

Journal of Psychoeducational
Assessment**The 'About Me' Questionnaire: Factorial Structure and
Measurement Invariance**

Journal:	<i>Journal of Psychoeducational Assessment</i>
Manuscript ID	JPA-16-0071.R1
Manuscript Type:	Regular Article
Keywords:	Factor analysis < Measurement, reliability < Measurement, Peers < Social and educational environment, Family < Social and educational environment, Validity < Measurement, Elementary school < Participants, High School < Participants
Abstract:	The About Me Questionnaire (AMQ; Maras, 2002) has been used to measure components of social identity, academic self-concept and self-worth in children and adolescents in the UK and abroad. Studies have reported simple reliability statistics but a comprehensive assessment of the scale's psychometric properties has not been conducted. Confirmatory factor analysis, using a sample of 5082 children aged 6-18 years from combined datasets of five cross-sectional research studies, was employed to establish the psychometric soundness of the 29-item AMQ. Analysis revealed generally adequate reliability with the seven factor structure confirmed in a replication sample. Results provide evidence of adequate psychometric properties, optimised with the omission of reverse coded item and selected items, suggesting it is suitable for assessing social identity and academic self-concept of children and adolescents in applied settings. Tests for measurement invariance showed that the assessment of parallel constructs was strongly supported across males and females and partially supported across primary and secondary school age groups.

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Invariance

Abstract

The About Me Questionnaire (AMQ; Maras, 2002) has been used to measure components of social identity, academic self-concept and self-worth in children and adolescents in the UK and abroad. Studies have reported simple reliability statistics but a comprehensive assessment of the scale's psychometric properties has not been conducted. Confirmatory factor analysis, using a sample of 5082 children aged 6-18 years from combined datasets of five cross-sectional research studies, was employed to establish the psychometric soundness of the 29-item AMQ. Analysis revealed generally adequate reliability with the seven factor structure confirmed in a replication sample. Results provide evidence of adequate psychometric properties, optimised with the omission of reverse coded item and selected items, suggesting it is suitable for assessing social identity and academic self-concept of children and adolescents in applied settings. Tests for measurement invariance showed that the assessment of parallel constructs was strongly supported across males and females and partially supported across primary and secondary school age groups.

Keywords: Peers, Family, School, Validity, Reliability, Social Identity, Academic Self Concept

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Invariance

Background

Psychological, cognitive and physical changes throughout childhood give rise to the development of social-identity, a critical social-psychological process that reflects an individual's knowledge of, their associated value with, and perceived significance of membership to specific social groups (Erikson, 1968). Social identity plays a significant role in the development of an individual's self-worth and is associated with long-term physical and mental health outcomes (Haslam, Jetten, Postmes, & Haslam, 2009), behavioural engagement (Tyler & Blader, 2003) and inter-personal relationships (Yampolsky & Amiot, 2013). Subsequently, the development of social identity during childhood and adolescence is of significant interest to researchers and there is a need for reliable instruments to measure this.

Social Identity Theory (SIT: Tajfel & Turner, 1979) proposes that an individual's self-esteem is largely rooted in their social identity with various institutions and groups. Two cognitive processes, self-categorisation and social comparisons, influence this bidirectional relationship (Schmitt, Branscombe, Silvia, Garcia & Spears, 2006). According to SIT, an individual is able to categorise the self in relation to other social classes or groups across a variety of social contexts. Comparisons made between the self and other people lead to the formation of in-group (share similar attributes) and out-group (markedly different) membership. Consequently, self-categorisation results in an enhanced perception of the similarities within in-group members, and further exacerbates the differences for out-group members. This social comparison process results in a selective application of accentuation effects that serve to benefit the individual. Evidence supports SIT indicating that a strong

