIE)

subscale also used eight items (α=.858), including "I can't do Māori cultural stuff properly" (reverse coded). The subscale for Interdependent Self-Concept used seven items (α=.810) including "My Māori identity is fundamentally about my relationships with other Māori" and "My relationships with other Māori people (friends and family) are what make me Māori". Spirituality was assessed using eight items (α=.810), for example "I feel a strong spiritual association with the land" and "I don't believe in that Māori spiritual stuff" (reverse coded). We looked at Socio-Political Consciousness by using eight items (α=.882) including the items "I stand up for Māori rights" and "Māori would be heaps better off if they just forgot about the past and moved on" (reverse coded). Authenticity Beliefs were assessed by using the eight item scale (α=.603) including items like "You can tell a true Māori just by looking at them" and "Real Māori put their whānau first". The final dimension, Perceived Appearance was assessed with seven items (α=.918), examples include: "You only need to look at me to see that I am Māori".

Analytic Approach

We conducted four separate Multigroup Confirmatory Factor Analyses (MCFA), assessing the configural, metric, and scalar equivalence of the MMM-ICE2 for Māori across different demographic factors. The four demographic factors we examined were:

(a) Urban Māori versus rural Māori.

(b) Women and men.

(c) Broad age cohorts (40 years and under, 41-54 years, and 55 years and over).

(d) Sole-identified Māori versus Māori who identify with a least one other ethnic group.

We estimated these models using Maximum Likelihood with Robust error estimation (MLR) using *MPlus* 7.3. MLR is a maximum likelihood estimator that means the standard errors and chi-square test statistic are robust to non-normality and non-independence of observations (Muthén & Muthén, 2012). For each demographic, we first conducted standard CFAs separately for each subgroup (e.g., separate CFAs of the MMM-ICE2 for Māori men, and another for Māori women), and then a MCFA assessing the configural, metric and scalar equivalent of the MMM-ICE2 in a model directly comparing these groups (e.g., a MCFA comparing the solution for Māori men and women).

Results

Table 2 presents fit indices for CFAs assessing each group within each model is examined independently (e.g., a model for men, a model for women), and also the configural, metric, and scalar tests for each model directly comparing groups (e.g., comparing men and women). We present the results for both the independent CFAs and MCFA for the purposes of completeness, so that interested readers have information that can inform their use of the scale both in a specific population of Māori (e.g., Māori men, or Māori of a certain age), as well as the equivalence of the scale access different demographic groups.

For interpretation of model fit we present measures of exact fit: model χ^2, and indicators of relative fit: the Tucker-Lewis Index (TLI), the Comparative Fit Index (CFI), the Root Mean Squared Error of Approximation (RMSEA), and the Standardised Root Mean Square Residual (SRMR). We present a variety of indices of relative fit as model χ^2 alone is not an appropriate assessment of model fit, and recommendations advocate the presentation of a range of fit indices (Bentler, 2007). This is because χ^2 is an indicator of *exact fit*: one's test is either significant (the model does not fit) or not (the model does fit) and because we have sample sizes over 200 χ^2 will always be significant (Barrett, 2007). Due to this limitation we additionally present indicators of relative fit: the TLI, CFI, RMSEA, and SRMR. Relative fit measures tell the researcher not whether the model fits exactly, but whether the level of fit in a model is acceptable.

Table 2
Fit indices for Standard and Multigroup CFAs assessing the equivalence of the MMM-ICE2 across different groups.

	N	x^2	*df*	TLI	CFI	RMSEA	SRMR
Standard CFAs							
Overall model	678	5004.69	1356	.795	.806	.063	.074
Regional Models							
Urban	315	3543.51	1356	.744	.757	.072	.087
Rural	360	3365.38	1356	.791	.802	.064	.074
Gender Models							
Women	428	2920.27	1356	.765	.777	.066	.083
Men	250	2772.51	1356	.807	.818	.065	.072
Age Models							
40 and under	271	2908.74	1356	.807	.817	.065	.075
41-54	186	2670.49	1356	.739	.753	.072	.088
55+	221	2695.81	1356	.714	.729	.073	.095
Ethnicity Models							
Sole	305	3453.95	1356	.672	.689	.071	.104
Mixed	373	3166.15	1356	.823	.832	.060	.067
Multigroup CFA							
Regional Model							
Configural model	675	6307.43	2712	.770	.782	.063	.080
Metric model		6328.04	2759	.776	.784	.062	.081
Scalar model		6383.69	2806	.779	.784	.061	.081
Gender Model							
Configural model	678	6110.77	2712	.784	.796	.061	.079
Metric model		6167.88	2759	.787	.795	.060	.081
Scalar model		6304.97	2806	.786	.790	.061	.082
Age Model							
Configural model	677	8067.16	4068	.760	.772	.066	.085
Metric model		8179.29	4162	.764	.771	.065	.087
Scalar model		8438.86	4256	.760	.762	.066	.088
Ethnicity Model							
Configural model	678	6045.70	2712	.767	.779	.060	.086
Metric model		6208.25	2759	.763	.771	.061	.088
Scalar model		6366.07	2806	.759	.764	.061	.090

