A Confirmatory Factor Analysis of the Student Adaptation to College Questionnaire

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Paper presented at the annual meeting of the Association of Institutional Research, May 2005, San Diego, CA

Abstract

The Student Adaptation to College Questionnaire (SACQ; Baker & Siryk, 1999) is used to measure students' adjustment to a college setting. To date, the majority of validity studies for the SACQ have been external domain studies in which the hypothesized relationships of the subscales with other measures have been examined. To maximize the utility of such studies, internal domain studies are needed to investigate whether the items are relating to each other in the manner in which the authors intended. The purpose of this study is to employ confirmatory factor analysis (CFA) to test the fit of the authors' proposed four-factor model using a sample of university students (N = 861). Results from the CFA indicated that the hypothesized model did not fit. Additional analyses were performed to diagnose areas of misfit. The results of separate CFAs specifying one-factor models for each subscale indicated lack of fit for all subscales. Exploratory factor analyses were then conducted including all subscales and a resulting four-factor model, different from the model proposed by the authors, was examined to provide information for future instrument revisions. The EFA results indicated that there were several items that were poor indicators of adjustment and also implied that the assignment of items to their current subscales may need to be reconsidered. It was concluded that the developers of the instrument need to return to the first stage of instrument development, which would entail not only examining the theories behind adjustment to college in greater detail, but examining how the current conceptualization of the SACQ relates to such theories.

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Over the past 35 years, there have been annual increases in the percentage of students attending college. From 1970 to 2000 college attendance at both 2- and 4-year institutions increased 44 percent (National Center for Education Statistics, 2003). It is projected that college attendance will continue to grow by 12 percent between now and 2012 to include 17.6 million people enrolled in college courses (National Center for Education Statistics, 2003). With enlarged attendance comes an increased proportion of students who might face difficulties adjusting to the college environment. It is imperative that students facing obstacles be identified in order to be provided with support services.

There are a variety of ways in which to go about identifying students who are having trouble adjusting to college. Consider two incoming freshmen students, Jane and Brenda, who differ in their levels of adjustment to college, but are similar in all other respects. Jane might be considered a well-adjusted student because she has a favorable view of her university, is very active in campus life, is doing well academically, has many friends and is relatively happy. Brenda, on the other hand, might be considered as poorly adjusted because she does not particularly care for her university, is not involved in campus life, has academic difficulties, few friends, and is oftentimes overly anxious or depressed. The description of these two students implies that adjustment may be measured using a number of different indicators, including student's attachment to a university, participation in campus activities, psychological well-being, and academic standing. Most researchers who study adjustment would advocate for the use of multiple indicators simultaneously so a more comprehensive picture of a student's adjustment can be obtained (Spady, 1971; Terenzini & Pascarella, 1977; Tinto, 1975, 1996). In fact, the

Student Adaptation to College Questionnaire (SACQ) is a self-report instrument created with the intention of capturing such a multi-faceted view of adjustment (Baker & Siryk, 1999).

The creation of the SACQ began in 1980 after Baker and Nisenbaum (1979) implemented an unsuccessful two-year intervention program designed to aid students in the transition from high school to college. Baker and Siryk (1980) attributed the failure of the program to the voluntary participation of students, where students in need of the intervention were precisely the ones who chose *not* to participate. The authors determined that a better approach would be to first, identify students in need of intervention or counseling services through the use of a measurement tool and second, implement the services only for such students. The authors hypothesized that one characteristic of an individual that might make them at-risk for a problematic transition is the degree to which the student experiences alienation, or as described by Baker and Siryk, the ability of the student to achieve a “fit” with their environment. Indeed, variables related to alienation, such as lack of involvement in campus activities, were found in previous research to be related to a difficult transition into college (Astin, 1975; Baumgart & Johnstone, 1977; Pascarella & Terenzini, 1976; Terenzini & Pascarella, 1977; Wright, 1973). A 36-item measure of alienation was created by the authors and found to be negatively related to a 52-item self-report measure of adjustment, also created by the authors. The following is the only information provided for how this 52-item measure of adjustment was created: “To measure success of transition, [a] self-rating scale was devised that consisted of 52 statements related to various aspects of students’ adjustment to the college situation” (p. 439).

