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Self-concept of Indigenous and non-Indigenous Australian students: Competence and affect components and relations to achievement

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Abstract

Previous research on differences and similarities in self-concept of Indigenous and non-Indigenous Australian students did not consider the possible differentiation between competence and affect components. As a result, it is unknown whether previously found differences between Indigenous and non-Indigenous students' self-concepts are the result of their beliefs about their abilities or their feelings about specific domains. Thus, the present study aims to examine and compare the structure, the mean levels, and the relations to achievement measures of Indigenous and non-Indigenous Australian students' self-concepts in academic and non-academic domains when taking the competence-affect separation into account. Self-concepts in math, English, school, physical ability, and art were measured with 1809 secondary school students including 343 Indigenous students. For Indigenous and non-Indigenous students, confirmatory factor analyses demonstrated that all self-concept facets measured could be separated into competence and affect components although the correlations between competence and affect components were high, particularly for art and physical ability self-concepts. Non-Indigenous students demonstrated higher levels of school competence, English competence, English affect, and math competence self-concepts. Indigenous students displayed higher levels of physical ability competence self-concept while no group differences could be found for school affect, math affect, physical ability affect, and art competence and art affect self-concepts. Invariance tests revealed an invariant factor structure and invariant relations between the multiple self-concept facets and achievement factors across Indigenous and non-Indigenous students. Hence, the present study adds to our understanding of the similarities and differences regarding Indigenous and non-Indigenous Australian students' self-concepts.

Key Words: Indigenous students, self-concept, competence self-perceptions, affect self-perceptions, achievement relations

Indigenous Australians are one of the oldest surviving and diverse Indigenous cultures in the world (Bodkin-Andrews & Carlson, 2013; Butler, 2000). However, Indigenous Australians have also been recognised as one of the most disadvantaged Indigenous groups in the world today, across a wide variety of quality of life indicators including socio-economic status, physical and mental health, and education (Andersen & Walter, 2010; Cook, Mitrou, Lawrence, Guimond, & Beavon 2007) and are the most disadvantaged group in Australia on a diverse range of socio-economic indicators (Craven & Bodkin-Andrews, 2011; Craven & Parbury, 2013; Gray & Partington, 2012). The disadvantage of Indigenous Australians particularly manifests itself with regard to educational inequities and "These educational inequities are of grave concern, particularly given they are pervasive, extending across pre-school through high school" (Craven & Parbury, 2013, p. 370; also see De Bortoli & Thomson, 2010; Purdie & Buckley, 2010). Indigenous Australians are disadvantaged in their access to all levels of education and in cognitive educational outcomes such as academic achievement and engagement (Bodkin-Andrews, Dillon, & Craven, 2010; Bodkin-Andrews, O'Rourke, & Craven, 2010; Craven & Bodkin-Andrews, 2011; Lillemyr, Søbstad, Marder, & Flowerday, 2010; Trudgett, 2013; Yeung, Craven, & Ali, 2013). For example, Indigenous Australian students have been found to be significantly lower in reading, mathematical, and science literacy measures in the Australian report on the 2009 Program for International Student Assessment (PISA) data (Thomson, De Bortoli, Nicholas, Hillman, & Buckley, 2010) when compared to their non-Indigenous counterparts. Over three waves of PISA (2000, 2003, 2006) results, Australia was ranked above the Organisation for Economic Co-operation and Development (OECD) average, however Indigenous Australian students' results were consistently below the OECD average for reading, mathematical, and science literacy (De Borteli & Thomson, 2010). Furthermore, across the three time frames, there was no improvement in Indigenous students' performance.

Some researchers have suggested that a reason why Indigenous Australian students fall short in their academic achievement compared to their non-Indigenous counterparts might be their low levels of academic self-concept (Craven & Marsh, 2008). Academic self-concept has been found to positively impact upon academic achievement (Marsh & O'Mara, 2008; Craven & Marsh, 2008; Marsh & Craven, 2005, 2006) as well as on other educational outcomes such as coursework selection (Marsh & Yeung, 1997), academic interest (Marsh, Trautwein, Lüdtke, Köller & Baumert, 2005), and academic aspirations (Nagengast & Marsh, 2012). There is a long and expanding base of international literature providing strong evidence of the cross-cultural validity of academic self-concept (e.g., Marsh & Hau, 2004). However, research exploring the academic self-concept of students from minority groups such as Indigenous Australians has been more limited (Craven & Marsh, 2004; Twenge & Crocker, 2002). In consequence, the self-perceptions of Indigenous Australian students have been noted as an area in need of more research (New South Wales Aboriginal Education Consultative Group Incorporated and New South Wales Department of Education and Training, 2004). With these calls in mind, the primary purpose of the present study, conducted in the Australian state of New South Wales, is to contribute to extending our understanding of the structure and nature of Indigenous Australian students' self-concepts in comparison to their non-Indigenous peers. More specifically, the present study aims to advance previous research on the academic self-concepts of Indigenous and non-Indigenous students (Bodkin-Andrews, Ha, Craven, & Yeung, 2010; Craven & Marsh, 2004, 2005) by taking the competence-affect differentiation into account (Arens, Yeung, Craven, & Hasselhorn, 2011). Furthering our knowledge about Indigenous Australian students' self-concept might help to identify constructs that could facilitate Indigenous Australians' well-being and educational outcomes including academic accomplishments (Tsey et al., 2007).

1. The Construct of Self-concept

By providing an empirically testable model of self-concept, the multidimensional and hierarchical self-concept model proposed by Shavelson, Hubner, and Stanton (1976) marked the beginning of sophisticated self-concept research. In this model, self-concept was assumed to be a hierarchical and multidimensional organized construct with general self-concept located at the apex of the self-concept hierarchy which then differentiates into a global academic self-concept facet and a global non-academic self-concept facet. Global academic self-concept was assumed to comprise the self-concepts related to various school subjects. Global non-academic self-concept was supposed to encompass physical, social, and emotional self-concepts each of which were further differentiated into more specific self-concept facets (e.g., physical ability and physical appearance self-concepts as subcomponents of physical self-concept). Extensive research on this model – mostly based on the Self-Description Questionnaire instruments explicitly designed to empirically validate the instrument (Byrne, 1996; Marsh, 2007) – demonstrated large support for the multidimensional structure of self-concept implying that self-concept consists of multiple academic and non-academic facets (e.g., Craven & Marsh, 2008; Marsh & O'Mara, 2008). Support for the hierarchy of self-concept was, however, weaker in favour of a strong multidimensional structure. Within the academic domain, students' verbal and math self-concepts have been found to constitute distinct facets (e.g., Marsh, 1986b, 1990a, 1990c) making it inadequate to integrate them into a global academic self-concept. The different facets of non-academic self-concept have also found to be distinct from each other. For instance, physical appearance and physical ability self-concepts could not be integrated into a global physical self-concept (Marsh, Relich, & Smith, 1983) but should rather be treated as separate constructs. Thus, modern self-concept research underscores the strong domain specificity and multidimensionality of self-concept.