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3 identification with a social group facilitates the formation of social identity and
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5 promotes general well-being and high levels of self-esteem (Stets & Burke, 2000).
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7 While social identity is a developmental process, evidence suggests that
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9 adolescence is the most salient period in which group behaviour is at its most
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11 influential (Palmonari, Pombeni & Kirchler, 1990). Group identity is a dominant
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13 theme at this time due to a progressive period of self-searching that accompanies
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15 biological, psychological and cognitive changes (Brown & Lohr, 1987). As the need
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17 to belong intensifies from childhood to early adolescence, a visible shift in an
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19 individual's interpersonal relationships can often be identified during specific
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21 transition periods, such as the transition to secondary school. During this period an
22
23 individual typically reports a decline in identification with family members but an
24
25 increase in identification with peers (Tanti, Stukas, Halloran, & Foddy, 2011). This
26
27 interactive relationship is thought to be as a consequence of increasing independence
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29 and skills during the pathway to adulthood, and the exploration of different social
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31 roles amongst different social groups (Gutman & Eccles, 2007). In sum, peer group
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33 memberships, and the status that is attached to them, are seen as the focal point in
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35 defining an individual's identity (Newman & Newman, 2001). Consequently, peer
36
37 group membership predicts a wide range of short and long-term outcomes for
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39 effective social, emotional and behavioural functioning (Tarrant, 2002; Espelage,
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41 Holt, & Henkel, 2003; Buhs, Ladd, & Herald, 2006).
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47 In addition to one's identification with peers and family groups, an individual's
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49 identification with school has a substantial impact upon their level of functioning,
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51 particularly upon their long-term prospects and general self-worth (Turner, Reynolds,
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53 Lee, Subasic, & Bromhead, 2014). While strong identification can harbour positive
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55 attitudes towards education and positively influence academic performance, success
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3 within education also requires a requisite amount of effort and interest in school-work
4 that can often be associated with negative feelings, and at certain times experience of
5 failure (Wang & Eccles, 2012). At a superficial level an individual's identity with
6 school is influenced by their experience of interpersonal relations with peers and
7 teachers. However, at a more detailed analysis school identity is influenced by an
8 individual's ability to deal with criticism and evaluation, their ability to handle
9 challenges, and their own knowledge of their competencies and overall intelligence
10 (Bizumic, Reynolds, Turner, Bromhead, & Subasic, 2009). It could be suggested that
11 this relationship is cyclical; poor identification with school predicts less effort, poor
12 academic competence and less interest in academia. Likewise, a lack of competency,
13 a disregard for academia and less effort amount to less identification with school.
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27 In summary, the group that an individual identifies with, whether it be school,
28 family or peer groups, and their subsequent attitude towards education, appears to
29 play a key role in determining social identity and the understanding of one's self. The
30 influence of social groups on one's identity can influence the trajectory of a child's
31 development into adulthood, and thus predict a number of behavioural outcomes,
32 including the ability to cope with developmental problems (Palmonari, Pombeni, &
33 Kirchler, 1990). Due to its dominant presence during key developmental milestones, a
34 tool measuring one's concept of social identity in relation to family, school and peer
35 groups, has potential to predict and explain a variety of social behaviours and
36 problems.
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49 **Current Measures of Social Identity in Childhood and Adolescence**

