

The Simple School Belonging Scale: Working towards a unidimensional measure of student belonging

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The Simple School Belonging Scale: Working towards a unidimensional measure of student belonging

A student's sense of belonging, and other closely associated constructs of school community, have been shown to relate to a large variety of psychological, health-related, and academic factors in school (Allen & Bowles, 2012; Anderman, 2003; Battistich, Solomon, Kim, Watson, & Schaps, 1995; CDC, 2009a; 2009b; Goodenow & Grady, 1993; Libbey, 2007; MacNeil, Prater & Busch, 2009; Osterman, 2000; Sergiovanni, 1994; Solomon, Watson, Battistich et al, 1996; Voelkl, 2012; Wingspread, 2004). Conversely, for all students, a lack of school belonging is associated with loneliness, emotional distress, psychosocial disturbance, suicide, mental illness, and depression (Allen & Bowles, 2012). School connectedness and belonging has been found to be second only to family connection in protecting children and adolescents against emotional distress, eating disorders, and suicide (CDC, 2009a; 2009b). In fact, it has been suggested that connectedness to school is the strongest protective factor in decreasing negative behaviors such as substance abuse, school absenteeism, early sexual involvement, and violence for both boys and girls in 7th through 12th grades (CDC, 2009b; see also Resnick, Bearman, Blume et al, 1997).

School transitions are periods of heightened physical and emotional upheaval for students (Harter, Whitesell, & Kowalski, 1992) and can interfere with developing a sense of belonging in the school community. This is especially marked for students transitioning out of elementary schools to middle school or junior high school who are also experiencing a transition to adolescence, which can be emotionally disorienting and uncomfortable (Eccles & Roeser, 2010). Middle schools or junior high schools typically combine students from several elementary schools. They are larger and often contain a more diverse student body (Eccles & Roeser, 2010). The organization of the school day is also new, with classes changing every 45-50 minutes, requiring students to adjust to a setting that requires more organizational skills, increased levels of independence and self-governing, as well as

increased demands for social awareness (Midgely, Anderman, & Hicks, 1995). Navigating this new setting includes having multiple teachers and more complex peer interactions throughout the day (Eccles & Roeser, 2010; Benner, 2011; Wigfield & Wagner 2005). For students at this transition to the secondary education school environment, school often includes changes in friendships and peer groups, and can feel impersonal and isolating for many students negatively impacting their sense of belonging at school (Benner, 2011). This critical stage in schooling provides an interesting and constructive setting for examining school belonging and the measurement of belonging.

School belonging has been measured in various ways across school settings and age ranges. For example, Libbey (2004) found that although many scholars acknowledge the importance of belonging for students and schools, there is a lack of consistency in how this construct is defined and operationalized in research. She found more than 21 different measures of belonging in an extensive review of literature on belonging in schools. In fact, many of the related constructs in the literature, which include school bonding, attachment, relatedness, membership, and others, use similar wording in their items and scales (Libbey, 2004). Despite this conceptual inconsistency, the *Psychological Sense of School Membership* (PSSM, Goodenow, 1993) scale was developed in middle schools for the use of researchers and school practitioners and has been widely used in research examining belonging and feeling connectedness to school for students in middle and high schools.

Previous studies using the PSSM have found a sense of belonging or connectedness to positively correlate with school success and motivation (Goodenow, 1993; McMahon, Parnes, Keys, & Viola, 2008). Research also has found moderate correlations with better school attendance (Sanchez, Colon, & Esparza, 2005), academic self-efficacy (Ibanez, Kuperminc, Jurkovic, & Perilla, 2004; Gutman & Midgley, 2000), and GPA (Anderman, 2003; Booker, 2007; Gutman & Midgley, 2000). Additionally, negative relationships have been found between the PSSM scores and scores on

the Child Depression Index (Shochet, Dadds, Ham, & Montague, 2006). Increased feelings of school connectedness, as measured by the PSSM, have been found to be related to lower levels of anxiety (McMahon et al., 2008).

The PSSM was developed by Carol Goodenow (1993) to examine student perceptions of belonging as it relates to academic motivation in school. She defines the construct measured by the scale as the “extent to which students feel personally accepted, respected, included and supported by others in the school environment” (1993, p.80). Forty-two items were initially constructed focusing on perceptions of liking, personal inclusion, acceptance, respect and encouragement as well as more general sense of belonging (Goodenow, 1993). These were paired down to 28 before administering the scale in middle school and junior high school settings. Initially, one third of the questions were purposefully phrased in a negative direction, and all questions used a 5-point Likert scale (true- not true)(Goodenow, 1993). Her 18-item measure was developed by removing items that contributed to low score reliability and exhibited minimal response variance (Goodenow, 1993; You et al, 2011).

Recent research reveals more than 42 studies using the PSSM with an additional 213 references to this scale (You, Ritchey, Furlong, Shochet & Boman, 2011). However only 27 of these studies use the full 18-question scale as developed by Goodenow (1993) and there are concerns about the level of inconsistency in the literature in how it is interpreted and used across these studies (You et al, 2011). As You and associates (2001) note, the PSSM is almost always used as a unidimensional measure despite conflicting psychometric evidence of its dimensional structure. Uses of the PSSM, largely as a unidimensional construct, have been helpful for raising questions about the importance of belonging in schools. Further, Ye and Wallace (2014) argue, “Having a psychometrically sound measure of students’ sense of school belonging permits future intervention-based work in schools” (p. 213) and suggest that such a scale might be helpful in identifying students who need additional

support or in monitoring teacher effectiveness. In practice, a clear unidimensional scale of school belonging with strong psychometric properties would be of value to the field. However, it has been difficult to find consensus on the appropriate use of the PSSM as a unidimensional approach to measure school belonging.