In 1984, Baker and Siryk focused less on their measure of alienation and more on improving upon their self-report measure of adjustment to college. In particular, Baker and Siryk (1984) felt that their 52-item measure developed in 1980 would be able to fill a gap in the area of adjustment because it was developed to measure several different facets of adjustment and captured many aspects of variables found in previous research to be related to a successful transition. The problem, according to Baker and Siryk (1984), with the previous instruments used to measure adjustment was that they often contained too few items, leading to an under representation of the construct. Even scales with a larger number of items did not capture the construct comprehensively. For instance, some researchers would focus on the measurement of social adjustment (i.e., Aitken, 1982; Bryant & Trower, 1974; Wright, 1973) while others would focus solely on the measurement of personal-emotional adjustment (i.e., Anastasi, Meade, & Schneiders, 1960; Borow, 1974; Kramer, 1980). It was very rare for both social and personal-emotional adjustment, along with other forms of adjustment, to be considered in unison. Baker and Siryk (1984) believed that integrating these concepts would result in a more accurate representation of the nature of students' transition to college. They also felt that their 52-item instrument would have superior psychometric properties when compared to earlier instruments where there was oftentimes, a lack of reliability, and more frequently, an absence of validity evidence for the instruments' scores.

Baker and Siryk (1984) posited that their 52-item SACQ provided a measure of adjustment that: 1) contained a sufficient number of items to establish suitable reliability, 2) contained items that comprehensively measured the various facets of adjustment to college, and 3) showed convergent validity with similar constructs (Baker & Siryk, 1984). Unlike in 1980, the authors in 1984 provided information regarding the nature of the subscales to which each of the 52 items uniquely belonged: academic adjustment (18 items), social adjustment (14 items), personal-emotional adjustment (10 items), and general adjustment (10 items). Statistical analyses using three separate samples of data indicated adequate internal consistency reliability coefficients for the subscale scores (all above .73). The authors also examined the relationships between the SACQ and other constructs considered to be similar manifestations of adjustment to college, such as grade point average, attrition, and appeals for psychological services. The resulting convergent validity coefficients provided supporting evidence for the validity of the SACQ scores.

In 1985, Baker, McNeil, and Siryk used a revised version of the instrument when studying the difference between freshmen's expected adjustment to college and actual adjustment. The instrument used in this study was described as "an expanded version of the original instrument" (p. 95). This expanded version was comprised of 67 items with 24, 20 and 15 items belonging uniquely to the academic, social and personal-emotional subscales, respectively (see Table 1). It is unclear whether any changes in the original items were made (either in wording or to which subscale they were assigned) or how new items were developed. Another difference between the revised and original version was the removal of the "general" subscale and the addition of an institutional attachment subscale. Unlike the other three subscales, this subscale was created to share eight items with the social subscale and one with the academic subscale. The following rationale was provided for why the institutional attachment subscale shares items with other subscales:

> The attachment subscale contains items from other subscales because it was constructed by including in it any item from the original version of the adjustment scale that correlated to a certain minimum degree with attrition in two prior samples of freshmen at Clark University (p. 96).

In this 67-item version, there were also two items that were not associated with any of the four subscales, but instead, were used along with the other 65 items to create an overall adjustment score. This version represents the final version published for commercialization originally in 1989 and reprinted for publication again in 1999. Internal consistency reliability coefficients were reported again for scores collected using the sample in Baker, McNeil, and Siryk's (1985) study and were comparable to those estimates reported previously (all above .78). The only validity evidence provided in the 1985 study for the SACQ scores was the ability of the instrument to differentiate between students' expected and actual adjustment to a college setting.