50 Several tools have been developed to assess social identity during adolescence. The
51 U-MICS (Crocetti, Rubini, Luyckx & Meeus, 2008; Crocetti, Schwartz, Fermani,
52 Meeus, 2010) is a 13 item questionnaire that assesses three identity processes
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3 (commitment; in-depth exploration and reconsideration of commitment) in
4 adolescents samples aged 11 to 19 years. It has been validated in seven European
5 countries and found to have good internal consistency (Dimitrova, Crocetti, Buzea,
6 Jordanov, Kosic, Tair *et al.*, 2015). The Social and Personal Identities Scale (SIPI:
7 Nario-Redmond, Biernat, Eidelman & Palenske; 2004) measures self-reported social
8 and personal identifications with both ascribed and achieved group memberships in
9 areas related to family, ethnicity, gender, place of origin, as well as other social
10 affiliations (e.g., teams, clubs, major fields of study). CFA validates the use of the
11 SIPI in adult samples (Nario-Redmond *et al.*, 2004) but the use of the measure in
12 younger samples is undocumented. A third measure, the Aspects of Identity
13 Questionnaire (AIQ-111x), developed by Cheek, Tropp, Chen & Underwood (1994),
14 is often used to measure personal, social and collective identity in late adolescent
15 samples. Since the AIQ-IIIx was developed for college students, the use of language
16 in the scale, statements and abstract concepts about ‘the self’ and ‘salient others’
17 mean it is inappropriate for use with children and young adolescents.
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36 One way of measuring social identity in primary school age children, without using
37 complex language and abstract concepts, would be to assess peer group identity in
38 relation to in-group and out-groups. Duffy and Newsdale (2008) used a social
39 network assessment measure (Cairns, Cairns, Neckerman, Gest & Garipey, 1988)
40 paired with a measure of social group constructs which assessed group norms and
41 intragroup position to determine which groups children aged 8 to 13 years felt they,
42 and other members of their class, belonged and identified themselves with. The
43 difficulty with this methodology is that one can only measure peer group social
44 identity rather than relational identity with other salient social groups that children
45 may feel they belong to, such as family or school.
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3 Thus, the assessment of primary and secondary school aged children's social
4 identity in academic settings seems largely neglected. One exception to this is the
5 'About Me Questionnaire' (AMQ; Maras, 2002), a 29-item scale designed to measure
6 adolescents' self-perceived identification with seven distinct factors (peers, family,
7 school, academic competence, academic effort, academic importance and general self-
8 worth).
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11 The AMQ was originally developed on the backbone of extensive research with
12 adolescent populations (Maras, Brosnan, Faulkner, Montgomery & Vital, 2006;
13 Maras, Carmichael, Patel, & Wills, 2007; Maras, 2007). Earlier versions of the AMQ
14 appeared as part of a larger questionnaire, the Aspirations for Higher Education
15 Questionnaire (AHEQ; Maras, 2002). However, 29-items relating to social identity
16 and academic self-concept were extracted from the AHEQ in 2007 when the AMQ
17 was used as a standalone measure for the first time. Since then, the AMQ has been
18 used both nationally and internationally within adolescent research i.e. the UK
19 (Maras, Brosnan, Faulkner, Montgomery & Vital, 2006; Maras, Carmichael, Patel, &
20 Wills, 2007; Maras, 2007; Knowles & Parsons, 2009), Australia (Bornholt, Maras &
21 Robinson, 2009) and China (Maras, Moon & Zhu, 2012).
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41 To date, the AMQ has evidenced adequate internal consistency (Maras, Moon &
42 Zhu, 2012) with some evidence of discriminant validity via correlations with
43 behavioural screening tests such as the Strengths and Difficulties Questionnaire
44 (SDQ; Goodman, 1997), measures of attributional style (Seligman, Abramson,
45 Semmel, & von Baeyer, 1979) and academic motivation (Vallerand, Pelletier, Blais,
46 Brière, Senecal, & Vallieres, 1992). Few if any studies, however, have provided a
47 comprehensive assessment of the AMQ's psychometric properties within a
48 confirmatory factor analysis (CFA) framework.
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3 The purpose of this study was therefore to provide a more in-depth assessment of
4 the AMQ as a psychometrically sound measure of children's social identity and self-
5 concept than currently exists. Confirmatory factor analysis (CFA), using a cross-
6 validation procedure, will be used to provide an assessment of the AMQ's
7 dimensional structure and identify potentially poor performing items. In addition,
8 measurement invariance across gender and age groups will be conducted. This will
9 help to assess whether the AMQ measures children's self-concept and social identity
10 equivalently for males and females and primary and secondary age groups to help
11 assess its suitability for use in these populations (Brown, 2006). Assessing reliability
12 within a CFA framework also provides a more accurate reliability estimate than
13 traditional methods such as Cronbach's alpha, as it accounts for excessive similarity of
14 item wording and other potential sources of inflation of reliability estimates (Raykov,
15 2001).

Method

Sample

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The sample for the current study was derived by combining complete case data from
five cross-sectional research projects conducted between 2005 and 2013 across South
East London and Kent. The final sample consisted of 5082 children aged between 6
and 18 years (mean age = 13.23, $SD = 1.70$) of which 45% were male.

Measures

The 'About Me' Questionnaire (AMQ; Maras, 2002; Maras et al., 2006; 2007; 2012)

As noted previously, the AMQ is a research tool designed to assess children's social
identity with several institutions including academia. The AMQ is comprised of 29

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3 items, each scored on a 5 point Likert scale ranging from strongly disagree (1) to
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5 strongly agree (5) with the exception of item 5 which is reversed scored. The 29-items
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7 have previously been grouped into seven composite variables relating to an
8
9 adolescents level of perceived social identity and self-concept (Table 1): Peer Identity
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11 (four items), Family Identity (four items), School Identity (four items), Academic
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13 Competence (four items), Academic Effort (four items), Academic Importance (four
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15 items) and Self-worth (five items). Completion of the AMQ typically takes 10
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17 minutes.
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20 21 **Procedure**

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23 Across all five projects ethical approval was granted by the hosting institution's
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25 research ethics committee. Written informed consent was obtained from both the head
26
27 teachers and the children themselves. Consenting participants were provided with an
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29 explanation into the nature of the study and informed that they reserved the right to
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31 withdraw without facing penalty. Paper copies of the AMQ were distributed to
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33 participants by researchers and were completed by all participants during school
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35 hours. Across all projects researchers were present during questionnaire
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37 administration to ensure that the participants knew how to answer the items on the
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39 questionnaire and were able to answer any questions that the participants may have
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41 had.
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45 46 **Statistical Analysis Plan**

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48 The factor structure of the AMQ was evaluated with confirmatory factor analysis
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50 (CFA) using the package *lavaan* in R (R Core Team, 2014). A cross-validation
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52 procedure was performed with data randomly split into separate testing and
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54 replication subsamples (N=2,547 for both). In the testing sample, the scale's factorial
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56 structure was assessed in a partially exploratory fashion within the CFA framework
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(Brown, 2006), with model respecification performed when theoretical and statistical justification could be provided. In the replication sample, generalisability was assessed by examining the fit of the model emerging from the analysis in the testing sample. Finally, a CFA on the full sample was conducted to examine whether the measurement properties of the scale were invariant in males and females and across primary and secondary school level age groups.