Recent research indicates that the PSSM scale is multi-dimensional with debate in the literature as to both the structure and interpretation of the factors (Cheung & Hui, 2003; Cheung, 2004; Harborg, 1994; 1998; O'Farrell & Morrison, 2003; Ye & Wallace, 2014; You et al, 2011). Because the PSSM was originally developed as a unidimensional scale, it is not always clear how it is best adapted to be able to use it as such. Scholars have variously dropped items problematic for unidimensional use and in efforts to improve psychometric properties (Anderman, 2003; Gutman & Midgely, 2000; Hagborg, 1994; Hagborg, 1998) or borrowed a few questions to add and compliment other related items (Voelkl, 1996) but there is not a systematic and agreed upon adaptation for use. Additionally, there is variability in the resulting factor structures of the PSSM tested in previous research.

A few notable studies have focused on understanding and unpacking the multidimensionality of the PSSM in an effort to more clearly define school belonging as measured by this scale. Hagborg (1994) first raised questions about the PSSM scale reflecting a unidimensional construct, and attempted to identify subcomponents through a principal components analysis. He identified a three-factor solution, including the dimensions *belonging*, *rejection*, and *acceptance*. However, he was unable to identify clear distinctions between the separate dimensions of the scale because of cross-loadings across factors. As a result he recommended reducing the full 18-item measure because of these cross loadings to a modified 11-item unidimensional scale (Hagborg, 1994; Hagborg, 1998) rather than pursuing a three-dimensional understanding of school belonging. Similarly, Cheung and

Hui (2003; Cheung, 2004) conducted a principal components analysis on a Chinese version of the PSSM and identified a two-factor solution, comprising of the dimensions *school belonging* (13 items) and *feelings of rejection* (5 items).

You and associates (2011) examined the factor structure of the PSSM using both exploratory and confirmatory factor analyses using split-half random samples. These authors identified a three-factor solution, comprised of the factors they called *caring relationships*, *acceptance*, and *rejection*, and eliminated the possibility of a hierarchical structure with one higher order factor. In line with other work with the PSSM, these authors found that many items cross-loaded across factors. However their recommendation was a reduction of items from 18 to 12 retaining all three factors. Likewise, Ye and Wallace (2014) conducted Exploratory Factor Analysis (EFA) and Confirmatory Factor Analyses (CFA). These authors discovered a four-factor solution, including three substantive factors and a method factor. Three items that either cross-loaded on the three substantive factors or had weak loadings were eliminated from the scale. Ye and Wallace (2014) labeled the substantive factors as *identification and participation in school* (6 items), *perception of fitting in among peers* (5 items), and *generalized connection to teachers* (4 items). Additionally, they identified a method factor, which included all of the negatively worded items (5 items) which were also found to cross-load on every other factor. These authors argue that this fourth factor is a method factor rather than a true *rejection* factor identified in other studies. They argue that a true rejection factor should exist across domains and contexts, which is not the case in the negatively worded items on the PSSM reflected in this factor. They further conclude that the *rejection* factor identified by other authors is most likely simply a method effect.

Finally, O'Farrell and Morrison (2003) found that all but five items on the PSSM cross-loaded onto other scales through an exploratory factor analysis of the PSSM along with several other scales

related to school bonding. These authors suggest that only five items on the PSSM represent something unique and assert that the construct of school belonging or bonding is indeed complex. Clearly constructs related to school belonging must be clearly articulated and discretely measured in order to be useful for stakeholders seeking to improve student experiences.

[Insert Table 1 about here]

From the above reviewed studies, we see the varying and sometimes conflicting ways in which the PSSM has been shown to measure sense of belonging in schools (see Table 1), which has led to some confusion about the underlying conceptualization of the construct. You and associates (2011) assert that much more work needs to be done to understand the factor structure of the PSSM in order to resolve inconsistencies among studies. The lack of clarity has led to further questions about the overall continued usefulness of the PSSM as the primary measure used by scholars measuring students' sense of belonging at their school, especially when used in a unidimensional application. Although a multidimensional model of school belonging is clearly important and warrants continued investigation, unidimensional uses of available measures (such as the PSSM) also suggests the practical importance of having a reliable and validated simple scale as a starting point for scholars examining school belonging.

The current study again examines the factor structure of the PSSM in one sample and then presents work toward the construction and psychometric analysis of a new unidimensional measure of belonging that we have called the *Simple School Belonging Scale* (SSBS). The goal of this project is to return to efforts in the development of a strong unidimensional scale of school belonging, using the PSSM as a place to start, in order to have a reliable and practical scale for both research scholars and school practitioners. In this paper we examine the overall structure of the PSSM with our sample in Phase 1, we explore the potential of a new unidimensional belonging scale using the PSSM with the

addition of new items in Phase 2, and validate and examine the psychometric properties of data for this new unidimensional belonging scale in Phase 3.

Method

Participants

This project is part of an ongoing collaboration with one junior high school, including grades 7, 8 and 9, located in the intermountain region of the United States. Approximately 900 students were surveyed about their school experiences at the beginning and end of the school year for 3 consecutive years. This school is the only middle level school in the town and represents a cross section of the overall population. A majority of students are White European American and speak English as a first language, however about 16% of the school population identify as Hispanic or Latino. Additionally, about 39.5% of students participate in the national free and reduced lunch program at this school. This sample, like others used to look at the PSSM factor structure, is a convenience sample and therefore limited in some ways. However, as all students at this school participated in the survey our sample represents the population of this particular community and school. As previous work with convenience samples shows various outcomes in the factor structure of the PSSM, we begin by looking at the factor structure in our own sample to place our work in context and continue to explore these factor variations.