It has only been recently that these advances in self-concept research and theory have been applied to Indigenous Australian students (Bodkin-Andrews, Ha, et al., 2010; Bodkin-Andrews, O'Rourke, et al., 2010; Craven & Marsh, 2004, 2005; Lillemyr et al., 2010;

Pedersen & Walker, 2000; Purdie, 2005; Yeung et al., 2013). In this context, Indigenous and non-Indigenous students have often been found to differ in their mean levels of self-concept. Given the multidimensional nature of self-concept, differences between Indigenous and non-Indigenous students might vary according to the specific self-concept domain under scrutiny. Indigenous students have been found to display significantly lower levels of academic self-concept including math, verbal, and general school self-concepts (Bodkin-Andrews, Ha, et al., 2010; Craven & Marsh, 2004, 2005; Purdie, 2005; Yeung et al., 2013). Indigenous students compared to non-Indigenous students have also been found to hold lower honesty, emotional stability, opposite and same sex peer self-concepts (Bodkin-Andrews, Ha, et al., 2010; Craven & Marsh, 2004, 2005; Purdie, 2005). However, Indigenous students compared to non-Indigenous students have displayed higher art, physical appearance, and physical ability self-concepts (Craven & Marsh, 2004, 2005). Inconsistent findings have been found for general self-esteem with some studies indicating higher levels for Indigenous students (Craven & Marsh 2004, 2005) while other studies (Bodkin-Andrews, Ha, et al. 2010) reported significantly lower levels. Ambiguous results have also been found for parent-relations self-concept as Bodkin-Andrews, Ha, et al. (2010) demonstrated lower levels for Indigenous students whereas Craven and Marsh (2004, 2005) did not find any significant differences between Indigenous and non-Indigenous students.

2. The Competence-Affect Separation of Self-concept

Previous research on Indigenous Australian students' self-concept has considered the multidimensionality of self-concept including the domain specificity of academic self-concept, distinguishing between verbal and math self-concepts (Marsh, 1986b, 1990a, 1990c). However, existing research on Indigenous students' self-concept has not yet addressed the separation between competence and affect components found for academic self-concept facets (Arens et al., 2011; Marsh, Craven, & Debus, 1999). Specifically, research on the structure of academic self-concept has extended its domain specificity (i.e., the distinctiveness of math and verbal self-concepts; Marsh, 1986b, 1990a) to the differentiation between competence and affect components (Arens et al., 2011; Marsh et al., 1999). This refinement of the academic self-concept structure emerged from the observation that the SDQ instruments use both competence-related and affect-related items for assessing academic self-concept facets. Originally these two sets of items (i.e., competence-related items and affect-related items) were combined into unified scales for students' domain-specific academic self-concepts. However, this approach has someway countered related theories which clearly differentiate between competence and affect self-perceptions. For instance, the expectancy-value theory (see for example Wigfield & Eccles, 2000) assumes that self-perceptions of competence including expectancies for success and task value beliefs constitute separate although related constructs of students' motivation. Reanalyses with the SDQ I as the preadolescent version of the SDQs demonstrated that the competence-related and affect-related items addressing domain-specific academic self-concept facets (e.g., math, verbal) indeed form separate factors (e.g., math affect, math competence, verbal affect, verbal competence; Arens et al., 2011; Marsh et al., 1999). These findings provided support for the competence-affect separation of academic self-concept in the context of within-network studies which explore the internal structure of self-concept by means of exploratory and confirmatory factor analyses (Byrne, 1984). Additional evidence has also come from between-network studies showing that the competence and affect components of academic self-concept display differential relations to outcome criteria. Arens et al. (2011) found that the competence component was more highly related to achievement within and between math and verbal domains than the affect component. For example, the competence component of math self-concept was found to share higher relations to math achievement but also to verbal achievement compared to the affect component of math self-concept. Similarly, the competence component of verbal self-concept demonstrated higher relations to both verbal and math achievements compared to the affect component of verbal self-concept. Whereas the competence component thus seems to be more highly related to achievement, recent studies (Marsh et al., 2013; Pinxten, Marsh, De Fraine, Van Den Noortgate, & Van Damme, 2014) demonstrated higher relations of the affect component to academic behaviour including effort expenditure and plans to take coursework. Thus, various studies have provided strong evidence of the differentiation of academic self-concept facets into competence and affect components. However, so far, evidence of the competence-affect separation of academic self-concept has been derived from studies with students from Western cultures (Germany: Arens et al., 2011; Anglo-Saxon countries: Marsh et al., 1999, 2013; French Canada: Marsh & Ayotte, 2003; Belgium: Pinxten et al., 2014), and from Arab countries (Marsh et al., 2013). Thus, it is unknown whether Indigenous Australian students who may differ in their learning background and experiences also differentiate between competence and affect components of academic self-concept.

The investigation of whether Indigenous Australian and non-Indigenous Australian students similarly differentiate between competence and affect components of academic self-concept might be important in several ways. First, it contributes to the issue of generalizability of the twofold multidimensional structure of academic self-concept (i.e., its domain specificity and separation into competence and affect components; Arens et al., 2011) to Indigenous Australian students as a disadvantaged group furthering our understanding of the nature of Indigenous Australian students' academic self-concept. In addition, separating between competence and affect components of academic self-concept might provide further valuable insight into mean level differences between Indigenous Australian and non-Indigenous Australian students' self-concepts. Indigenous Australian students have been found to display lower levels of academic self-concept than non-Indigenous students (Craven & Marsh, 2004, 2005). However, it is unknown as to whether these differences apply to both the competence and affect components of academic self-concept. Further, the potential competence-affect separation of academic self-concept should be utilized to re-examine whether Indigenous Australian and non-Indigenous Australian students display similar or differential relations between academic self-concept and achievement. The results of Pedersen and Walker (2000) and McInerney (2003) supported equivalent relations between academic self-concept and achievement outcomes for Indigenous and non-Indigenous students, but other studies have provided evidence of differential relations. In this regard, Purdie and McCrindle (2004) found stronger positive correlations between self-acceptance and academic achievement for non-Indigenous than for Indigenous students. Bodkin-Andrews, O'Rourke, et al. (2010) found that math and verbal self-concepts significantly predicted math and English grades respectively for both Indigenous and non-Indigenous high school students. However, post-hoc analyses revealed a significantly stronger predictive power of math self-concept on math grades for non-Indigenous students. These results acknowledge the strength of domain-specific academic self-concepts for predicting schooling outcomes for Indigenous and non-Indigenous students although academic self-concept might be a stronger predictor of schooling outcomes for non-Indigenous students (see also Bodkin-Andrews, Dillon, et al., 2010 for similar results pertaining to patterns of school engagement). However, all these previous studies did not take the separation between competence and affect components of academic self-concept into account. Given that research has demonstrated higher relations of the competence component to academic achievement (Arens et al., 2011; Pinxten et al., 2014), it might be worthwhile to probe whether this pattern applies to both Indigenous and non-Indigenous Australian students. As Indigenous Australian students have been consistently found to display lower levels of school accomplishments (e.g., Thomson et al., 2010), this research might glean insights into potentially promising means for fostering Indigenous students' achievement and educational outcomes commensurate to their non-Indigenous peers.

Thus far, the competence-affect separation has only been tested with regard to academic self-concept facets including math, verbal, and school self-concept facets (Arens et al., 2011; Marsh et al., 1999). Hence, it is unknown whether it also applies to non-academic self-concept domains. Students might also differentiate between competence self-perceptions (i.e., the competence component) and affective-motivational reactions (i.e., the affect component) in the domains of physical abilities and art. The present study aimes to elucidate this issue by testing whether the competence-affect separation found for academic self-concept can be extended to non-academic domains (physical ability and art self-concepts). By examining a sample of Indigenous and non-Indigenous Australian students, the present study may advance overall self-concept theory while simultaneously extending its applicability to Indigenous Australian students.