Input data was the sample variance-covariance matrix (see Appendix 1 for sample correlations with means and SDs), with maximum likelihood estimation used to estimate model parameters. Model fit was examined with the Root Mean Square Error of Approximation (RMSEA), the Standardized Root Mean Square Residual (SRMR), and the Bentler Comparative Fit Index (CFI). The chi-square test of model fit was also performed, but it should be noted that we expected all such tests to be significant, given the sensitivity of this test to trivial deviations from perfect fit for large sample sizes (Brown, 2006). Multiple fit indices were used to provide an assessment of different aspects of model fit to allow for a more well-rounded model evaluation. Acceptable model fit was defined as follows: RMSEA $<.06$, CFI $>.90$, SRMR $<.08$, (e.g. Hu & Bentler, 1999; Bentler, 1990).

To assess equivalence of measurement of the AMQ across gender (males/females) and age (6-11/12-18yrs¹), multiple-groups CFA was performed. Measurement invariance was tested in a hierarchical manner (e.g., Vandenberg & Lance, 2000), assessing model fit with increasingly restrictive equality constraints. Specifically, we assessed (a) adequate model fit in each independent sample, (b) configural invariance (equal factor structure across groups), (c) metric invariance (equal factor loadings), and (d) scalar invariance (equal item intercepts). As limitations of the chi-square test

¹ 11-11.5 yrs and 11.6-12 yrs were rounded to 11yrs and 12yrs respectively.

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3 in large samples are also applicable to multi-group CFA, the CFI was used as the
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5 primary indicator of measurement invariance. Data simulations by Meade, Johnson,
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7 and Braddy (2008) have demonstrated an absolute change in CFI less than 0.002
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9 ($\Delta\text{CFI} < 0.002$) may indicate that deviations from perfect group equivalence are
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11 functionally trivial. All analyses were performed on unstandardized parameters as is
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13 appropriate for multiple-groups CFA (Brown, 2006).
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21 Results

22 Preliminary Data Screening

23 Preliminary analysis found no out of range values, no outliers and no obvious non-
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25 linear relationships were observed. Distributions of most variables closely
26
27 approximated normality. While some negative skewness was observed in a few items,
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29 this was not considered problematic due to the large sample size employed.
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34 CFA in testing sample

35 A 7-factor model consistent with the AMQ's original specification was estimated
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37 (Maras, Moon & Zhu, 2012), with factor cross-loadings set to zero, errors left
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39 uncorrelated and latent factors allowed to covary. Factor variances were estimated by
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41 fixing the loading of the first item of each factor to 1.
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45 Estimated fit statistics were $\chi^2(356) = 4778.46, p < 0.001, \text{RMSEA} = 0.070, \text{SRMR}$
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47 $= 0.063, \text{CFI} = 0.83$, largely suggesting an inadequate fit of the specified model to the
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49 observed data. Localised areas of model strain were examined with modification
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51 indices (MIs) and standardized expected parameter change (EPC), which estimate the
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53 degree of change in model fit resulting from allowing fixed parameters to be freely
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55 estimated. Relaxation of parameter constraints was performed by freeing one
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parameter then recomputing MIs and EPCs each time (Brown, 1996). Results suggested two areas of respecification:

1. Items 16, 21 and 27 substantively cross-loaded onto multiple factors (MIs = 183 - 486, EPCs = 0.36 - 0.67). This suggests these questions were composite items influenced by several latent variables rather than exclusive measures of their intended factor (e.g. 'I love going to this school' cross-loaded onto 'Identification with School', 'Self-Worth' and 'Academic Importance'). Although one option would be to include cross-loadings of these items in the model, these items were instead dropped to preserve model parsimony and to evaluate psychometric properties within a scoring framework which can be more easily administered by the researcher.

2. Recomputation after exclusion of the above items suggested correlated residuals of q2/10, q4/12, q9/11 and q25/26 (MI = 114 - 450, EPC = 0.20 - 0.32), reflecting obvious common methods effects due to wording similarity (e.g. 'I like being at school the most', 'I like being at school').