Data Collection

In the spring of 2013, a 45-minute survey was administered to all students through an online survey program in the computer lab during school. As part of this survey students answered questions taken from the Vaux Social Support Record (VSSR, Vaux et al, 1986), a nine-item index of social support adapted from the original 23-item Social Support Appraisals scale (SS-A, Vaux et al, 1986), and the full PSSM scale (Goodenow, 1993). In addition to the PSSM, fourteen additional items

related to the construct of school belonging were included in the survey. The intent in adding additional items was to modify and extend the PSSM to create a reliable unidimensional scale that effectively measured school belonging. In order to accomplish this, a pool of additional questions were developed by the authors from a review of literature and research on belonging. We followed recommendations by Worthington and Whittaker (2006) who recommend an expert review of a limited number of items for content validity during scale development stage. They recommend very limited, if any, construct validity work (convergent, discriminant) at this development stage and argue that it is best to keep the questionnaire short and central to the purpose as other items may “interact” with the items being tested and affect response patterns on the critical items that are being tested in this stage. We selected these 14 items after a review by a panel of scholars for content validity and clarity, sensitive to the limitations of space in the survey. These were placed as a separate set of items in the survey along with the PSSM and the VSSR. Various demographic student data was also gathered from the survey and from the school.

We adopted a four-point likert scale (“NO!,” “no,” “yes,” “YES!”) after considering research arguing for and against the use of a middle response category in Likert type scales (e.g., Clark & Watson, 1995; Krosnick, Holbrook, Berent, Carson, Hanemann, Kopp, et al, 2002; Nowlis, Kahn, & Dhar, 2002). Research indicates that middle response categories can be inconsistent, reflecting situational endorsements and can be indications of ambivalence, confusion or a form of nonresponse (Kulas & Stachowski, 2013; Hernández, Drasgow, & González-Romá, 2004). Further, prior studies have used a four-point scale with adolescents (CDC, 2014). Thus, after consultation with the school administration and counselors at the school, we deemed it appropriate for our purposes with this population and age group for these measures.

Data Analysis

The goal of the first phase of analyses in this study was to replicate the findings from prior scholars using exploratory and confirmatory factor analyses (CFA). Based on preliminary findings from these analyses, we then explored alternative structures to the PSSM based on our sample. The goal of Phase 2 of our analysis was to use the additional information contained in the 14 new belonging items to both better understand the structure of the PSSM and to identify a supportable unidimensional adaptation of a belonging scale. To this end, we repeated these EFA and CFA analyses with the addition of the additional 14 new belonging items to the PSSM questions. Given the history of using the PSSM as a one-dimensional measure of belonging, our goal of this phase was to develop a more psychometrically sound unidimensional belonging scale. In Phase 3 we examined the scale developed in Phase 2 for item difficulty, item and test information, and item discrimination statistics in order to better understand the adequacy of the scale.

Procedures. To begin our analyses in Phase 1, the overall sample was randomly split into two subsamples. Sample A comprised the development sample, and Sample B the validation sample. The 881 students included in the spring 2013 panel were randomly split into two groups for analysis. Sample A included 392 students and Sample B included 465 students. Males consisted of 47.8% of the students in Sample A and 50.9% in Sample B. Students with free or reduced lunch status included 37.5% of the students in Sample A and 44.5% in Sample B. In Sample A, 80.3% students identified as white and in Sample B 77.7% identified as white. 9.2% of the students in Sample A identified Spanish as their dominant language and 7.7% in Sample B. Sample A included 127 seventh graders, 126 eighth graders, and 139 ninth graders compared to 144 seventh graders, 165 eighth graders, and 154 ninth graders in Sample B. On average, the students in Sample A had lived in the local community for 9.18 years ($SD = 4.66$) while the students in Sample B had lived in the community for 9.27 years ($SD = 4.64$).

For Phase 1 and Phase 2, a hypothesized structure of belonging was identified using EFA with the development sample (Sample A), including possible item deletions. We began with EFA because the variety of structures uncovered by prior studies left us unsure as to whether any prior discovered structure, or something entirely new, might be discovered in our sample. The final hypothesized structure resulting from EFA was tested in the validation sample (Sample B) using CFA. Although similar analyses were performed in both Phase 1 and Phase 2 of our study Phase 2 includes new items in addition to the PSSM that are analyzed in Phase 1.

A WLSMV (robust weighted least squares) estimator was used in MPLUS for both the EFA and CFA analyses due to the fact that normality could not reasonably be assumed (Brown, 2006; Muthen & Muthen, 1998-2001). For both EFA and CFA analyses, model fit was examined using the root mean square error of approximation (RMSEA), the Comparative Fit Index (CFI), and the Tucker Lewis coefficient (TLI). The RMSEA was considered acceptable if its confidence limits included 0.08 and was considered to be good if they included 0.05, with values closer to zero representing better fit. The CFI and TLI were considered to indicate good fit if they were above 0.95, and marginal fit if between .90 and .95, which is in accordance with current standards for these fit statistics (Bandalos & Finney, 2010; Brown, 2006). However, we chose to interpret these criteria as guidelines rather than as firm rules (Worthington & Whittaker, 2006).

In examining items with large cross-loadings, we followed the advice of Worthington and Whittaker (2006) and determined *a priori* a threshold that would be consistently used for determining whether cross-loadings suggested item removal. In keeping with their suggestion that that threshold be set as low as possible provided reliability and validity do not suffer, we used a threshold of .20, with the understanding that we would increase that threshold if needed. This threshold partly reflected

our preference for a shorter scale with approximate simple structure, if possible, in order to maximize usefulness to practitioners and also reduce survey burden when the scale was used in future studies.

Phase 3 analyses were conducted to investigate the psychometric properties and to verify the new belonging scale specified in Phase 2. These analyses were conducted in R software (R Core Team, 2014) using the *grm* function, an estimator based on Samejima's graded response model (1969), in the *ltm* package (Rizopoulos, 2006). This function uses an approximate marginal maximum likelihood estimation approach. Because sample size requirements are large for polytomous scales, the entire sample ($N = 857$) was used for these item response theory-based analyses. A minimum sample size of 500, with 1000 or more preferred, is considered appropriate for graded response models (Reise & Yu, 1990). Our purpose, however, was to examine item quality, not to calibrate particular items, making a split sample less necessary for the IRT analyses. Category response and information curves were examined for apparent usefulness of the item categories, coverage of the intended range of the trait, and appropriate discrimination at various levels of the trait. As part of Phase 3, evidence of construct validity was established by correlating our new unidimensional belonging scale to the Vaux Social Support Record (Vaux et al, 1986) with the expectation that the two scales would be strongly, but not perfectly, correlated. Additional construct validity was established by correlating the scale with the number of years the student had resided in the local community. This relationship was expected to be weak, but significant and positive.