In 1989, Baker and Siryk published results from normative data collected for the SACQ. The SACQ manual (1999) provides both reliability and validity evidence from a number of studies conducted by Baker and Siryk as well as from studies conducted by other researchers who were contracted to use the instrument. In the manual, the authors state that the SACQ can be used for research purposes or as a diagnostic tool to identify students with poor adjustment to college. The extent to which the SACQ is used as a diagnostic tool is unknown, but there has been an increase in the number of authors using the SACQ for research purposes, especially during the past five years (see Hook, 2004; Meehan & Negy, 2003). An increasing number of these works are dissertations indicating a growing use of the instrument. Because of its widespread use and the implications involved with its use, it is necessary to continue providing validity evidence for the SACQ scores.

Benson (1998) has provided a comprehensive framework for assessing construct validity that can be used to evaluate the development of the SACQ and the validity studies that have been executed thus far. Benson's first step in building a strong program of construct validity should be executed prior to item development and includes substantial research into the theory of the construct. It is unclear whether Baker and Siryk completed this step prior to the development of the 52-item SACQ in 1980. In the description of how the instrument was developed, no theoretical rationale was provided and from what information is provided, one can conclude that the items were developed based on Baker and Siryk's perception of the characteristics necessary for a successful transition into college.

While no theoretical rationale was provided in 1980, previous research regarding adjustment and the different ways in which adjustment had been measured (i.e., the empirical domain of the construct) was provided in their 1984 article with the findings supporting the multifaceted nature of the construct as well as the inclusion of the specific facets included in the SACQ. However, the decision of the authors to focus on their 52-item instrument in 1984, even though the construct of adjustment was of secondary importance to their study in 1980, seemed post-hoc and driven by the realization that few multi-item, multi-faceted instruments of adjustment existed. Based on the information provided by the authors in both the 1980 and 1984 articles, one can conclude that instrument development occurred in the following order: 1) the SACQ items were developed based on the authors' perception of adjustment, 2) a gap in the measurement of the construct was identified by the authors and 3) previous research regarding adjustment was examined. Item creation, therefore, occurred prior to any investigation of the adjustment literature. Legitimate rationale was even lacking in the development of the commercially-available 67-item version in 1985 since no information was provided regarding how and why new items were developed.

The lack of a strong theoretical basis for the instrument is perhaps most evidenced by how the authors went about creating the institutional attachment subscale. Instead of defining institutional attachment prior to item development and citing how such a facet was important to the representation of the adjustment construct, the subscale was developed by combining items from the other subscales that were most related to attrition at one particular university in the early 80s. Another piece of evidence that shows how little theory guided the development of the SACQ is the existence of two items that contribute only to the full-scale score and not to any subscale. The authors never state why these two items are necessary to represent the construct of adjustment as a whole.

The second stage in Benson's strong program of construct validation involves structural validation of the instrument through the use of internal domain studies. Internal domain studies are those that focus on the quality of an instrument's items and on the relationships among items on a scale. Analyses typical in this stage include computation of reliability coefficients, item and factor analysis. There have been several studies of the reliability of the SACQ scores, however there is only one study that attempts to examine the scale's dimensionality. In the SACQ manual, Baker and Siryk submitted the intercorrelations among the subscales to a principal components analysis to determine the legitimacy of the four-subscale structure versus a structure implying the existence of a single overall adjustment construct.

One disadvantage of this approach is that principal components analysis (PCA) is simply a data reduction method attempting to explain as much total variance as possible in a set of observed variables using a smaller number of components. Essentially, components are created that are simply transformations of the observed variables. Principle axis factor analysis (FA) would have been a more appropriate statistical technique since it is suitable in situations in which latent constructs or factors, such as academic adjustment, are thought to cause variable responses. Also, FA is advantageous over PCA in that it only analyzes common variance, or the variance that a variable shares with other variables. PCA analyzes total variance, which includes not only common variance, but also specific variance that is unique to the variable as well as error. If the variables submitted to a PCA include a large amount of measurement error, the results from a PCA may be meaningless and will look very different from the results using the same data and FA techniques.