After model respecification as detailed above, recomputed fit indices were $\chi^2(274) = 2162.03$, $p < 0.001$, RMSEA = 0.052 (90% CI = 0.050 - 0.054), CFI = 0.91 and SRMR = 0.048 suggesting acceptable fit. Table 1 presents the fully standardized factor loadings, all of which were statistically significant ($p < 0.001$). In line with growing psychometric research suggesting reverse coded items may not perform well (van Sonderen, Sanderman, & Coyne, 2013), a low factor loading of 0.08 emerged for item 5. Although this endorses exclusion of item 5 from future administrations of the scale, this item was retained in the current analysis (with the exception of reliability assessment) to examine whether its loading varied across models or across subgroups. Otherwise, standardized loadings in Table 1 all exceeded 0.45 (range: 0.46 - 0.86), with the exception of item 12 (0.41). The magnitude of these loadings appears

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3 generally consistent with the measurement of a common construct within each
4 domain, supporting convergent validity. Table 2 reveals factor correlations to range
5 from $r=0.08$ to 0.79 with a mean $r=0.43$. These correlations are fairly modest
6 suggesting a degree of discriminant validity, but with the possibility of a common
7 factor affecting item responses. The highest inter-factor correlations were between
8 Academic Effort, Academic Competence and Academic Importance (mean $r=.66$,
9 range= 0.45 to 0.79), which although conceptually distinct would be expected to be
10 closely associated.
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24 **Alternative models**

25 The moderate factor correlations observed in analysis of the previous model
26 suggested a possible common factor and prompted exploration of two further models.
27 First a bifactor model, which specified a single general factor in addition to the seven
28 domain-specific factors, with all factors uncorrelated (Brown, 1997). Second, a
29 hierarchical second-order model with seven domain-specific factors loading onto a
30 general factor. Both models assess the presence of a common factor, but while the
31 bifactor model hypothesises that the common factor directly influences item responses
32 (independent of domain factors), the hierarchical model hypothesises that the general
33 factor affects item responses indirectly through its influence on the domain factors.
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49 For the bifactor model, analysis suggested mostly poor fit of the model to the data,
50 $\chi^2(285) = 3694.59, p < 0.001$, RMSEA = 0.069 , CFI = 0.84 and SRMR = 0.059 . For
51 the hierarchical model, a largely acceptable fit was found, $\chi^2(288) = 2721.29, p <$
52 0.001 , RMSEA = 0.058 , CFI = 0.89 and SRMR = 0.057 with standardized domain-
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3 item loadings ranging from 0.40 to 0.86 (mean 0.63), with general factor loadings
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5 ranging from 0.22 to 0.89 (mean 0.65). Although fit statistics were marginally less
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7 favourable than the first-order model (specified in 'CFA in testing sample'), the
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9 magnitude of both the common and domain factor loadings suggest the likely
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11 existence of both a common factor and domain-specific factors.
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14 15 16 **CFA in replication sample**

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18 To determine whether the final domain-specific² model (described in the 'CFA in
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20 testing sample' section) showed acceptable fit in an independent data sample, fit was
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22 assessed in the replication sample. Similarly favourable fit statistics emerged, $\chi^2(274)$
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24 = 2280.64, $p < 0.001$, RMSEA = 0.054 (90% CI = 0.052 - 0.056), SRMR = 0.049,
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26 CFI = 0.90, with similar factor loadings to the testing sample also observed.
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32 **Reliability & Determinacy**

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34 Scale reliabilities of each factor were estimated within the CFA model using both
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36 coefficient omega and alpha. Reliability was estimated after exclusion of the reverse
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38 coded item 5 (given its low factor loading it is suggested that this item is excluded
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40 from future administrations of the scale). Table 2 shows reliability values computed
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42 using the entire dataset ($N = 5,094$). Mean reliability values averaged across domains
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44 were omega = 0.69 and alpha = 0.72, which suggests general acceptable reliability
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46 compared against conventional guidelines of 0.7 for alpha, e.g., Kline, 2000.
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48 However, Table 2 also suggests suboptimal reliability for some individual domains,
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50 with omega values below 0.60 for Identification with School (0.58) and General Self-
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52 Worth (0.59).
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57 ² This model was assessed as this had the most favourable fit statistics
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5 Determinacy was also evaluated for all factors. A highly indeterminate factor is
6 one that can produce markedly different sets of factor scores from the same factor
7 loadings depending on the method of computation (Grice, 2001). It is therefore
8 important to evaluate factor determinacy to inform research outside of the SEM
9 framework that intends to compute factor (e.g. to assess rank order or for use in
10 further analysis). Table 2 shows determinacy values to range from 0.82 - 0.94 meeting
11 suggested thresholds (e.g. > 0.80, Gorsuch, 1983).
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20 21 22 23 **Measurement invariance across gender and age**