Results

Phase 1: PSSM Factor Structure

Exploratory factor analyses. Using Sample A, exploratory factor analyses were conducted in MPLUS (Muthén & Muthén, 1998-2011) using the WLSMV estimator. Factors were rotated using an

oblique (Geomin) rotation, following Ye and Wallace (2014). Results comparing 2 and 3 factor models using Sample A are presented in this section.

An examination of eigen-values ($\lambda_1 = 9.01$, $\lambda_2 = 2.11$, $\lambda_3 = 1.21$, $\lambda_4 = 0.81$) in the EFA initially suggested a three-factor solution using either the oft-used $\lambda = 1.0$ cutoff, examination of scree plots, and parallel analysis. In the two-factor model, we found inadequate fit ($\chi^2 = 757.41$, $df = 118$, $p = 0.000$, $CFI = .933$, $TLI = .913$, $RMSEA = .118$). The three-factor model fit noticeably better ($\chi^2 = 496.92$, $df = 102$, $p = 0.000$, $CFI = .959$, $TLI = .938$, $RMSEA = .100$) with a chi-square difference test showing statistical significance ($\Delta\chi^2 = 260.49$, $\Delta df = 16$, $p < .001$), however the RMSEA was still unacceptably high, as the confidence interval [.091, .109] did not contain even the most liberally accepted value of .08. The CFI and TLI fit statistics for the 3-factor model, however, indicated good and adequate model fit respectively. In spite of findings from Ye and Wallace's (2014) study pointing to a four-factor model, the Eigen-values from these data provided no justification for a four factor model in our analyses.

Examination of factor loadings for the three-factor model (Table 2), suggested the majority of items (13) loaded on the first factor and the other 5 loaded on the second factor. This division is aligned cleanly with the positive versus negative wording of the items. Unlike Ye and Wallace's (2014) finding, only one of the negative items is cross-loaded on another factor suggesting little evidence of a method effect. The third factor includes at least three items, but the factor loadings are mostly under 0.50. Thus, the third factor appears to be weakly defined. In addition, all of the items loading on this factor are cross-loaded onto one of the other factors, with cross-loadings of at least .554. In fact, only one item from Factor 3 does not cross-load with Factor 1. Thus factor 3 does not appear to represent a factor that is clearly distinguishable from the others. Correlations among the factors are included in Table 3.

[Insert Table 2 about here]

[Insert Table 3 about here]

As our goal is to identify independent factors of belonging, one possibility suggested by our EFA was to eliminate all items that loaded on the ill-defined third factor, and accept a reduced two-factor instrument. In this scenario, if the six items with loadings on Factor 3 greater than 0.20 are eliminated, eight items remain to measure Factor 1 and four items remain to measure Factor 2. We re-ran the EFA with items 4, 5, 7, 9, 14, and 15 removed and only allowing two factors. Fit statistics were mixed ($\chi^2 = 278.95$, $df = 43$, $p = 0.000$, $CFI = .963$, $TLI = .943$, $RMSEA = .119$, Upper limit = 0.132, Lower limit = 0.106). Factors were strongly correlated ($r = .53$). We conclude, however, that a 2-factor reduced model is the best fit for the PSSM in Sample A and proceed with a CFA to confirm the model.

Confirmatory factor analyses. In order to validate the findings of a two-factor, 12-item model suggested by the exploratory factor analyses in Sample A, a CFA was conducted using our validation sample, Sample B. All factor loadings were moderate to strong (above 0.50) and statistically significant as shown in Table 2. The factor correlation was high ($r = -0.71$) suggesting that the positive and negatively worded items may only be distinguished due to a method effect. Fit statistics, however, were inconsistent in reflecting even adequate model fit ($\chi^2 = 433.30$, $df = 53$, $p = 0.000$, $CFI = .942$, $TLI = .928$, $RMSEA = .125$, Upper limit = 0.136, Lower limit = 0.114). Modification indices suggest a large number of potential error covariances or factor cross-loadings. The model was not modified, however, as the purpose of the CFA was model validation, not exploration, and model modifications at this stage were likely to capitalize on chance.

In addition, we estimated the model with negatively worded items as a method effect (correlated covariances) rather than as a second factor. Model fit using this approach was slightly

better than when fitting a two factor model, but reached good fit standard for only the CFI fit statistic ($\chi^2 = 345.43$, $df = 48$, $p = 0.000$, $CFI = .955$, $TLI = .938$, $RMSEA = .116$, Upper limit = 0.104, Lower limit = 0.127).

Our results in Phase 1 indicate that the PSSM is not a unidimensional measure of belonging and does not have good fit as a two-factor model even after eliminating cross loading items. This is in line with previous work in other samples (Cheung & Hui, 2003; Cheung, 2004; Hagborg, 1994; 1998; O'Farrell & Morrison, 2003; Ye & Wallace, 2014; You et al, 2011), although we found differences across the development (Sample A) and validation (Sample B) samples in our own analysis of the structure of this measure.

In sum, our findings differ from previous scholars in that our analysis pointed to a two-factor model after removing the six items that loaded onto an unspecifiable third factor. Following Ye and Wallace (2014), we also explored the possibility that the third factor represented a method effect due to the negative wording of the items. However, unlike Ye and Wallace, we did not find that all negatively worded items were cross-loaded with other factors, suggesting the possibility that the *feeling of rejection* factor may indeed be a unique construct. As these authors suggest, however, examining responses to these items on an instrument that contains items from a variety of scales may help uncover whether these items represent only method effect or represent a substantive construct. Despite the fact that the PSSM is often used as a unidimensional scale measuring belonging, our findings suggest that this is an inappropriate use of this scale.