Another major problem with the authors' use of PCA is that only intercorrelations among the subscale scores were submitted to the PCA in order to determine whether there was a general overarching construct of adjustment to college or four separate constructs. Typically, it would be more appropriate to submit the intercorrelations among actual items to this sort of analysis so as to observe the strength of an association between each item and each component or factor. By analyzing the items as opposed to the subscales, one can examine whether the items assigned to a given subscale are related to the same factor (e.g., all social adjustment items are related most strongly to Factor 1). As well, one can examine if the item is related to more than one factor, which may be desirable since several of the SACQ items serve as indicators for multiple subscales.

If one is content with the authors' use of PCA, there are still problems with their interpretation of the PCA results. The estimation technique used (maximum likelihood) for the PCA gave a significance test for model fit which Baker and Siryk (1999) reported as rejecting a one-component model. Despite this finding, they continued to report pattern coefficients from the one component solution. As well, the authors concluded that the lack of fit for the one-component solution implied evidence in favor of the four-component solution. It could be however, that a two-component solution or another four-component solution, would best represent the data, but was not examined by the authors. Also puzzling is the authors' use of exploratory techniques when they clearly have in mind particular structures (1-factor, 4-factor) for the dimensionality of the data. Confirmatory techniques, such as a confirmatory factor analysis (CFA), would have provided them with a more rigorous test of the dimensionality of their scale.

Only after extensive study of the internal domain should a construct validation program move to Benson's third and final step, which is the external stage of validation. In this stage, the instrument is studied in terms of its relation to other similar and dissimilar constructs. A number of external domain studies do exist for the SACQ, but perhaps these studies were executed prematurely since internal domain studies, particularly those investigating the dimensionality of the instrument, are lacking. The purpose of the present study, therefore, is to examine the fit of Baker and Siryk's (1999) proposed structure of adjustment to college. Specifically, CFA is used to test the fit of the proposed four-factor structure (Figure 1). Of particular interest are the factor coefficients for those items representing two factors. For instance, over half of the institutional attachment items are shared with the social adjustment subscale. From a statistical viewpoint, the fact that these two subscales share so many items is problematic since issues of multicollinearity arise whenever the subscales are entered into an analysis simultaneously. From a conceptual viewpoint, the items on the institutional attachment subscale are of interest because of the questionable rationale behind this subscale's development.

In addition to examining the fit of the proposed four-factor model and investigating the relationship of the items assigned to more than one dimension with their respective factors, we are also interested in the plausibility of calculating a full-scale score from the SACQ items. According to the instrument's authors, all 67 items on the scale can be summed to create a full-scale score. Calculation of a full scale score in addition to four subscales implies that either: 1) there is a higher order factor structure underlying responses with a single second-order factor giving rise to four first-order factors (Figure 2). It should be noted that the model in Figure 2 will only be tested if acceptable fit is found for the four-factor model and the intercorrelations among the factors imply the existence of a second-order factor. The notion of a full-scale score also implies that a more parsimonious, single first-order factor model may be used to describe item responses (Figure 3). For this model, the decision was made to use the 65 items that contribute to subscale scores in order to allow comparison of this model with the other various models. Finally, because of the large number of items that are shared by the social adjustment and institutional attachment subscales, a three-factor model will also be tested that combines the two subscales into a single factor (Figure 4).

Method

Participants and Procedure

The sample used in this study consisted of 878 sophomores at a mid-sized southeastern university. The SACQ was administered to these students during a large-scale assessment performed annually in February to examine student learning outcomes for students with 45-70 credit hours. Because the sample used in this study was randomly sampled from the sophomore class, its demographic make-up mirrors that of the university population which is 61% female and 85% Caucasian, with all other ethnicities representing less than 5% of the student population.

Materials

Participants responded to each of the 67 items contained in Baker and Siryk’s (1999) SACQ using a 9-point scale ranging from 1 (applies very closely to me) to 9 (doesn’t apply to me at all). See Tables 1 and 2 for subscale descriptions and item breakdown.