3. The Present Study

The present study measures Indigenous and non-Indigenous Australian students' academic self-concepts in the domains of school, math, and English, and non-academic self-concepts related to physical ability and art to investigate the following research questions.

1. In consideration of the competence-affect separation of academic self-concept found in previous studies (Arens et al., 2011; Marsh et al., 1999), we aim to examine whether it also applies to Indigenous Australian students in New South Wales as a disadvantaged minority group of students.

2. The present study aims to investigate whether the competence-affect separation generalizes to non-academic self-concept domains such as physical ability and arts self-concepts for both Indigenous and non-Indigenous students.

3. Considering that previous research identified significant differences between Indigenous and non-Indigenous self-concepts (e.g., Bodkin-Andrews, Ha, et al., 2010; Craven & Marsh, 2004), we aim to test whether these mean level differences can be observed when differentiating between competence and affect components.

4. Given that the competence component of academic self-concept was found to be more highly related to achievement compared to the affect component (Arens et al., 2011) and given findings of stronger predictive relations of self-concept for achievement with non-

Indigenous students (e.g., Bodkin-Andrews, O'Rourke, et al., 2010), another target of the study is to test to what extent the competence and affect components of self-concept (including academic and non-academic self-concept facets) are similarly related to achievement outcomes for both Indigenous and non-Indigenous students.

4. Method

4.1 Sample

The sample of the present study consists of 1809 (*N* = 933 boys, *N* = 874 girls, *N* = 2 not specified) Australian students attending grades 7 to 10 (grade 7: *N* = 503, grade 8: *N* = 519, grade 9: *N* = 433, grade 10: *N* = 352, not specified: *N* = 2). Among these students, 343 (*N* = 158 boys) students reported being Aboriginal or/and Torres Strait Islander, *N* = 1460 (772 boys) reported being non-Indigenous, and 6 students did not answer this question. Students' age ranged between 11 and 17 years (*M* = 13.60, *SD* = 1.17) as expected for Australian students attending grades 7 to 10. The student sample was drawn from five New South Wales (NSW) high schools (two rural, three metropolitan), selected from the recommendations of both the NSW Department of Educational and Training (DET) and the NSW Aboriginal Education and Consultative Group based on an Indigenous school population size of 10% - 40%. The schools were approached after ethical clearance was given from both the university and the NSW DET ethics committees, as well as after consultation with the NSW Aboriginal Education and Consultative Group, and no data were collected until all students and their parents had consented to participating in the study.

4.2 Instruments

To measure self-concept, items from the Self-Description Questionnaire II (SDQ II; Marsh, 1990b) were utilized. Specifically, measures for math, English, school, and physical ability self-concept scales were selected. In addition to the items drawn from the SDQ II, measures for students' art self-concept were also included (cf. Craven & Marsh, 2005). Thus, the items used in this study aimed to measure students' self-concepts in five domains: math, English, school, physical ability, and art. Among these items, some items were competence-related asking for students' self-perceptions of competence in the different domains (math: 4 items, English: 5 items, school: 4 items, physical ability: 4 items, art: 4 items, e.g., "I learn things quickly in most school subjects"). Another set of items (math: 3 items, English: 4 items, school: 4 items, physical ability: 3 items, art: 4 items) were affect-related asking for students' affective-motivational reactions including students' liking, enjoyment, and interest (e.g., "I am looking forward to English classes"). The students were asked to indicate whether the statements constituting the items were false, mostly false, more false than true, more true than false, mostly true, or true on a 6-point Likert-type scale. Amongst the 39 items used in the present study, five items (one item for math competence, math affect, physical ability competence, English competence, and school competence, respectively) were negatively worded. These items were reverse scored such that high scores consistently represent a high self-concept for all items.

Students' achievement was measured in two ways. First, standardized achievement for math and spelling was measured by the corresponding tests included in the Wide Range Achievement Test - 3rd Edition (WRAT-3, Wilkinson, 1993). For both the math and spelling tests, the students were given up to 15 minutes to complete the tests under exam conditions (e.g., no talking or working together). Scores for the WRAT-3 were computed based on the number of correct single-answer written responses for 40 questions across both the math and spelling tests. In the math test, progressively more difficult written arithmetic computation tasks (e.g., 2/5 of 35 = ____) were administered with the answers required to be expressed in their lowest form. No calculators were allowed and a blank, 'working-out' sheet was provided for every student. In the spelling test, the instructor read aloud the target words separately followed by an example of the words included in sentences (e.g., "lucidity… We think best in moments of lucidity… lucidity"). The target word had to be written down correctly by the students. As the WRAT-3 has not been normalized for Australian samples, standardized scores for math and spelling achievement were computed according to the grade level (i.e., by grades 7, 8, 9, and 10) of the students in order to control for developmental effects. In order to collect additional achievement measures, the teachers were asked to rate students' achievement in math, English, and science. Due to variation in rating styles across schools, scores were z-standardized across schools and grade level.

4.3 Statistical Analyses

For examining whether the academic (math, English, school) and non-academic (physical ability, art) self-concept facets measured in the present study can be differentiated into competence and affect components, confirmatory factor analyses (CFA) were utilized. We started the analyses by considering each self-concept domain separately. For each domain of self-concept, a 1-factor model was compared to a 2-factor model. The 1-factor model assumed that all items including competence-related and affect-related items relating to the same domain load on one common factor (e.g., the four competence-related and the three affect-related items pertaining to math together form the factor of math self-concept). The 2-factor model assumed that the competence-related items and the affect-related items loaded on two separate factors (e.g., the four competence-related items for math constitute a factor for math competence self-concept while the three affect-related math items form a separate factor for math affect self-concept). The 1-factor and 2-factor models were first tested for the total sample. For examining whether the competence-affect separation of self-concept applies to both Indigenous and non-Indigenous students, we then examined whether the 2-factor model exhibited a better model fit for both the groups of Indigenous and non-Indigenous students.

Next, we stated a CFA model integrating all domain-specific self-concept facets. This model formed the basis for invariance tests used to investigate the generalizability of the self-concept structure across Indigenous and non-Indigenous students (Byrne, 2003). Following the stepwise procedure of invariance testing proposed by Meredith (1993), we first stated a model of configural invariance (Model 34 in Table 1) assuming an invariant factor pattern (i.e., the same factors defined by the same set of items) across both groups. The model of configural invariance was then increasingly complemented by invariance constraints which stated various model parameters (e.g., factor loadings, item intercepts) to be of equal size for Indigenous and non-Indigenous students. First, a model of weak measurement invariance (Model 35 in Table 1) constrained the factor loadings to be invariant across groups. The subsequent model of strong measurement invariance with factor loadings and item intercepts set to be equal for Indigenous and non-Indigenous students (Model 36 in Table 1) is of particular importance for this study as this form of measurement invariance is the precondition for conducting mean level comparisons. A model of invariant factor variances was tested in Model 37 as invariance of factor variances is prerequisite for testing invariant factor covariances (Marsh, 1994). A model of invariant factor covariances (Model 38 in Table 1) could provide insight as to whether the multiple self-concept facets assessed in this study are similarly related to each other for both Indigenous and non-Indigenous students.