Phase 2: PSSM adding Additional Belonging Items

The goal of the second phase of this study was to determine whether the PSSM could be improved as a measure of belonging with approximate simple structure with the addition of new items. The following EFA and CFA analyses explore the development of an optimal unidimensional

belonging scale using the combined set of items from the PSSM and the 14 new items designed to measure sense of belonging.

Exploratory Factor Analyses. As in Phase 1, EFAs were estimated in MPLUS using the WLSMV estimator and Geomin rotation with Sample A. Eigen-values suggested a four-factor solution when the additional items were included ($\lambda_1 = 16.43$, $\lambda_2 = 3.05$, $\lambda_3 = 1.68$, $\lambda_4 = 1.34$, $\lambda_5 = 0.95$), but a three-factor solution was also estimated for comparison. The three-factor solution had adequate fit on all measures ($\chi^2 = 1563.62$, $df = 403$, $p = 0.000$, $CFI = .948$, $TLI = .937$, $RMSEA = .086$, Upper limit = .090, Lower limit = .081). However, the four-factor solution had excellent fit ($\chi^2 = 1194.48$, $df = 374$, $p = 0.000$, $CFI = .964$, $TLI = .952$, $RMSEA = .075$).

The pattern of factor loadings for the four-factor solution (Table 4) revealed many significant cross-loadings. Factor 1 included most of the positively worded items and, as in Phase 1, Factor 2 included all the negatively worded items. The third factor in this model was constructed similarly to the third factor found in Phase 1, when only items from the PSSM were included. In this model, Factor 3 is more cohesive though still comprised of items only from the PSSM. The addition of the new items appears to have clarified the factor structure, with many squared factor loadings above 0.50 and at least two of the items are measured without cross-loading on other factors. The fourth factor is unique among the factors in that it includes a balance of positively and negatively worded items. All of the factor four items, however, had cross-loadings on either Factor 1 or Factor 2 of at least .578, making this factor independently uninterruptable. Interestingly, even following Ye and Wallace's (2014) approach where the factor representing negative items is considered a method effect, considering Factor 4 as an independent factor remains problematic in our analyses. Factor correlations are included in Table 5.

[Insert Table 4 about here]

[Insert Table 5 about here]

In sum, additional items were designed to represent the construct of school belonging and included in the analyses in order to validate the constructs represented by the PSSM itself. We uncovered a three-factor structure for our sample in our EFA. The first factor seemed best represented by a factor we called *school belonging*, the feeling that a student feels comfortable, accepted, and liked at the school. The second factor, *feelings of rejection*, included primarily the negative items. However, significant negative loadings on the second factor in the EFA for the positively-worded items “I can really be myself at this school” and “I fit in with other students at (school name)” may provide evidence of a substantive rejection factor rather than a method effect. Cross-loadings, however, muddied the interpretation of this factor and only two items, both negatively worded, were identified to measure the factor during the CFA. Thus, this factor is underspecified and may not validly represent the breadth of the construct. A third factor identified in the EFA, *connection to teachers*, was also underspecified (two items) once cross-loaded items were removed for the CFA analysis. While EFA suggested a fourth factor, *school loyalty*, which included both positively and negatively worded items, all items were cross-loaded on other factors. Thus the school loyalty factor cannot be measured as an independent construct. Among these four factors, then, only the *school belonging* factor, indicated by ten items, is potentially fully specified.

Based on these exploratory analyses, two final approaches to modeling belonging from these data emerged as options to be confirmed through CFA. The first approach considered included eliminating all items that loaded strongly on the problematic Factor 4, with any other items with significant cross-loadings also removed. This model would retain the ten items that loaded cleanly on Factor 1, the two items that loaded cleanly on Factor 2, and the two items that loaded cleanly on Factor 3. As noted above, this multidimensional approach raised question about the possibility of

being fully specified. The second approach retains the ten items on Factor 1 and eliminates all other items. This approach is in line with our overarching research goal, seeking to confirm a unidimensional model of belonging.

Confirmatory Factor Analyses. Confirmatory factor analyses using Sample B revealed that both approaches to the data that emerged from the EFA were viable models. A multifactor model was found to have good fit ($\chi^2 = 276.61$, $df = 74$, $p = 0.000$, $CFI = .975$, $TLI = .969$, $RMSEA = .077$, Upper Limit = .067, Lower Limit = .086), after dropping items from Factor 4 as suggested by the EFA. The second approach, specifying a unifactor model, also was confirmed to have good fit. As our goal in these analyses was to explore the feasibility of developing a robust unidimensional model in order to advance the work of belonging among adolescent students, we present the results of this second approach, the unifactor model, in this paper.

The ten-item unifactor model had good fit ($\chi^2 = 150.50$, $df = 35$, $p = 0.000$, $CFI = .982$, $TLI = .977$, $RMSEA = .084$, Upper Limit = .098, Lower Limit = .071). Interestingly this factor included 5 items from the PSSM and 5 items from the new belonging questions added in Phase 2. All standardized loadings were large (at least 0.635) and statistically significant (Table 5). The internal consistency as measured by Cronbach's alpha was 0.91 for the scores estimated using this unifactor model. Using Raykov's (2004) CFA-based method, the scale reliability of the scores was 0.96.

Phase 3: Item Response and Construct Validation of the Unidimensional Scale

The results of our confirmatory factor analysis in Phase 2 show that our 10-item one factor model represents a robust unidimensional measure of student belonging. These encouraging results led us to further test the psychometric properties of the scores in this new belonging scale through an item response analysis and construct validation, which we carried out in Phase 3 of this study.

Item Response Analysis. Using the graded response model (Samejima, 1969), the final unidimensional factor model converged and reported a negative log likelihood of -7960.872 with AIC = 16001.74 and BIC = 16192.11. These measures are most interpretable in comparing models, with lower values representing better fit. Item parameter estimates indicate all items are discriminating (discrimination parameters greater than 1.0), suggesting a much higher probability of selecting a higher response category if the person has a greater sense of belonging. Thresholds for each item are fairly evenly spaced and non-overlapping (Table 6), indicating all response categories are functioning well with each category representing a higher degree of belonging. Item category response curves (Figure 1) verify the distinct functioning of the response categories for this sample.