However, finding an exact cut-off value for relative model fit is difficult (as it depends on a number of factors; Hu & Bentler, 1998; Marsh, Hau, & Wen, 2004) and well-contested (and perhaps in contrast to the point of "relative" fit; Barrett, 2007; Bentler, 2007; Hayduk, Cummings, Boadu, Pazderka-Robinson, & Boulianne, 2007; Marsh et al., 2004). Standard guidelines or 'rules-of-thumb' generally recommend that an RMSEA of less than .08 indicates acceptable model fit and an RMSEA of less than .05 indicates excellent fit (Marsh et al., 2004). For SRMR, Hu and Bentler (1999) have reported a standard 'rule-of-thumb' of less than .08 is generally desirable. They also propose that CFI and TLI should be greater than .95, but a CFI and TLI greater than .90 may also indicate a reasonable model.

As can be seen in Table 2, the overall CFA model provided reasonable fit across the whole sample (χ^2(1356, N=678)=5004.69, p<.001, TLI=.795, CFI=.806, RMSEA=.063, SRMR =.074). Additionally, the independent CFAs for each group across each test also indicated that the MMM-ICE2 fits reasonably well when examining each group independently. The configural models for the MCFAs for region (χ^2(2712, N=675)=6307.43, p<.001, TLI=.770, CFI=.782, RMSEA=.063, SRMR =.080), gender (χ^2(2712, N=678)=6110.77, p<.001, TLI=.784, CFI=.796, RMSEA=.061, SRMR =.079), age groups (χ^2(4068, N=677)=8067.16, p<.001, TLI=.760, CFI=.772, RMSEA=.066, SRMR =.085), and sole versus mixed Māori (χ^2(2712, N=678)=6045.70, p<.001, TLI=.767, CFI=.779, RMSEA=.060, SRMR =.086) performed reasonably well. Although, the SRMR for both the age groups and ethnicity models was above the .08 generally recommended for acceptable fit. The TLI and CFI were also below the recommended .90 cut-off.

Additionally presented in Table 2 are the results for the metric models. Metric equivalence is attained if the factor loadings are the same across groups. The results for the metric models are as follows: for region (χ^2(2759, N=675)=6328.04, p<.001, TLI=.776, CFI=784, RMSEA=.062, SRMR =.081), gender (χ^2(2759, N=678)=6167.88, p<.001, TLI=.787, CFI=.795, RMSEA=.060, SRMR =.081), age groups (χ^2(4162, N=677)=8179.29, p<.001, TLI=.764, CFI=.771, RMSEA=.065, SRMR =.087), and sole versus mixed Māori (χ^2(2759, N=678)=6208.25, p<.001, TLI=.763, CFI=.771, RMSEA=.061, SRMR =.088). Again, no models had a TLI or CFI higher than the .90 cut-off value. Additionally, the SRMR for the age and ethnicity models were again well above .08.

The results for our third and most stringent test of the measurement equivalence of the MMM-ICE2 are also presented in Table 2. Recall that scalar equivalence assesses the similarity of the intercepts for each item across groups. The results for the scalar models are as follows: for region (χ^2(2806, N=675)=6383.69, p<.001, TLI=.779, CFI=.784, RMSEA=.061, SRMR=.081), gender (χ^2(2806, N=678)=6304.97, p<.001, TLI=.786, CFI=.790, RMSEA=.061, SRMR =.082), age groups (χ^2(4256, N=677)=8438.86, p<.001, TLI=.760, CFI=.762, RMSEA=.066, SRMR =.088), and sole versus mixed Māori (χ^2(2806, N=678)=6366.07, p<.001, TLI=.759, CFI=.764, RMSEA=.061, SRMR=.090). As with the configural and metric models, the scalar models for ethnicity and age had SRMR values higher than the desired .08. Again, the TLI and CFI values for each model were lower than the desired .90.