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25 After first establishing adequate absolute fit in independent male and female
26 subsamples and in independent age groups, configural, metric and scalar invariance
27 were assessed in sequence across gender and then across age. As expected, chi-square
28 tests for all invariance models were significant, suggesting population parameters
29 were unlikely to be precisely equal across gender or age groups. CFI and RMSEA fit
30 indices for measurement invariance testing are summarised in Table 3, with $\Delta\text{CFI} <$
31 0.002 used in each invariance test as the threshold to indicate meaningful differences
32 across groups (Meade, Johnson, and Braddy, 2008).
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49 For gender, absolute values of CFI and RMSEA in Table 3 indicate acceptable
50 absolute model fit for configural, metric and scalar invariance tests, with all $\Delta\text{CFIs} <$
51 0.002 , suggesting little appreciable degradation in model fit with each increasingly
52 restrictive constraint. These results suggest that the basic factor structure of the AMQ,
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3 the factor loadings and the item intercepts are unlikely to be substantively different
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5 across gender (similarity of factor loadings³ across groups can be easily corroborated
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7 by an inspection of unstandardized loadings in Table 1), and therefore that males and
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9 females respond to items in the same way. Given all invariance tests were satisfied, a
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11 further equality constraint was imposed on item error variances, and indicated
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13 acceptable fit, RMSEA = 0.051, CFI = 0.902, with Δ CFI = 0.001 suggesting the
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15 degree of item error was also equivalent across gender.
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18 For age, results indicate partial variance of the AMQ across the two age groups.
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20 Results in Table 3 support configural invariance across age, with metric invariance
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22 largely satisfied (although the absolute CFI fit statistic was marginally below the
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24 acceptable threshold), suggesting the basic factor structure and factor loadings of the
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26 AMQ are likely to be similar across age groups of 6-11 yrs and 12-18 yrs. However,
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28 for scalar invariance testing, Δ CFI=.003 was observed, suggesting that item intercepts
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30 may be different across age groups.
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34 Finally, coefficient omega indicated adequate overall reliability of the AMQ for
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36 both male ($\omega=.68$) and female ($\omega=.70$) subsamples and for Primary ($\omega=.66$) and
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38 Secondary ($\omega=.68$) age groups.
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40 Discussion