Model Identification

There must be at least one degree of freedom in order to test for model fit. Calculating the degrees of freedom involves the difference between the number of observations and the number of estimated parameters. Therefore, a model with more observations than estimated parameters is identified and can be tested for model fit. Observations include the variances and covariances from the covariance matrix of the items and estimated parameters include: the direct effects of the latent variables on the observed variables (items), the covariance between the latent constructs, and the variance of the error terms. Typically, the variances of the factors would be included as parameters to be estimated; however, in the present study such variances were set to one in order to define the scale of the latent factors. Using 65 observed variables (items), the number of estimated parameters is large, but so is the number of observations. For 65 items, there are 2,145 observations. Table 3 shows the number of estimated parameters for each hypothesized model along with the degrees of freedom for each model. As the table shows, all models are identified with the most complex model (the model with the fewest degrees of freedom) being the four-factor model.

Model Comparisons

A more complex model will necessarily show better fit than any simpler model. Models that are nested, those that can be produced by freeing or fixing one or more parameters, can be compared using a difference test based on the chi-square distribution. For example, because the four-factor model is the most complex model and can be transformed to a three-factor model simply by fixing the paths between one of the factors and its items to zero, the three-factor model is considered to be nested within the four-factor model. The test is whether the simpler model fits significantly worse than the more complex model which is determined using the chi-square difference test. The chi-square difference tests will only be of interest if the four-factor model fits the data. If the four-factor model does not fit the data, we know without even running the simpler models that they also will not fit.

Assessing Model Fit

The models tested in this study were estimated using maximum likelihood estimation. Several authors advocate the use of MLE over other estimation methods, such as generalized least squares, because MLE is more sensitive to model misspecification. Less sensitivity to model misspecification can lead to higher Type II error rates, where a model is accepted as fitting the data well but in reality is misspecified (Olsson, Foss, Troye, & Howell, 2000; Olsson, Troye, & Howell, 1999). Model fit was assessed by a number of indices. First, model fit was determined using the minimum fit function chi-square. As this index is extremely sensitive to sample size (Hu & Bentler, 1995), it was supplemented with additional fit indices. Supplemental fit indices can be subdivided into two categories: absolute and incremental. While absolute fit indices simply describe the fit of the model, incremental fit indices describe the fit of the model relative to an independence model where all variables are specified as being uncorrelated. Two absolute fit indices are reported here, the standardized root mean square residual (SRMR) and the root mean square error of approximation (RMSEA). The SRMR is recommended by Hu and Bentler (1998) as an index to report because of its sensitivity to simple model misspecification (i.e., misspecification of the factor correlations). According to Hu and Bentler (1998), acceptable model fit is indicated by SRMR values less than .08. This index is also easy to interpret because it is on a correlation metric. The second absolute fit index reported is the RMSEA. The RMSEA is particularly useful as an absolute fit index in detecting complex model misspecification (i.e., misspecification of the factor loadings), which is the most likely source of misspecification in this study. Hu and Bentler (1998) recommend that this value not exceed .06. Using the two absolute fit indices ensures detection of either simple or complex model misspecification. Finally, the comparative fit index (CFI), an incremental fit index, will also be consulted. Again, this fit index compares model fit of the proposed model to that of an independence model and is particularly sensitive to complex model misspecification. Hu and Bentler (1998, 1999) suggest that CFI values indicating adequate model fit should exceed .95.

Results

Data Screening

The data were examined for out of range responses (i.e., responses greater than 9), missing data, and aberrant response patterns. No out of range responses were detected. Following recommendations by the authors of the instrument, any student with three or more missing responses per subscale were excluded from the data set. This exclusion, along with the deletion of a record due to the presence of a response set, resulted in a valid sample of 865 students. Missing data for the remaining students was handled using Baker and Siryk's (1999) recommendation to impute values for students with two or fewer missing responses using the mean response for that student on the subscale for which the response was missing.