We then tested for differences in model fit for each group comparison using chi-square difference tests and change in CFI. When assessing model fit we assessed the metric against the configural model, then the scalar against the configural model. We conducted chi-square difference tests. In these tests if the more restrictive model (e.g. scalar), is significantly different from the less restrictive one (e.g. metric), then the model does not fit as well. Additionally, Cheung and Rensvold (2002) propose that fit can be assessed incrementally with change in CFI across these models: if ΔCFI is less than .01 the more restrictive model can be accepted.

For region, the metric against configural model ($\Delta\chi^2$(47)=28.17, p=.987; ΔCFI=.002), the scalar against configural model ($\Delta\chi^2$(94)=76.43, p=.907; ΔCFI=.002), and the scalar against metric model ($\Delta\chi^2$(47)=50.33, p=.343; ΔCFI=.000) did not significantly differ in fit and ΔCFI was below the <.01 threshold. For gender, the metric and configural model did not significantly differ in fit ($\Delta\chi^2$(47)=59.37, p=.106; ΔCFI=.001). The scalar and configural model ($\Delta\chi^2$(94)= 193.77, p<.001; ΔCFI=.006), and the scalar against the metric model ($\Delta\chi^2$(47)=140.60, p<.001; ΔCFI=.005) results indicated that the more restrictive measurement equivalence models did not fit as well as the metric model. However, when assessing ΔCFI, the differences were below .01, indicating that the more restrictive models can be accepted in both cases.

We found when testing both age cohort and sole versus mixed Māori, the more restrictive models significantly differed from the fit of the less restrictive metric models. For the age cohorts there were significant differences for the metric against configural ($\Delta\chi^2$(94)=120.32, p=.035; ΔCFI=.001), scalar and configural ($\Delta\chi^2$(188)= 371.73, p<.001; ΔCFI=.010), and the scalar against metric models ($\Delta\chi^2$(94)=264.28, p<.001; ΔCFI=.009). However, the ΔCFI for each comparison came in equal to or below the <.01 guideline indicating that the more restrictive models can be accepted in this case, although ΔCFI for the configural versus scalar comparison was .01.

The results were similar for sole versus mixed Māori. There were significant differences for the metric against configural models ($\Delta\chi^2$(47)=155.07, p<.001; ΔCFI=.008), the scalar and configural models ($\Delta\chi^2$(94)= 316.10, p<.001; ΔCFI=.015), and the scalar against metric models ($\Delta\chi^2$(47)=161.76, p<.001; ΔCFI=.008). However, when using ΔCFI as an indicator of model fit, the metric versus configural and configural versus scalar models were under the <.01 guideline. The threshold of ΔCFI <.01 was not met when comparing the configural model to the most restrictive scalar model, with the change being .015.

Discussion

The MMM-ICE2 is a scale that purports to measure subjective Māori ethnic identity in a scale specific to Māori. However, Māori are a diverse group, which may present problems for any scale wishing to capture the

multiplicity of Māori identity (Durie, 1994; Greaves et al., 2015). Thus, we aimed to answer the questions: does the MMM-ICE2 measure the same concepts across all Māori? Even across such diverse groups as urban Māori, rural Māori, Māori men, Māori women, young Māori, older Māori, those solely-identified as Māori, and bi-/multi-ethnic identifying Māori? As such, we conducted several Multigroup Confirmatory Factor Analyses to test measurement equivalence across these groups.

Our results showed that the scale performed well across region (urban or rural) and gender (female or male), the only exception being that the region and gender models did not reach the .90 guideline for TLI or CFI at any point. However, it bears keeping in mind that TLI and CFI may have been sensitive to the large number of items on the scale (Cheung & Rensvold, 2002). The ethnicity (sole or mixed identifying Māori) and age (40 and under, 41-54, and 55 plus) models again did not meet the .90 recommended for TLI or CFI, and had an SRMR higher than the recommended .80. Additionally, when comparing the configural (base) model and the most conservative scalar models, the results were just over the guideline for ethnicity and right on the rule-of-thumb value for age. This indicates two areas where the scale could have performed better. Our results suggest that the intercepts for the indicators are not similar across these groups. When examining the CFA results, the key weaker areas for the MMM-ICE2 was the comparison between older Māori and sole identifying Māori, and the comparison between age groups.