[Insert Table 6 about here]

[Insert Figure 1 about here]

In addition, item information curves (Figure 2) suggest that the items provide optimal information (the item curves are peaked) about respondents with ability levels between -2 and 2 on the scale. For our scale, 97.87% of respondents had factor scores in this ability range, as estimated by the model. In essence, the IRT analysis suggests that the items individually extract helpful information that allows for fine distinctions in the levels of belonging possessed by the respondents to this survey.

[Insert Figure 2 about here]

Construct Validation. While we made significant efforts toward content validity we also found some limited evidence of construct or criterion validity. The size of the loadings from the CFA for the ten-item unidimensional school belonging scale as well as the reliability evidence suggest high levels of factor cohesion. Using Sample B in MPLUS, evidence of construct validity was found through correlating the new ten-item school belonging scale with the Vaux School Support Scale

(1986). Although both scales had items measuring student perceptions of whether people at school care and can help students at school in one form or another, items do not overlap in these two scales. When both scales were included, the model had mediocre fit ($\chi^2 = 1018.92$, $df = 103$, $p = 0.000$, CFI = .935, TLI = .924, RMSEA = .138, Upper Limit = .146, Lower Limit = .131). However the correlation between the two constructs was $r = 0.64$, which aligns with expectations, suggesting some evidence of construct validity. Model fit might be improved by adding error covariances within the social support scale. However, we felt we had found adequate evidence of validity without making revisions to the measurement of school support. The belonging scale correlated weakly with the number of years the student had lived in the local community ($r = 0.142$, $p = .007$), as expected (see also Gallagher, 1996). This provides some limited evidence of discriminant validity, however, much more work related to validating this scale is in order. As we have exhausted the limits of this particular data, future work with a new sample can extend this work and gather more evidence of construct validity.

In sum, the scale tested in our analyses in Phase 3 that includes five PSSM items and five new items, has strong psychometric properties, including high score reliability. These findings point to the construction of a new, robust, unidimensional, measure of school belonging with minimal measurement error. We have called this new measure the *Simple School Belonging Scale* (SSBS). The development of this new scale is significant because it provides a unidimensional scale that can be used to compare school belonging across groups and track change in school belonging for individuals across time.

Discussion

Having a sense of belonging in school is protective for students and supports the psychosocial and academic wellbeing of students. This is particularly interesting in middle level education during

which time students are in a crucial transition time. Unfortunately, there has not been consensus in the field on ways to conceptualize and measure student belonging. One commonly used measure has been the PSSM, which has generally been applied unidimensionally and without much psychometric substantiation. We argue that a unidimensional measure of student belonging in schools is warranted to assist researchers and practitioners in intervention-based work and increase insight into helpful approaches for student belonging (Ye & Wallace, 2014).

The main contribution from this study is the presentation of a new measure of school belonging, the *Simple School Belonging Scale* (SSBS). The SSBS contains 10 items, 5 taken from the PSSM and 5 from a set of new items collected for this study. Results from our analyses reveal that the SSBS is psychometrically sound with preliminary evidence of construct validity. Interestingly, the inclusion of these new belonging items also clarified the structure of the PSSM items in our exploratory factor analyses.

Our study builds on the work by scholars who began to critique the PSSM in an effort to improve the measurement of school belonging overall. This study extends the work of previous scholars by developing and testing a new measure of belonging that is more appropriate for unidimensional applications than previously used measures such as the PSSM. Although this is an important contribution, it is just one step forward in conceptualizing and measuring school belonging in more coherent and unified ways. Future research should attend to validation of the SSBS across age groups and across varied contexts in order to continually advance the theoretical and methodological underpinnings of student belonging.

The continued use of the PSSM as a unidimensional measure of belonging in research suggests the usefulness and demand for a simple unidimensional scale. Indeed, there is much that can be learned by examining an overall sense of belonging in schools with a simple reliable

unidimensional tool. However, we should also acknowledge the difficulties revealed in work to develop such a scale. Our work here has been interested in developing a psychometrically strong unidimensional measure of belonging that can be consistently used by researchers and practitioners in the field. Yet, we also recognize the overwhelming evidence of the complexity surrounding measurement of school belonging that must be closely examined as we go forward. Although we did not pursue further analysis due to our specific purpose in this study, our own work suggests that a two-dimensional approach might also yield productive insight into the conceptual terrain of school belonging. There is certainly much more work to be done in unpacking and further specifying constructs related to belonging. We encourage future research to expand understandings of how concepts of school belonging, connectedness, bonding, social support, and other related constructs relate and differ from each other.

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Table 1

Factor identifications for the PSSM in prior studies

Item Number	Item	Hagborg (1994)	Cheung & Hui (2003)	You et al. (2011)	Ye & Wallace (2014)
1	I feel like a real part of (school name).	Belonging, Acceptance	School belonging	Removed	Identification & participation in school
2	People here notice when I am good at something.	Belonging	School belonging	Acceptance	Removed
3	It is hard for people like me to be accepted here.	Rejection	Feeling of rejection	Rejection	Perception of fitting in among peers
4	Other students in this school take my opinions seriously.	Belonging	School belonging	Acceptance	Perception of fitting in among peers
5	Most teachers at this school are interested in me.	Belonging	School belonging	Caring Relationships	Generalized connection to teachers
6	Sometimes I don't feel as if I belong here.	Rejection	Feeling of rejection	Rejection	Identification & participation in school
7	There's at least one teacher or adult in this school that I can talk to if I have a problem.	Belonging	School belonging	Caring Relationships	Generalized connection to teachers
8	People at this school are friendly to me.	Belonging	School belonging	Removed	Perception of fitting in among peers
9	Teachers here are not interested in people like me.	Belonging	Feeling of rejection	Caring Relationships	Generalized connection to teachers
10	I am included in lots of activities at this school.	Belonging	School belonging	Acceptance	Identification & participation in school
11	I am treated with as much respect as other students.	Belonging	School belonging	Removed	Removed
12	I feel very different from most other students here.	Rejection	Feeling of rejection	Removed	Identification and participation in school
13	I can really be myself at this school.	Belonging	School belonging	Acceptance	Perception of fitting in among peers
14	The teachers here respect me.	Belonging, Acceptance	School belonging	Caring Relationships	Generalized connection to teachers
15	People here know that I can do good work.	Belonging	School belonging	Removed	Removed
16	I wish I were in a different school.	Acceptance	Feeling of rejection	Rejection	Identification & participation in school