In a next step, the different indicators of academic achievement (math test, spelling test, teacher ratings of math achievement, teacher ratings of English achievement, teacher ratings of science achievement) were integrated in the model in addition to the self-concept factors (Model 40 in Table 1). As the different achievement measures were single-item indicators for depicting achievement factors, we calculated their measurement errors on the basis of an assumed reliability estimate of .90 and sample variance. The research question was to test whether Indigenous and non-Indigenous students hold similar relations between self-concept and achievement. After the prerequisite tests of configural invariance (Model 43 in Table 1), weak measurement invariance (Model 44 in Table 1), strong measurement invariance (Model 45 in Table 1), and factor variance invariance (Model 46 in Table 1), we tested the invariance of the covariances between self-concept and achievement factors. In five tests (Models 47 to 51 in Table 1), the relations between the multiple self-concept factors and one single achievement factor (either math test, spelling test, teacher ratings of math achievement, teacher ratings of English achievement, or teacher ratings of science achievement) were set equal for Indigenous and non-Indigenous students whereby the relations among the self-concept factors were freely estimated. The series of invariance testing was concluded with an omnibus test in which all relations between achievement and self-concept factors integrated in this study were assumed to be of equal size for Indigenous and non-Indigenous students (Model 52 in Table 1).

All analyses were conducted with Mplus Version 7.0 using the Maximum Likelihood (ML) estimator. Missing data (1.85% in the total sample) were estimated by the Full Maximum Likelihood Method (FIML) implemented in Mplus. Correlated uniquenesses between negative items were allowed in all models to account for the bias associated with negative items found in previous research (Marsh, 1986a; Marsh, Scalas, & Nagengast 2010; Marsh et al., 2013). For evaluating and comparing the CFA models, we considered a wide range of goodness-of-fit indices including the comparative fit index (CFI), the Tucker-Lewis index (TLI), the root mean square error of approximation (RMSEA), and the Standardized Root Mean Square Residual (SRMR). For indicating a good model fit, CFI and TLI values should be above .90, and ideally above .95 (Hu & Bentler, 1999). For the RMSEA, values should be below .05, but values between .05 and .08 are accepted as a reasonable fit (Browne & Cudeck, 1993). For the SRMR, values less than .08 are considered a good fit (Hu & Bentler, 1999), but values below .10 are assumed to still indicate an acceptable model fit (Kline, 2005).

The evaluation of invariance models involves the comparison of nested models which differ in the number of parameters restricted to be invariant across groups. Given the sensitivity of the chi-square difference test to sample size (Marsh, Hau, & Grayson, 2005), Cheung and Rensvold (2002) recommended the use of descriptive goodness-of-fit indices for comparing the fit of nested models. Following the guidelines of Cheung and Rensvold (2002), invariance can be seen as established if the CFI value does not drop more than .01 and if the values of the RMSEA and SRMR do not increase more than .015 and .030, respectively, between less restrictive and more restrictive models. Chen (2007) advised to use changes in the CFI as the main criterion for the evaluation of invariance as changes in the RMSEA and SRMR were found to vary depending on the particular model parameters set invariant across groups.

5. Results

5.1 Competence-Affect Separation of Self-concept

Table 1 shows the goodness-of-fit indices of the 1-factor models and the 2-factor models for each self-concept facet examined in the present study (Models 1 to 10 in Table 1). For all self-concept domains, the 2-factor models displayed better model fits compared to the 1-factor models (see Table 1). Thus, the academic and non-academic self-concept domains scrutinized in the present study displayed a separation between competence and affect components. Similar results could be found when analysing the subsamples of Indigenous (Models 12 to 21 in Table 1) and non-Indigenous students (Models 23 to 32 in Table 1) separately. In both the subsamples of Indigenous and non-Indigenous students, for all self-concept facets, the 1-factor models demonstrated worse model fits compared to the 2-factor models. After examining the different self-concept domains separately, we stated a model which integrates all domain-specific self-concept facets. Thus, Model 11 consists of 10 self-concept factors: math competence, math affect, English competence, English affect, school competence, school affect, physical ability competence, physical ability affect, and art competence, art affect. The fit of this model was excellent for the total sample (Model 11: χ^2 (647) = 2561.289, CFI = .972, TLI = .968, RMSEA = .040, SRMR = .028) as well as for the subsamples of Indigenous (Model 22: χ^2 (647) = 1121.671, CFI = . 962, TLI = .956, RMSEA = .046, SRMR = .040) and non-Indigenous students (Model 33: χ^2 (647) = 2248.088, CFI = .971, TLI = .967, RMSEA = .041, SRMR = .028).

Thus, so far, the results of the CFA analyses provided evidence of the domain specificity of self-concept as well as of the differentiability between competence and affect components in each self-concept domain and these findings were consistent across the subsamples of Indigenous and non-Indigenous students. Table 2 illustrating the standardized factor correlations further affirmed this conclusion. Supporting the domain-specific, multidimensional structure, the self-concept facets related to the different domains of school, math, English, physical ability, and art had moderate intercorrelations. Within the academic self-concept domains considered (i.e., math, English, school), the competence and affect components were highly but not perfectly correlated (for the total sample: math: $r = .690$, English: $r = .842$, school: $r = .576$). This finding further supported the differentiation of academic self-concept into competence and affect components. However, for the non-academic self-concept domains of physical ability and art, very high correlations between the competence and affect components were evident (for the total sample: physical ability: $r = .920$, art: $r = .917$).

The results of the CFA thus indicate that competence-related and affect-related items for measuring domain-specific academic and non-academic self-concept facets should be treated as separate scales as they constitute separate factors. Hence, coefficient alpha reliability estimates were conducted separately for the competence-related and affect-related scales of the different self-concept domains included. As it can be seen in Table 3, the reliability estimates were good for all scales further corroborating the distinctiveness of competence and affect components.

5.2 Invariance of Self-concept Structure

Model 11 (i.e., the 10-factor model for the total sample) provided the basis for testing invariance across Indigenous and non-Indigenous students in order to examine whether the self-concept structure is the same across groups. Students' ethnicity (Indigenous vs. non-Indigenous) was included as a grouping variable in Model 11. In a first model of configural invariance (Model 34 in Table 1) only an equal factor pattern was assumed across Indigenous and non-Indigenous students so that the same number of factors was defined by the same set of items in both groups but the factor loadings and item intercepts could vary across groups. This model was extended by assuming invariant factor loadings (i.e., weak measurement invariance) in Model 35. As compared to the model of configural invariance the CFI, TLI, and RMSEA values did not change, weak measurement invariance could be supported. The additional assumption of invariant item intercepts (Model 36) led to a decrease in the CFI value of .001 which is, however, too low for rejecting invariance. Hence, strong measurement invariance could be supported allowing comparisons between Indigenous and non-Indigenous students' mean levels of self-concept. As the CFI, TLI, and RMSEA values did not further change when including invariant factor variances (Model 37), we could test the invariance of factor covariances in Model 38 to get insight into the similarity of the interrelations among the different self-concept facets. Invariance of factor covariances (Model 38) was supported due to the small decrease in the CFI value (Δ = -.001) and the small increase in the SRMR value (Δ = +.004) along with an unchanged RMSEA value and an improvement in the TLI value due to the gain of model parsimony. These findings supported the generalizability of the self-concept structure including the separation between competence and affect components for academic (math, verbal, school) and non-academic (physical ability, art) self-concept facets across Indigenous and non-Indigenous students.