To put this in practical terms, those who are older (when compared to the younger age groups), or those who vary across ethnic affiliation, may have conceptually the same level of identification with a MMM-ICE2 domain, but a different mean score on an item across groups. For example, across age groups people may conceptually, equally agree with the item "Being Māori is cool" however, they may have a different mean score on this item due to a variety of possible reasons. The result is that any mean differences found across groups, across items, may not be related to there being a real difference in scores. Therefore, if someone were to conduct research exploring age differences or differences between sole- and mixed-Māori in a domain of the MMM-ICE2, there is a possibility some of the differences found could be attributed to measurement invariance. However, in both cases these comparisons fell barely short of the guideline we used for model fit (change in CFI). Additionally, in future, those working with the MMM-ICE2 should also try to replicate our results in an independent sample of Māori as intercepts, and therefore scalar invariance, may be sample-specific (Vandenberg & Lance, 2000). Generally, the results of our analyses should provide confidence to researchers that the MMM-ICE2 can continue to be used as a scale to measure Māori identity across broad and diverse samples of Māori.

It is also important to keep in mind that the Māori population is youthful compared to the non-Māori population (Statistics New Zealand, 2013). As such representative samples of Māori tend to have lower rates of people over 55 (or older: only around 5% of the Māori population is over 65; Statistics New Zealand, 2013) compared to samples of the general population. Further, younger people may be more familiar with the format and goals of surveys. It could be interesting to test measurement equivalence with a sample of Māori over time (Vandenberg & Lance, 2000) to explore whether the slight measurement invariance we found here is a cohort effect, i.e. whether it is due to a feature of this cohort of older Māori, or whether these effects for equivalence change as people age. Additionally, future studies examining the scale properties of the MMM-ICE2 could explore the particular items that were invariant (Byrne, Shavelson, & Muthén, 1989).

There remains the possibility that a couple of key things are missing from this examination of the MMM-ICE2 scale, and this sample used to test the MMM-ICE2 more generally. While the MMM-ICE2 purports to be a scale of Māori identity, there is the possibility that some unexamined part of Māori identity is not measured in the scale. This would mean that the scale is not a complete picture of Māori identity and can be remedied with improvements and feedback over time (like the addition of the Perceived Appearance dimension in the MMM-ICE2; Houkamau & Sibley, 2015a). Another limitation is the relatively low response rate to the survey (7.78% when electoral roll address accuracy adjusted). Participants were opting into a 16 year longitudinal survey and this may have been off-putting. However, survey response rates have been dropping over time and the effect is particularly pronounced for Māori (see Fink, Paine, Gander, Harris, & Purdie, 2011; Sibley 2014). This low response rate may mean that the sample tested here was biased in some way.

One problem is that we cannot know if our sample differs in views or identity to non-respondents, although, the sample look reasonably representative compared with census data on the Māori population (notwithstanding gender; Sibley, Muriwai, & Greaves, 2014). However, it may be that there is a group of Māori who are resistant to surveys, a Western concept that they may view as being linked to the Government. Additionally the survey was only sent in English and not *te reo* Māori. This may be the case, considering that the model did not fit as well for sole-identifying and older Māori, groups who may speak *te reo*. Alternatively, there may have been problems with address accuracy – it may be that some aspect of Māori identity predicts moving house more often and we have missed an important group – or we may have missed a group of more economically deprived Māori. However, these are all speculative, and we hope to follow up on these ideas with future analyses.

A key future research direction for the MMM-ICE2, however, is to collect longitudinal data. There are plans for a follow up Māori focus questionnaire in the next couple of years. This means that more complex, longitudinal models can be created to help us better understand how Māori identity may change over time. There is currently a need for research to discover how Māori identity may change with age, although extant research suggests that Māori may become more enculturated as they get older (Sibley & Houkamau, 2013; Greaves et al., 2015). Furthermore, collecting data from adolescent Māori, to both compare age groups and to examine scores as they age, are potential future research

directions. Here, we have found that the intercepts of the scale may vary by age, meaning that future research examining age and Māori identity will need to examine, and control for, measurement invariance. We hope that the groundwork laid in this paper allows for future longitudinal research to be conducted with relative confidence that the MMM-ICE2 is an efficacious measure of the broad, diverse group that are 'Māori'.