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42 The purpose of the current study was to determine whether the AMQ is a
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44 psychometrically sound instrument to measure a child or adolescent's social identity
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46 and self-concept. Results from analysis were largely supportive of the original
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48 proposed seven-factor structure of the AMQ (Maras, 2002; Maras et al., 2007),
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55 ³ Given that the standard deviations of most items are close to 1, any differences in loadings can be
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57 roughly approximated to differences in standardized scores.
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3 indicated general adequate reliability and suggest that the AMQ is a sound instrument
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5 whose psychometric properties are optimised with the omission of specific items.
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8 Prior to the current study, the factorial structure of the AMQ had not been
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10 extensively assessed. These findings therefore build upon previous research that has
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12 reported the use of AMQ within adolescent research (Maras, Brosnan, Faulkner,
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14 Montgomery & Vital, 2006; Maras, 2007; Maras et al., 2007; Maras, Moon & Zhu,
15
16 2012) and provide support for the original framework of the AMQ suggested by the
17
18 developer (Maras, 2002) thereby validating previous research that has reported use of
19
20 this tool within childhood research. Furthermore, in addition to the existence of
21
22 individual domain factors, there was some evidence to suggest an additional common
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24 factor influence on domain factors, possibly reflecting Academic Social Identity.
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28 Metric and scalar invariance across gender was demonstrated for the AMQ
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30 supporting measurement equivalence and that male and female factor scores can be
31
32 legitimately compared (Brown, 1997). Indeed, several studies have already made
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34 comparisons across gender on the AMQ (Maras, Moon & Zhu, 2012; Maras,
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36 Carmichael, Patel & Wills, 2007; Maras, 2007; Bornholt, Maras & Robinson, 2009;
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38 Maras, Brosnan, Faulkner, Montgomery & Vital, 2006), and the current results
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40 suggest such comparisons are valid.
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44 However, the current analyses suggested that while the AMQ demonstrated metric
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46 invariance (equal factor loadings) across two age groups (6-11 yrs and 12-18 yrs),
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48 scalar invariance (equal intercepts) was not supported. While metric invariance
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50 suggests that the strength of the relationship between the items and the underlying
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52 AMQ domains is the same across primary and secondary level age groups, the lack of
53
54 scalar invariance indicates that different age groups may interpret some items
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56 differently. This could potentially result in a difference in mean factor scores across
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3 groups even when true values of the underlying construct are the same (Brown, 2006),
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5 and therefore any comparisons of AMQ domain scores across these age groups should
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7 be undertaken with extreme caution in future studies. Furthermore, while adequate
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9 reliability was generally demonstrated for most AMQ domains, reliability for
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11 Identification with School ($\omega=.58$) and General Self-Worth ($\omega=.59$) was
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13 low (Table 2). The fact that notably lower omega values were observed relative to
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15 alpha values for these factors suggests that this may be partly a result of similarity of
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17 item wording within these domains.
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21 The current study has a number of strengths. Firstly, this is the first formal
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23 assessment of the AMQ's reliability and subsequent psychometric properties.
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25 Consequently, the current findings significantly contribute to our understanding of
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27 how the items load together and provide evidence for the validity of the tool. Based
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29 on these findings, the AMQ has the potential to become a reasonable alternative to
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31 other measures already standardised and validated, particularly as a method of
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33 measuring social identity in younger samples.
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37 Secondly, CFA provides a more in-depth assessment of the AMQ as a
38
39 psychometrically sound measure of children's social identity and self-concept. CFA
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41 provides a **more informative** measure of reliability (Raykov, 2001), a more rigorous
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43 examination of factorial structure and evidence of previously unexamined
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45 measurement invariance across gender.
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48 The current study has a number of limitations. Firstly, the findings are based on
49
50 cross-sectional data. The limitations associated with this design method suggest that
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52 future assessment of the AMQ's stability over time is required using longitudinal
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54 design and further validation between age groups. Thus, future research should assess
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3 the reliability and psychometric properties of the AMQ with across salient
4 developmental periods such as the transition to primary and secondary schools.
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8 Secondly, the current study does not include an assessment of the AMQ's
9 concurrent, predictive or convergent validity via assessment with other tools that have
10 been standardised and validated on similar populations. Although this was not the
11 objective of the current study, future research should address this limitation. As a
12 consequence the current study should be regarded as the first of many assessments
13 reporting the AMQ's psychometric properties.
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21 The findings have a number of implications for researchers currently using the
22 AMQ and for professionals working with students within academic contexts. Firstly,
23 the modifications to the AMQ suggested by these findings indicate that current users
24 are still able to administer the 29-item version of the AMQ. It is however advisable
25 that the suggested modifications are then to be made at the analysis stage to optimise
26 measurement.
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34 Secondly, as the findings indicate that the AMQ is designed for assessing social
35 identity with children across a broad spectrum of ages within academic contexts,
36 researchers are able to investigate when and where and how changes in social identity
37 are occurring developmentally using the one measure. Furthermore, when combining
38 the AMQ tool with other measures, such as the Strengths and Difficulties
39 Questionnaire (Goodman, 1997) or the Youth Materialism Scale (Goldberg, Gorn,
40 Peracchio & Bamossy, 2003), as previous projects have, it is possible to identify the
41 bio-psycho-social risk factors in adolescents and how these factors change and
42 interrelate as children develop.
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54 Finally, the results have implications for professionals working with children
55 within schools. With further assessment of the AMQ's reliability and validity over
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3 time, different age groups and comparisons with standardised tools, the AMQ could
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5 become a valuable measure to assess children within school contexts. Indeed, findings
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7 generated using the AMQ have already been used to inform public policy, Special
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9 Educational Needs (SEN), and to address antisocial behaviour in schools (i.e. see
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11 Parsons, Maras, Knowles, Bradshaw, Hollingworth & Monteiro, 2008; and UK House
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13 of Commons Education Select Committee inquiry, 2011).
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17 Future research should strive to overcome the limitations of the current study by
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19 establishing the AMQ's stability over time, in addition to seeking validity of the
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21 AMQ against other standardised tools such as the SDQ and other social identity
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23 measures. Such research would strengthen the AMQ's viability in an already
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25 competitive field. Furthermore, it is acknowledged that an individual's social identity
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27 is not a stable property, particularly in relation to academia and family institutions,
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29 thus it would be of interest to current and future users of the AMQ to understand how
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31 scores may fluctuate over time by assessing children of different age cohorts and from
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33 different clinical populations. Subsequent findings would permit the development of
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35 normed values, allowing the AMQ to be developed for use as a screening tool to
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37 identify children most at risk of poor social identity and poor academic outcomes. In
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39 addition, the widespread use of the AMQ across international borders suggests that
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41 further assessment of the tools viability as a cross-cultural measure is warranted.
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45 Finally, and importantly, further research would be beneficial to identify reasons for
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47 suboptimal reliability of the 'Identification with School' and 'General Self-Worth'
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49 domains, as well as reasons for lack of scalar invariance across age, and identify
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51 appropriate remedial solutions.
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Conclusions

The key benefit of the AMQ is that, with the use of the primary school pictorial supplement, it can be administered to both males and females, and used across age groups to study associations with other constructs of interest, although caution must be applied when making direct comparisons of factor means across age groups. It should allow researchers to investigate and map developmental changes in social identity longitudinally, effectively identifying the when, where and how in one measure. It is recommended that the single reverse coded item (q5) and the composite items 16, 21, 27 are omitted from future applications of the AMQ in order to maximise its measurement properties for the assessment of self-concept and social identity in applied social settings

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For Peer Review

Table 1. Descriptive statistics and fully standardized (β) factor loadings in testing sample ($n=2541$), with unstandardized (B) loadings across gender and age based on entire sample ($N=5082$).