5.3 Mean Level Differences

Overall, the students reported positive levels of self-concept as the responses for the total sample varied between 2.85 and 4.95 on the 6-point Likert-type scale (Table 3). To test whether Indigenous and non-Indigenous students differed in their mean levels of the multiple self-concept facets, we conducted a MIMIC (multiple indicators multiple causes) model (Model 39 in Table 1). Given the invariance of factor loadings and item intercepts (i.e., strong measurement invariance, Model 36 in Table 1) latent mean level comparisons were meaningful. The results indicated higher mean levels of school competence, English competence, English affect, and math competence self-concepts for non-Indigenous students. Indigenous students compared to non-Indigenous students displayed higher mean levels of physical ability competence self-concept. No mean differences between Indigenous and non-Indigenous students could be found for the self-concept facets related to school affect, math affect, physical ability affect, and art (both competence and affect components, see Tables 3 and 4).

5.4 Self-concept-Achievement Relations

In a next step, we tested the relations between the different self-concept facets and academic achievement. Therefore, we integrated five factors for the different achievement measures (spelling test, math test, teacher ratings in English, teacher ratings in math, and teacher ratings in science) to the ten factors for students' self-concepts. The resulting model had excellent model fits for the total sample (Model 40 in Table 1: χ^2 (792) = 2838.678, CFI = .971, TLI = .965, RMSEA = .038, SRMR = .028) and for the subsamples of Indigenous (Model 41 in Table 1: χ^2 (792) = 1331.654, CFI = .958, TLI = .950, RMSEA = .045, SRMR = .042) and non-Indigenous students (Model 42 in Table 1: χ^2 (792) = 2449.457, CFI = .971, TLI = .966, RMSEA = .038, SRMR = .027). Table 5 depicts the standardized correlations between self-concept and achievement factors for the total sample and the subsamples of Indigenous and non-Indigenous students.

The results indicated the domain specificity of the measured self-concept facets by demonstrating higher relations between self-concept and achievement measures of matching domains. For the total sample, among all competence components of self-concept facets measured in the present study, the competence component of English self-concept showed higher relations to verbal achievement measured by the spelling test (r = .342) and teacher ratings for English achievement (r = .327) compared to the competence components of the other self-concept facets considered (spelling test: school competence self-concept: r = .311, math competence self-concept: *r* = .140, physical ability competence self-concept: *r* = -.034, art competence self-concept: *r* = -.025; teacher ratings for English achievement: school competence self-concept: *r* = .292, math competence self-concept: *r* = .165, physical ability competence self-concept: *r* = .027; art competence self-concept: *r* = .005). In parallel, the affect component of English self-concept displayed higher relations to verbal achievement measures (spelling test: *r* = .227; teacher ratings for English achievement: *r* = .261) than the affect components of school (*r* = .069, resp. *r* = .179), math (*r* = -.001, resp. *r* = .086), physical ability (*r* = .006, resp. *r* = .052), or art self-concepts (*r* = -.001, resp. *r* = .023). A similar pattern emerged for the math domain since the competence component of math self-concept showed higher relations to both indicators of math achievement (math achievement test: *r* = .278, teacher ratings of math achievement: *r* = .398) than the competence components of the other self-concept facets included in the study (for math achievement test: *r* = -.021 to *r* = .261; for teacher ratings of math achievement: *r* = .324 to *r* = -.017). Likewise, the affect component of math self-concept was more highly related to math achievement (math achievement test: *r* = .150; teacher ratings of math achievement *r* = .179) than any other affect component measured for math achievement test: *r* = .127 to *r* = -.010; for teacher ratings of math achievement: *r* = .143 to *r* = -.021)

Examining the relations within specific self-concept domains, the competence component revealed higher relations to achievement than the corresponding affect component. In essence, the competence component of English self-concept was more highly related to verbal achievement measures (spelling test: *r* = .342; teacher ratings of English achievement: *r* = .327) compared to the affect component of English self-concept (*r* = .227, resp. *r* = .261). Within math self-concept, the competence component showed higher relations to math achievement (math test: *r* = .278; teacher ratings of math achievement: *r* = .398) than the affect component (*r* = .150, resp. *r* = .179). Thus, the findings implicate differential achievement relations for the competence and affect components of academic self-concept domains with stronger relations between the competence component and achievement in matching domains.

The same pattern of results regarding the relations between self-concept and achievement measures could be found for the subsamples of Indigenous and non-Indigenous students. That is, Indigenous as well as non-Indigenous students' English self-concept displayed the highest relations to verbal achievement measures (i.e., spelling test and teacher ratings of English achievement) than any other domains of self-concept. Within English self-concept, the competence component itself demonstrated higher relations to achievement than the affect component. In parallel, math self-concept revealed higher relations to math achievement measures (i.e., math test and teacher ratings of math achievement) than any other self-concept facet whereby the competence component of math self-concept itself was again more highly related to math achievement than the affect component. Thus, the examination of relations between self-concept and achievement measures further attested the domain specificity of self-concept as well as the differentiability between competence and affect components within academic self-concept facets for both Indigenous and non-Indigenous Australian students.

In the next step, invariance tests were applied as a more sophisticated approach to test whether self-concept and achievement factors shared similar relations for Indigenous and non-Indigenous students. Models 43 to 46 tested the preconditions for testing the invariance of covariances between achievement and self-concept factors by exploring the fit of models of configural invariance (Model 43 in Table 1), invariant factor loadings (Model 44 in Table 1), invariant factor loadings and item intercepts (Model 45 in Table 1), and invariant factor loadings, item intercepts, and factor variances (Model 46 in Table 1). As the descriptive goodness-of-fit indices did not change substantially between less and more restrictive models across this series of invariance models, we could turn to tests of invariant factor covariances. In Models 47 to 51, the covariances between the various self-concept factors and one achievement factor (spelling test, math test, teacher ratings of English achievement, teacher ratings of math achievement, or teacher ratings of science achievement) at a time were stated to be invariant across Indigenous and non-Indigenous students. Stating invariant covariances between spelling achievement and the multiple self-concept facets (Model 47) resulted in a change of $\Delta = -.001$ in the CFI value compared to Model 46 without any constraints on factor covariances. Thus, spelling achievement seems to be similarly related to the various academic and non-academic self-concept facets for Indigenous and non-Indigenous Australian students. When achievement was operationalized as math test scores (Model 48), teacher ratings of math achievement (Model 49), teacher ratings of English achievement (Model 50), or teacher ratings of science achievement (Model 51), the integration of the assumption of invariant relations between the self-concept facets and the respective achievement measure also did not lead to any substantial changes in the fit indices relative to the less restrictive Model 46. Thus, the one-on-one tests of invariant relations between the multiple self-concept facets and single achievement measures indicated no differences in self-concept–achievement relations between Indigenous and non-Indigenous students. In order to further examine the issue of invariant relations between self-concept and achievement factors, we completed the analyses by an omnibus test (Model 52) in which the relations between all achievement and self-concept factors were simultaneously set to be equal across Indigenous and non-Indigenous students. Compared to the less restrictive Model 46, the drop in the CFI ($\Delta = -.001$) and the increase in the SRMR ($\Delta = +.002$) values were above the guidelines for rejecting invariance (Cheung & Rensvold, 2002) while the RMSEA value remained stable and the TLI even increased ($\Delta = +.001$) due to gains in model parsimony. This finding implies that Indigenous and non-Indigenous students did not differ in their relations between multiple self-concept facets and various achievement measures.