17	I feel proud of belonging to (school name).	Acceptance	School belonging	Removed	Identification & participation in school
18	Other students here like me the way I am.	Belonging	School belonging	Acceptance	Perception of fitting in among peers

Table 2

Phase 1: Exploratory and confirmatory factor loadings, PSSM

Item	<u>EFA Factor Loadings</u>			<u>CFA Standardized Loadings</u>	
	1	2	3	1	2
1	0.836*	-0.118*	-0.045	0.850	
2	0.758*	-0.010	-0.196*	0.692	
3	0.021	0.750*	0.004		0.762
4	0.783*	0.113*	-0.276*		
5	0.805*	0.066	0.275*		
6	-0.046	0.857*	0.045		0.823
7	0.554*	-0.021	0.398*		
8	0.756*	-0.210*	-0.046	0.794	
9	0.007	0.574*	-0.414*		
10	0.647*	-0.025	-0.028	0.595	
11	0.693*	-0.195*	0.032	0.774	
12	-0.003	0.755*	0.052		0.502
13	0.663*	-0.252*	0.006	0.779	
14	0.730*	0.014	0.564*		
15	0.722*	-0.111*	0.239*		
16	-0.245*	0.575*	-0.134*		0.815
17	0.762*	-0.119*	0.047	0.836	
18	0.677*	-0.175*	-0.009	0.842	

*Significant at $p < 0.05$

Table 3
PSSM 3-Factor EFA: Factor Correlations

	Factor 1	Factor 2	Factor 3
Factor 1	1.000		
Factor 2	-.479	1.000	
Factor 3	-.289	.200	1.000

Table 4

Phase 2: Exploratory and confirmatory factor loadings, PSSM + New Items

<i>PSSM Questions</i>	<u>EFA Factors Loadings</u>				<u>CFA Standardized Loadings (Unifactor Model)</u>	<u>CFA Standardized Loadings (Multi-factor Model)</u>		
	1	2	3	4	1	1	2	3
1 I feel like a real part of (school name).	0.769*	-0.022	0.039	0.276*				
2 People here notice when I am good at something.	0.730*	0.013	0.071	-0.055	0.729	0.727		
3 It is hard for people like me to be accepted here.	-0.048	0.729*	-0.089	0.176*				
4 Other students in this school take my opinions seriously.	0.829*	0.112*	-0.054	-0.039	0.730	0.719		
5 Most teachers at this school are interested in me.	0.386*	0.082*	0.545*	0.044				
6 Sometimes I don't feel as if I belong here.	-0.195*	0.779*	0.021	0.008			0.959	
7 There's at least one teacher or adult in this school that I can talk to if I have a problem.	0.063	-0.011	0.605*	0.109*				0.715
8 People at this school are friendly to me.	0.648*	-0.159*	0.198*	-0.003	0.748	0.768		
9 Teachers here are not interested in people like me.	0.310*	0.555*	-0.488*	-0.019				
10 I am included in lots of activities at this school.	0.490*	0.02	0.248*	0.035	0.635	0.636		
11 I am treated with as much respect as other students.	0.517*	-0.169*	0.314*	-0.110*				
12 I feel very different from most other students here.	-0.102	0.699*	-0.004	0.019			0.508	
13 I can really be myself at this school.	0.484*	-0.244*	0.258*	-0.006				
14 The teachers here respect me.	0.045	-0.001	0.832*	0.097*				0.754
15 People here know that I can do good work.	0.279*	-0.136*	0.610*	-0.091*				

16	I wish I were in a different school.	-0.016	0.603*	-0.086*	-0.548*		
17	I feel proud of belonging to (school name).	0.624*	0.005	0.046	0.503*		
18	Other students here like me the way I am.	0.578*	-0.160*	0.191*	-0.043	0.837	0.802
<i>Additional Belonging Questions</i>							
1	I feel loyal to people in (school name).	0.633*	0.121*	0.034	0.380*		
2	I feel like I belong to (school name).	0.624*	-0.123*	-0.043	0.443*		
3	I would be willing to work together with others on something to improve (school name).	0.336*	0.147*	0.320*	0.384*		
4	I like to think of myself as similar to others at (school name).	0.667*	-0.085*	-0.003	0.170*	0.685	0.679
5	Given the opportunity, I would move to a different school.	0.080*	0.608*	0.007	-0.683*		
6	People at (school name) care if I am absent.	0.824*	0.025	-0.09	-0.031	0.739	0.728
7	I fit in with other students at (school name).	0.722*	-0.305*	-0.042	-0.005		
8	I participate in activities at (school name).	0.439*	0.056	0.282*	0.134*		
9	I would rather attend a different junior high school.	-0.031	0.578*	0.000	-0.666*		
10	I feel out of place at (school name).	-0.302*	0.685*	0.067*	-0.162*		
11	I feel like my ideas count at (school name).	0.671*	0.024	0.181*	0.042	0.791	0.800
12	(School name) is a comfortable place for me.	0.726*	-0.053*	0.003	0.331*		
13	I feel like I matter to people at (school name).	0.857*	-0.049*	0.008	0.071*	0.890	0.885
14	People really listen to me when I am at school.	0.814*	-0.003	0.098*	-0.097*	0.837	0.838

*Significant at $p < 0.05$

Table 5
PSSM + New Items 4-Factor EFA: Factor Correlations

	Factor 1	Factor 2	Factor 3	Factor 4
Factor 1	1.000			
Factor 2	-.399	1.000		
Factor 3	.623	-.183	1.000	
Factor 4	.240	-.126	.306	1.000