Item	Overall			Gender		Age	
	M	SD	β	B (Girls)	B (Boys)	B (5-11 yrs)	B (12-18 yrs)
<i>F1 - Identification with Peers</i>							
1. I like being with my friends	3.80	0.91	0.62	1.00	1.00	1.00	1.00
2. I like doing the same as my friends	3.30	0.93	0.57	0.89	0.91	0.88	0.94
3. I like hanging out with my friends	4.30	0.69	0.58	0.68	0.71	0.72	0.72
4. I am similar to my friends	3.30	1.02	0.50	0.81	0.87	0.80	0.92
<i>F2 - Identification with Family</i>							
5. I like being alone at home	2.70	1.08	0.08	0.16	0.12	0.05	0.15
6. I like doing the same as my family	3.10	1.03	0.63	1.00	1.00	1.00	1.00
7. I like being with my family	4.10	0.93	0.76	1.10	1.12	0.98	1.11
8. I am similar to my family	3.30	1.13	0.65	1.18	1.05	1.31	1.12
<i>F3 - Identification with School</i>							
9. I like being at school the most	2.10	1.05	0.56	1.00	1.00	1.00	1.00
10. I like doing same as students	2.70	0.95	0.50	0.39	0.56	0.57	1.05
11. I like being at school	2.80	1.18	0.66	1.30	1.34	0.91	1.42
12. I am similar to students at my school	2.40	0.96	0.41	0.33	0.34	0.38	0.87
<i>F4 - Academic Effort</i>							
13. I work hard at school	3.70	0.95	0.86	1.00	1.00	1.00	1.00
14. I put in lot of effort at school	3.80	0.93	0.85	0.95	0.95	0.87	0.97
15. I finish schoolwork	3.30	0.95	0.63	0.70	0.70	0.64	0.72
<i>F5 - Academic Competence</i>							
17. My schoolwork is good	3.60	0.88	0.75	1.00	1.00	1.00	1.00
18. Friends think my schoolwork is	3.40	0.93	0.65	0.93	0.96	0.96	0.93
19. Family think my schoolwork is	3.90	0.92	0.71	1.00	0.97	0.91	1.00
20. Teachers think my schoolwork is	3.60	0.90	0.76	1.03	0.99	1.07	1.01
<i>F6 - Academic Importance</i>							
22. My friends think it's great I go	3.40	1.02	0.64	1.00	1.00	1.00	1.00
23. My family think it's great I go	3.70	1.09	0.69	1.11	1.06	0.83	1.15
24. My teachers think it's great I go	3.50	0.92	0.67	1.01	0.90	0.88	0.90
<i>F7 - General Self-Worth</i>							
25. I am happy being the person I am	4.00	1.06	0.53	1.00	1.00	1.00	1.00
26. I like the way I look	3.50	1.18	0.46	0.99	0.90	0.90	0.90
28. My friends like me	4.10	0.82	0.64	0.79	1.05	0.99	0.90
29. My family like me	4.40	0.87	0.72	1.01	1.22	0.78	1.06

Table 2. Intercorrelations, reliability (alpha and omega) and determinacy of factors (final model)

	F1	F2	F3	F4	F5	F6	F7
F1	1.00						
F2	0.15	1.00					
F3	0.20	0.45	1.00				
F4	0.08	0.46	0.52	1.00			
F5	0.19	0.46	0.51	0.79	1.00		
F6	0.18	0.46	0.60	0.54	0.65	1.00	
F7	0.33	0.65	0.31	0.45	0.58	0.63	1.00
Alpha	0.65	0.72	0.67	0.81	0.80	0.69	0.72
Omega	0.64	0.71	0.58	0.82	0.80	0.69	0.59
Determinacy	0.82	0.88	0.82	0.94	0.93	0.88	0.87

Table 3. Measurement invariance tests across gender (male/female) and age (5-11 yrs/ 12-18 yrs) showing absolute and change (Δ) values for CFI and RMSEA.

	Invariance Test*	CFI	RMSEA	Δ CFI
Gender	Configural	0.905	0.054	-
	Metric	0.904	0.053	0.001
	Scalar	0.903	0.052	0.001
Age	Configural	0.900	0.054	-
	Metric	0.898	0.053	0.002
	Scalar	0.895	0.053	0.003

* Configural=equivalent factor structure, Metric=equal factor loadings, Scalar=equal intercepts