6. Discussion

The present study aimed to enhance research on Indigenous Australian students' self-concept by considering recent advances in self-concept theory and measurement evincing separate competence and affect components of academic self-concept (Arens et al., 2011; Marsh et al., 1999). The findings emanating from this study clearly indicate separate competence and affect components for the academic self-concept facets of math, English, and school for the total sample as well as for the subsamples of Indigenous and non-Indigenous students. With this result, the present study provided evidence of the generalizability of the domain-specific structure of academic self-concept including the competence-affect separation to Indigenous Australian students thereby enhancing the understanding of Indigenous Australian students' academic self-concept.

Based on the finding of the distinctiveness between competence and affect components for both Indigenous and non-Indigenous students, we re-examined mean level differences in academic self-concept facets between these two groups of students. Previous research has demonstrated higher mean levels of academic self-concept for non-Indigenous students than for Indigenous students (Bodkin-Andrews, Ha, et al. 2010; Craven & Marsh, 2004, 2005; Purdie, 2005), but these studies did not account for the distinctiveness between competence and affect components. In this study, non-Indigenous students displayed higher mean levels of self-concept facets related to school competence, English competence, English affect, and math competence but Indigenous and non-Indigenous students did not differ in their mean levels of school affect and math affect self-concepts. Thus, mean level differences between Indigenous and non-Indigenous students vary according to the specific academic self-concept facet under concern and do not seem to apply to academic self-concept in general. It is also worth noting that mean level differences were more obvious for the competence component of domain-specific academic self-concept facets. Given that the competence component of academic self-concept has been found to be more highly related to achievement than the affect component (Arens et al., 2011; see below for related findings from this study), this result might arise from Indigenous students' lower levels of achievement (e.g., Thomson et al., 2010). This finding might also draw attention to the risk of a further widening achievement gap between Indigenous and non-Indigenous students as given the reciprocal relations academic self-concept and achievement share (Marsh & Craven, 2005, 2006), low competence-related self-concepts of Indigenous students might lead to low school accomplishments. Further, it is interesting to note that Indigenous and non-Indigenous students did not differ in their affect to math and school but differed in their affective reactions to English. Perhaps this pattern of results reflects the difficulties many Indigenous Australians experience with literacy in particular (Thomson et al., 2010), inhibiting their affective self-concept in this domain.

With respect to the non-academic self-concept facets of physical ability and art, the CFA results imply separate competence and affect facets for both Indigenous and non-Indigenous students. Previous research has found higher mean levels of physical ability and art self-concepts for Indigenous students (Bodkin-Andrews, Ha, et al. 2010; Craven & Marsh 2005). In this study, Indigenous students displayed higher mean levels in the competence component of physical ability self-concept, whereas Indigenous and non-Indigenous students did not differ in physical ability affect, art competence, and art affect self-concept ratings. These findings suggest that more information is likely to be obtained by differentiating competence-related from affect-related self-concept constructs.

Invariance tests demonstrated similar relations between self-concept facets and achievement measures across Indigenous and non-Indigenous students. For both Indigenous and non-Indigenous students, the relations between the self-concept facets and achievement measures included in this study followed a domain-specific pattern with the highest relations between achievement and self-concept measures pertaining to the same domain (i.e., verbal achievement and English self-concept). In addition, for both groups of students, within domains of self-concept, the competence and affect components of academic self-concept facets displayed differential relations to achievement. The competence component was found to be more highly related to achievement than the affect component replicating the results of previous studies (Arens et al., 2011; Pinxten et al., 2014). Thus, this study adds to the debate as to whether Indigenous and non-Indigenous Australian students hold similar (Pedersen & Walker, 2000; McInerney, 2003) or differential (Purdie & McCrindle, 2004; Bodkin-Andrews, O'Rourke, et al., 2010) relations between academic achievement and self-concept which has, however, not yet considered the separation between competence and affect components. Given that for both Indigenous and non-Indigenous students the competence component of academic self-concept was found to be more highly related to achievement compared to the affect component, interventions focused on fostering students' competence self-perceptions might be effective for enhancing students' achievement outcomes for both Indigenous and non-Indigenous students. It should also be noted that although invariance testing suggested more similarities than differences in the relations between self-concept and achievement for Indigenous and non-Indigenous students, a casual observation of Table 5 reveals that some correlations between self-concept and achievement were stronger for the non-Indigenous students (e.g., math self-concept and math achievement; for similar results see Purdie & McCrindle, 2004; Bodkin-Andrews, et al., 2010). In interpreting these findings, it might be critical to investigate potential mechanisms and cultural differences that may influence how self-concept is related to academic outcomes. Numerous Indigenous Australian researchers have called for greater endeavours to understand how Indigenous students' unique sense of identity could be more closely linked to the academic domain and their confidence at school (Andersen & Walter, 2010; Bodkin-Andrews, Dillon, et al., 2010; Kickett-Tucker & Coffin, 2010). Granting greater respect to Indigenous culture and identity might aid to link Indigenous students' self-concept to the academic domain helping to make schooling more relevant to Indigenous students and to avoid increasingly maligned epistemological biases that knowingly and unknowingly alienate Indigenous students from the schooling system and the wider Australian milieu (Bodkin-Andrews & Carlson, 2013; Harris, Carlson, & Poata-Smith, 2013; Moreton-Robinson, 2006).

In sum, this study provides some interesting new insights into Indigenous students' self-concept compared to that of non-Indigenous students by pointing out similarities in the internal structure (domain specificity and competence-affect separation) and in relations of self-concept facets to achievement outcomes while simultaneously demonstrating mean level differences in various self-concept facets. The present study thus enhances our knowledge on the nature of Indigenous Australian students' self-concept. However, all the results and related implications should be qualified in terms of generalization. The sample of Indigenous students integrated in the present study was collected in the Australian state of New South Wales. Due to the vast number of different Indigenous Australian cultures with differences in their cultural practices, history, and language, it is unwise to suggest that the results of this study may generalize to all Indigenous student populations within Australia. Ideally, larger and more diverse samples of Indigenous Australian students (e.g., from different geographical locations, language groups) would help to test the generalizability of our findings across Indigenous Australian students (see McInerney & King, 2013 for an example). It would also be helpful to test the generalizability of our findings to different Indigenous peoples of the world and other cultural groups, whilst ensuring that the unique identities of these Indigenous peoples are respected (Walter & Andersen, 2013).