Acknowledgements

This manuscript is based on part of Lara Greaves' PhD thesis supervised by Chris Sibley and Carla Houkamau. Lara Greaves was supported by a University of Auckland Doctoral Scholarship during the preparation of this manuscript. This research was supported by a Te Whare Kura New Knowledge Acquisition Grant awarded to Carla Houkamau and Chris Sibley (#03903/1550). Data collection for the NZAVS was also supported by a Templeton World Charity Foundation Grant (ID: 0077). The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript. As per the NZAVS data access statement, a copy of the anonymous data reported in each NZAVS publication is available from CS upon request from appropriately qualified researchers. Such data will be provided with the explicit understanding that it is used solely for the purposes of replicating or otherwise checking the validity of analyses reported in scientific papers analyzing NZAVS data.

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Appendix

Table A1.
Item content for the MMM-ICE2 by dimension.

Group Membership Evaluation (GME)
1. I reckon being Māori is awesome.
2. I love the fact I am Māori.
3. Being Māori is cool.
4. I don't really care about following Māori culture.
5. I wish I could hide the fact that I am Māori from other people.
6. My Māori ancestry is important to me.
7. Being Māori is NOT important to who I am as a person.
8. Being Māori is NOT important to my sense of what kind of person I am.
Cultural Efficacy and Active Identity Engagement (CEAIE)
9. I don't know how to act like a real Māori on a marae.
10. I can't do Māori cultural stuff properly.
11. I can't do Māori culture or speak Māori.
12. I know how to act the right way when I am on a marae.
13. I'm comfortable doing Māori cultural stuff when I need to.
14. I have a clear sense of my Māori heritage and what it means for me.
15. I try to korero (speak) Māori whenever I can.
16. I sometimes feel that I don't fit in with other Māori.
Interdependent Self-Concept (ISC)
17. My relationships with other Māori people (friends and family) are what make me Māori.
18. I consider myself Māori because I am interconnected with other Māori people, including friends and family.
19. My Māori identity is fundamentally about my relationships with other Māori.
20. For me, a big part of being Māori is my relationships with other Māori people.
21. How I see myself is totally tied up with my relationships with my Māori friends and family.
22. My Māori identity belongs to me personally. It has nothing to do with my relationships with other Māori.
23. Reciprocity (give-and-take) is at the heart of what it means to be Māori for me.
Spirituality (S)
24. I believe that Tupuna (ancient ancestors) can communicate with you if they want to.
25. I don't believe in that Māori spiritual stuff.
26. I believe that my Taha Wairua (my spiritual side) is an important part of my Māori identity.
27. I can sense it when I am in a Tapu place.
28. I can sometimes feel my Māori ancestors watching over me.
29. I have never felt a spiritual connection with my ancestors.
30. I think Tapu is just a made up thing. It can't actually affect you.
31. I feel a strong spiritual association with the land.

Table A1 (continued).

Socio-Political Consciousness (SPC)	
1.	Māori would be heaps better off if they just forgot about the past and moved on.
2.	All of us, both Māori and Pākehā, did bad things in the past—we should all just forget about it.
3.	I'm sick of hearing about the Treaty of Waitangi and how Māori had their land stolen.
4.	I think we should all just be New Zealanders and forget about differences between Māori and Pākehā.
5.	I think that Māori have been wronged in the past, and that we should stand up for what is ours.
6.	What the European settlers did to Māori in the past has nothing to do with me personally. I wasn't there and I don't think it affects me at all.
7.	I stand up for Māori rights.
8.	It's important for Māori to stand together and be strong if we want to claim back the lands that were taken from us.
Authenticity Beliefs (AB)	
9.	You can always tell true Māori from other Māori. They're real different.
10.	I reckon that true Māori hang out at their marae all the time.
11.	True Māori always do karakia (prayer) before important events.
12.	You can tell a true Māori just by looking at them.
13.	Real Māori put their whānau first.
14.	To be truly Māori you need to understand your whakapapa and the history of your people.
15.	You can be a real Māori even if you don't know your Iwi.
16.	You can be a true Māori without ever speaking Māori.
Perceived Appearance (PA)	
17.	I think it is easy to tell that I am Māori just by looking at me.
18.	You only need to look at me to see that I am Māori.
19.	When people meet me, they often do not realize that I am Māori.
20.	I think it is hard to tell that I am Māori just by looking at me.
21.	I think it is clear to other people when they look at me that I am of Māori descent.
22.	People would never know that I am of Māori descent just by looking at me.
23.	People who don't know me often assume that I am from another (non-Māori) ethnic group.