Table 6

Phase 3: Item parameter estimates from graded response model: SSBS

Item	Source	Threshold 1	Threshold 2	Threshold 3	Discrimination
People here notice when I am good at something.	PSSM 2	-1.91	-0.71	0.85	2.10
Other students in this school take my opinions seriously.	PSSM 4	-1.81	-0.34	1.62	2.09
People at this school are friendly to me.	PSSM 8	-2.13	-1.22	0.78	2.36
I am included in lots of activities at this school.	PSSM 10	-1.99	-0.32	1.48	1.47
Other students here like me the way I am.	PSSM 18	-2.20	-1.32	0.50	2.25
I like to think of myself as similar to others at (school name).	New 4	-1.58	-0.47	1.19	1.86
People at (school name) care if I am absent.	New 6	-1.72	-0.59	0.95	2.10
I feel like my ideas count at (school name).	New 11	-1.53	-0.29	1.29	2.49
I feel like I matter to people at (school name).	New 13	-1.55	-0.68	0.77	3.86
People really listen to me when I am at school.	New 14	-1.47	-0.43	0.99	3.25

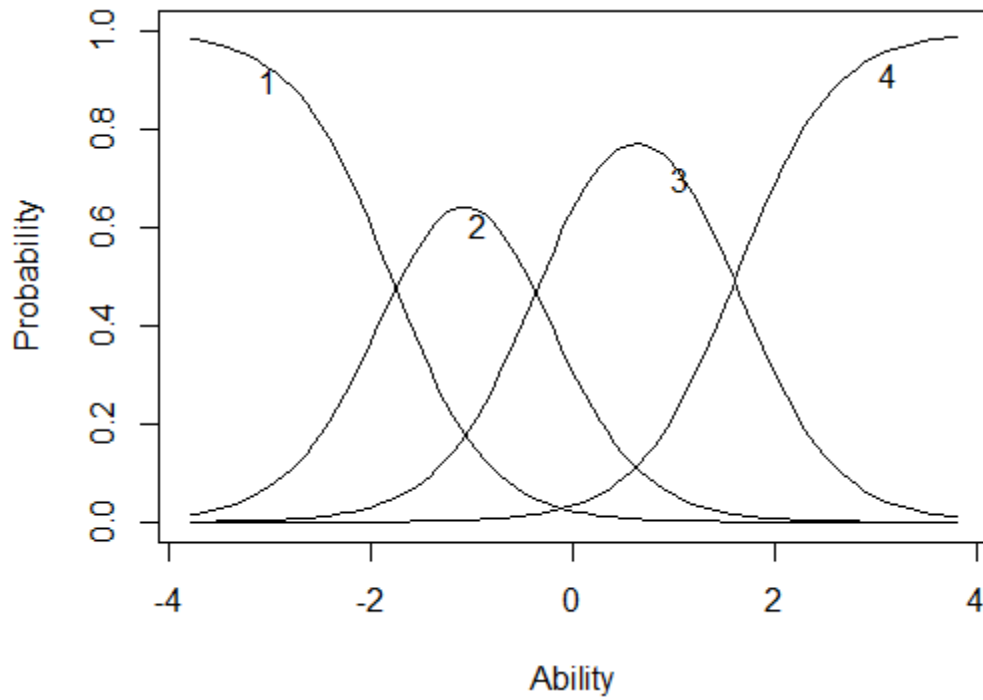


Figure 1. Sample category response curve for item 4, suggesting good category functioning and good discrimination. Curves for other items on the scale are similar.

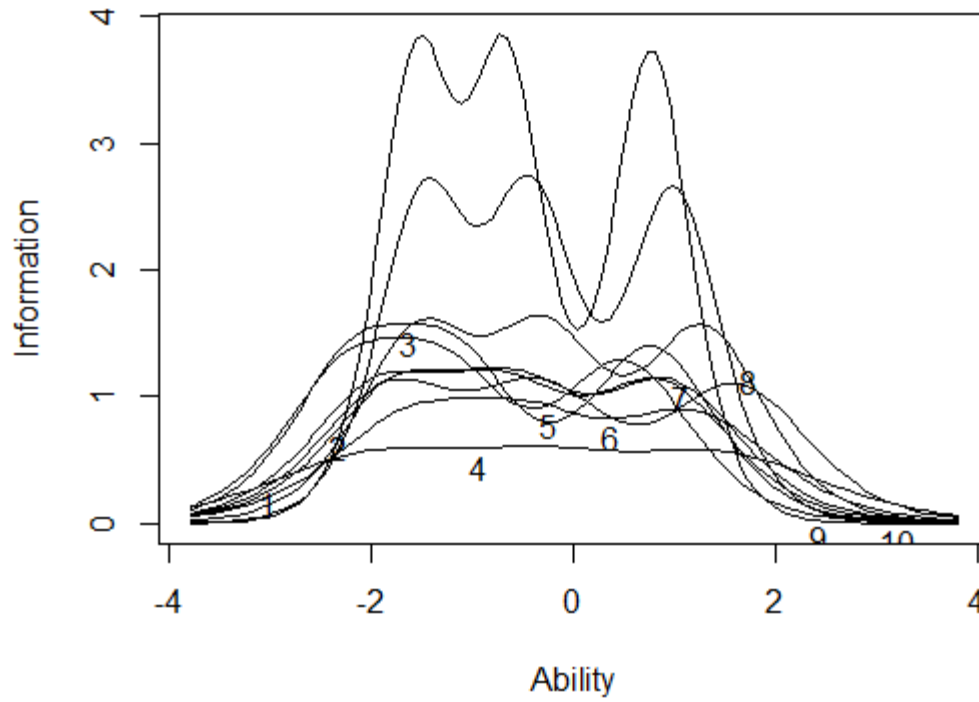


Figure 2. Item information curves for final unidimensional scale showing peak information is available between -2 and 2.