Although the main focus of this study was to get insight into similarities and differences between the self-concepts of Indigenous and non-Indigenous Australian students, the present study also contributed to overall self-concept research and theory. As previous studies only tested the competence-affect separation of self-concept with regard to academic self-concept facets, the present study tested whether the non-academic self-concept facets of physical ability and art can also be separated into competence and affect components. Within the CFA approach, models with separate factors for competence and affect components for physical ability and art self-concepts provided better fits than models with common factors for physical ability and art self-concepts integrating competence-related and affect-related items. However, the competence and affect components of physical ability and art self-concepts were more highly correlated than the competence and affect components of the academic self-concept facets considered. Essentially, the competence and affect components for physical ability and art self-concepts were so highly correlated that their distinctiveness is questionable. Thus, our study provided only limited support for the competence-affect separation for non-academic self-concept facets making further research necessary.

As the study was only cross-sectional in nature, we could not investigate research questions which would require longitudinal data. Future studies should test the reciprocal relations between the competence and affect components of academic and non-academic self-concept facets and achievement measures. In this regard, it would be interesting to explore whether similar patterns of relations could be found for Indigenous and non-Indigenous students. Longitudinal studies could also examine the development of the differentiation between competence and affect components in both groups of students as well as the development of self-concept mean level differences between Indigenous and non-Indigenous students. By focusing on physical ability and art self-concepts, only a limited range of non-academic self-concept domains were considered in the present study. As no non-academic outcomes were integrated in this study, we could not test their relations to multiple self-concept facets including their competence and affect components. Thus, future research should integrate a wider range of academic and non-academic self-concept facets and achievement measures. Finally, the present study only focused on the level of individual students'self-concept although previous studies, particularly those on the Big-Fish-Little-Pond Effect (Seaton, Marsh, & Craven, 2009), demonstrated effects of students' learning environment including the frames of reference for self-concept formation on students' level of self-concept. It might be thus interesting to examine whether those mechanisms operate in similar ways for Indigenous and non-Indigenous students and students from different cultural backgrounds.

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Table 1
Goodness-of-fit Indices of CFA Models

	χ^2	df	CFI	TLI	RMSEA	SRMR	RMSEA 90% CI	Model description
total sample								
1	1170.763	20	.941	.918	.179	.038	[.170, .188]	art self-concept, 1-factor model
2	253.253	19	.988	.982	.083	.014	[.074, .092]	art self-concept, 2-factor model
3	1497.648	27	.904	.872	.174	.062	[.166, .181]	English, 1-factor model
4	173.427	26	.990	.987	.056	.019	[.048, .064]	English 2-factor model
5	1396.998	13	.836	.734	.243	.081	[.232, .253]	math , 1-factor model
6	216.722	12	.976	.957	.097	.040	[.086, .109]	math, 2-factor model
7	1852.981	20	.801	.721	.225	.126	[.217, .234]	school, 1-factor model
8	51.043	19	.997	.995	.031	.018	[.021, .041]	school, 2-factor model
9	677.559	14	.938	.907	.162	.031	[.152, .172]	physical ability, 1-factor model
10	357.527	13	.968	.948	.121	.025	[.110, .132]	physical ability, 2-factor model
11	2561.289	647	.972	.968	.040	.028	[.039, .042]	10-factor model
Indigenous students								
12	206.203	20	.951	.931	.165	.026	[.145, .186]	art self-concept, 1-factor model
13	85.481	19	.982	.974	.101	.015	[.080, .123]	art self-concept, 2-factor model
14	201.366	27	.937	.916	.137	.049	[.120, .155]	English, 1-factor model
15	75.032	26	.982	.975	.074	.026	[.055, .094]	English 2-factor model
16	190.074	13	.874	.796	.199	.059	[.175, .225]	math , 1-factor model
17	58.405	12	.967	.942	.106	.040	[.080, .134]	math, 2-factor model
18	315.721	20	.825	.756	.208	.113	[.188, .228]	school, 1-factor model
19	19.300	19	1.000	1.000	.007	.022	[.000, .048]	school, 2-factor model
20	120.663	14	.942	.913	.149	.034	[.125, .174]	physical ability, 1-factor model
21	72.585	13	.968	.948	.116	.033	[.090, .142]	physical ability, 2-factor model
22	1121.671	647	.962	.956	.046	.040	[.042, .051]	10-factor model
Non-Indigenous students								
23	1034.392	20	.936	.910	.187	.041	[.177, .197]	art self-concept, 1-factor model

[Table 1 continues.]

[Table 1 continued.]

	χ^2	df	CFI	TLI	RMSEA	SRMR	RMSEA 90% CI	Model description
24	235.762	19	.986	.980	.089	.014	[.079, .099]	art self-concept, 2-factor model
25	1339.221	27	.895	.860	.183	.067	[.174, .191]	English, 1-factor model
26	127.829	26	.992	.989	.052	.018	[.043, .061]	English 2-factor model
27	1208.070	13	.831	.727	.251	.086	[.239, .263]	math , 1-factor model
28	178.416	12	.976	.959	.097	.040	[.085, .110]	math, 2-factor model
29	1517.873	20	.800	.720	.227	.126	[.217, .236]	school, 1-factor model
30	51.866	19	.996	.994	.034	.018	[.023, .046]	school, 2-factor model
31	581.744	14	.936	.904	.167	.031	[.155, .178]	physical ability, 1-factor model
32	305.915	13	.967	.947	.124	.024	[.112, .137]	physical ability, 2-factor model
33	2248.088	647	.971	.967	.041	.028	[.039, .043]	10-factor model
Invariance models								
34	3369.760	1294	.969	.965	.042	.031	[.040, .044]	configural invariance
35	3415.738	1323	.969	.965	.042	.033	[.040, .044]	invariance of factor loadings
36	3501.684	1352	.968	.965	.042	.033	[.040, .044]	invariance of factor loadings, item intercepts
37	3523.006	1362	.968	.965	.042	.036	[.040, .044]	invariance of factor loadings, item intercepts, factor variances
38	3616.797	1407	.967	.966	.042	.040	[.040, .043]	invariance of factor loadings, item intercepts, factor variances, factor covariances
39	2640.025	676	.971	.966	.040	.028	[.039, .042]	Mimic model
Integration of academic achievement								
40	2838.687	792	.971	.965	.038	.028	[.036, .039]	total sample; 10-factors of self-concept and 5 achievement factors
41	1331.654	792	.958	.950	.045	.042	[.040, .049]	Indigenous sample: 10-factors of self-concept and 5 achievement factors
42	2449.457	792	.971	.966	.038	.027	[.036, .040]	Non-Indigenous sample: 10-factors of self-concept and 5 achievement factors
43	3781.224	1584	.969	.963	.039	.031	[.038, .041]	configural invariance

[Table 1 continues.]

[Table 1 continued.]

	χ^2	df	CFI	TLI	RMSEA	SRMR	RMSEA 90% CI	Model description
44	3828.095	1613	.969	.963	.039	.032	[.037, .041]	invariance of factor loadings
45	3914.027	1642	.968	.963	.039	.032	[.038, .041]	invariance of factor loadings and item intercepts
46	3940.407	1657	.968	.963	.039	.035	[.038, .041]	invariance of factor loadings, item intercepts, factor variances
47	3960.468	1667	.967	.963	.039	.036	[.038, .041]	invariance of factor loadings, item intercepts, factor variances, covariance between self-concept factors and spelling achievement
48	3944.415	1667	.968	.963	.039	.035	[.037, .040]	invariance of factor loadings, item intercepts, factor variances, covariance between self-concept factors and math test
49	3957.908	1667	.968	.963	.039	.036	[.037, .041]	invariance of factor loadings, item intercepts, factor variances, covariance between self-concept factors and math grade
50	3953.863	1667	.968	.963	.039	.035	[.037, .041]	invariance of factor loadings, item intercepts, factor variances, covariance between self-concept factors and English grade
51	3949.495	1667	.968	.963	.039	.035	[.037, .041]	invariance of factor loadings, item intercepts, factor variances, covariance between self-concept factors and science grade
52	4018.195	1707	.967	.964	.039	.037	[.037, .040]	invariance of factor loadings, item intercepts, factor variances, covariances between all self-concept and achievement factors

Note: CFI = Comparative Fit Index, TLI = Tucker-Lewis-Index, RMSEA = Root Mean Square Error of Approximation, CI = confidence interval, SRMR = Standardized Root Mean Squared Residual.

Table 2
Standardized Factor Correlations

	School competence	School affect	English competence	English affect	Math competence	Math affect	Physical ability competence	Physical ability affect	Art competence
School affect									
total (Model 11)	.576								
Indigenous (Model 22)	.597								
Non-Indigenous (Model 33)	.579								
English competence									
total (Model 11)	.628***	.414***							
Indigenous (Model 22)	.595***	.424***							
Non-Indigenous (Model 33)	.622***	.417***							
English affect									
total (Model 11)	.447***	.573***	.842***						
Indigenous (Model 22)	.434***	.547***	.892***						
Non-Indigenous (Model 33)	.442***	.583***	.829***						
Math competence									
total (Model 11)	.694***	.427***	.243***	.134***					
Indigenous (Model 22)	.656***	.516***	.317***	.257***					
Non-Indigenous (Model 33)	.703***	.403***	.211***	.094**					
Math affect									
total (Model 11)	.456***	.669***	.160***	.293***	.690***				
Indigenous (Model 22)	.404***	.653***	.205***	.308***	.770***				
Non-Indigenous (Model 33)	.483***	.672***	.154***	.289***	.679***				
Physical ability competence									
total (Model 11)	.249***	.201***	.104***	.082 **	.203***	.152***			
Indigenous (Model 22)	.301***	.245***	.162**	.166**	.171**	.191**			
Non-Indigenous (Model 33)	.252***	.197***	.103***	.071*	.217***	.141***			
Physical ability affect									
total (Model 11)	.229***	.223***	.120***	.126***	.192 ***	.164***	.920***		
Indigenous (Model 22)	.255***	.319***	.211***	.242***	.161**	.214***	.927***		
Non-Indigenous (Model 33)	.227***	.205***	.101***	.099***	.201***	.151***	.920***		
Art competence									
total (Model 11)	.275***	.276 ***	.185***	.175***	.107***	.106***	.117***	.123***	
Indigenous (Model 22)	.338***	.326***	.170**	.127*	.175**	.125**	.253***	.194***	
Non-Indigenous (Model 33)	.261***	.266***	.192***	.189***	.092**	.102***	.083***	.105***	
Art affect									
total (Model 11)	.198***	.291***	.148***	.190***	.067**	.118***	.062*	.096***	.917***
Indigenous (Model 22)	.261***	.314***	.126*	.113*	.172**	.168**	.203***	.154**	.941***
Non-Indigenous (Model 33)	.188***	.288***	.162***	.214***	.046	.105***	.028	.082**	.912 ***

Note: *** $p < .001$, ** $p < .01$, * $p < .05$.

Table 3

Reliability Estimates, Means and Standard Deviations for the Self-concept Facets

		Means and Standard Deviations (in Parentheses)		
	α	Total sample	Indigenous students	Non-Indigenous students
School competence	.831	4.38 (1.13)	4.03 (1.22)	4.46 (1.09)
School affect	.931	3.33 (1.39)	3.28 (1.47)	3.35 (1.37)
English competence	.898	4.03 (1.31)	3.62 (1.38)	4.13 (1.27)
English affect	.960	3.72 (1.58)	3.46 (1.68)	3.78 (1.55)
Math competence	.904	3.76 (1.22)	3.55 (1.24)	3.81 (1.21)
Math affect	.855	2.85 (1.48)	2.90 (1.58)	2.85 (1.46)
Physical ability competence	.873	4.47 (1.33)	4.61 (1.27)	4.44 (1.35)
Physical ability affect	.920	4.95 (1.39)	5.06 (1.37)	4.93 (1.39)
Art competence	.936	4.12 (1.63)	4.15 (1.73)	4.11 (1.60)
Art affect	.976	4.07 (1.85)	4.16 (1.89)	4.04 (1.84)

Table 4

β – coefficients of the MIMIC Model

	β
School competence	.143***
School affect	.021
English competence	.156***
English affect	.082**
Math competence	.087***
Math affect	-.031
Physical ability competence	-.068**
Physical ability affect	-.037
Art competence	-.006
Art affect	-.027

Note: Indigenous students = 1 vs. Non-Indigenous students = 2.

*** $p < .001$, ** $p < .01$, * $p < .05$.

Table 5
Standardized Correlations between Self-concept and Achievement Factors

	Spelling test	English ratings	Math test	Math ratings	Science ratings
School competence					
total	.311***	.292***	.261***	.324***	.370***
Indigenous	.196**	.251***	.236***	.198**	.258***
non-Indigenous	.313***	.282***	.255***	.329***	.372***
School affect					
total	.069**	.179***	.127***	.143***	.171***
Indigenous	.016	.062	.082	.123	.061
non-Indigenous	.080**	.206***	.134***	.148***	.196***
English competence					
total	.342***	.327***	.120***	.158***	.228***
Indigenous	.215***	.268***	.103	.201**	.198**
non-Indigenous	.350***	.319***	.105***	.118***	.202***
English affect					
total	.227***	.261***	.099***	.068**	.135***
Indigenous	.106	.232**	.056	.127*	.088
non-Indigenous	.244***	.258***	.099***	.042	.126***
Math competence					
total	.140***	.165***	.278***	.398***	.271***
Indigenous	.089	.087	.276***	.240***	.151*
non-Indigenous	.133***	.168***	.266***	.417***	.282***
Math affect					
total	-.001	.086**	.150***	.179***	.094***
Indigenous	.040	-.029	.159**	.016	.025
non-Indigenous	-.008	.118***	.150***	.227***	.120***

[Table 5 continues.]

[Table 5 continued.]

	Spelling test	English ratings	Math test	Math ratings	Science ratings
Physical ability competence					
total	-.034	.027	.071**	.022	.016
Indigenous	-.052	-.047	.053	.030	-.026
non-Indigenous	-.020	.054	.079**	.039	.036
Physical abilities affect					
total	.006	.052	.092***	.042	.076**
Indigenous	.006	-.061	.052	.021	.004
non-Indigenous	.009	.080*	.104***	.056	.094**
Art competence					
total	-.025	.005	-.021	-.017	.020
Indigenous	-.130*	.019	-.049	.022	.000
non-Indigenous	.005	.001	-.012	-.023	.027
Art affect					
total	-.001	.023	-.010	-.021	.020
Indigenous	-.126*	-.005	-.019	.017	-.005
non-Indigenous	.037	.032	-.003	-.021	.032

Note: *** $p < .001$, ** $p < .01$, * $p < .05$.