The data were screened with respect to multicollinearity, outliers, and normality. Bivariate multicollinearity was assessed through examination of the intercorrelations among items. No bivariate correlations were greater than .80, a cutoff specified by the researchers prior to data analysis. Multivariate multicollinearity was assessed through examination of tolerance and variance inflation values for items. Tolerance is the proportion of variance not explained by the other SACQ items; thus, a desirable value for tolerance is high. Small values are desired of the variance inflation (VIF) statistic, which is simply one divided by the tolerance (Tabachnick

& Fidell, 2001). We decided a priori that multivariate multicollinearity would not be an issue if tolerance values were greater than .10 and VIF values were less than 10. Using these criteria, it was determined that no multivariate multicollinearity was present. Next, the data were examined for univariate and multivariate outliers. No univariate outliers were identified after inspection of the items' boxplots and histograms. However, four multivariate outliers were detected using Mahalanobis distance and were excluded from further analyses resulting in a valid sample of 861.

Finally, the data were examined with respect to univariate and multivariate normality. In particular, univariate normality was determined by inspecting the item skewness and kurtosis. Criteria recommended by Kline (1998) suggest that absolute values greater than three for skewness and greater than eight for kurtosis are indicative of univariate non-normality. Using these cutoffs, only one problematic item was identified. Item 23 had a kurtosis value of 9.86 exceeding the cutoff; however, the value of skew was less than the cutoff of 3. Despite the moderately high kurtosis, the researchers chose to keep the item in all further analyses because of its importance in comprising the academic adjustment subscale. Finally, multivariate normality was examined using Mardia's normalized multivariate kurtosis value. Bentler and Wu (2003) suggest that this value should not exceed a maximum of three. The Mardia's value for this study was over 100 suggesting extreme multivariate kurtosis. In situations like this, it is appropriate to use the Satorra-Bentler scaled chi-square and robust standard error corrections. Unfortunately, the number of observed variables for this study was so large that an asymptotic covariance matrix (needed for Satorra-Bentler corrections) could not be produced with the sample size available. Thus, although the parameter estimates themselves will not be affected by the non-normality, significance tests of parameter estimates are likely to be biased due to underestimated standard errors. Another consequence of using multivariate non-normal data is the inflation of the chi-square statistic and a deflation of other fit indices, such as the CFI.

Model Fit

The covariance matrices submitted for analysis were produced using PRELIS and the various models were tested using LISREL 8.54 (Jöreskog & Sörbom, 2003). Table 4 shows results for the various models tested. The results indicate that the four-factor model did not fit the data. The fit of the alternative models, although shown in Table 4, are not of interest because the four- factor model, a more complex model, did not fit which implies that simpler models also would not fit.[1] Also, the higher-order factor model was not fit to the data since fit of the first-order factor structure was lacking. Table 4 shows that the RMSEA and CFI, which are both particularly sensitive to complex model misspecification, were the most indicative of model misfit for the four-factor model. These findings were somewhat expected in that complex model misspecification is represented by misspecified factor loadings and this type of misspecification is typically expected in the absence of a strong theoretical foundation underlying an instrument's development.

When models do not fit, rather than interpreting the factor loadings, the focus shifts to diagnosing model misfit. Because the most complex model, the four-factor model, did not fit, it is the model that we used to investigate areas of misfit. Misfit can be examined both through standardized residuals, which represent the difference between the model implied covariance matrix and the observed covariance matrix, and the modification indices produced by the software. Byrne (1998) suggested that standardized residuals exceeding an absolute value of three were indicative of model misfit. Out of 1007 possible standardized residuals, 642 were greater than an absolute value of 3. More than half the standardized residuals indicated model

[1] A one-factor model with the entire set of 67 items was also tested and did not fit.

misfit meaning there are large differences between the observed covariance matrix and the implied covariance matrix for a number of items. Often, a pattern of large standardized residuals can be discerned for a set of items. In this case, however, the large number of residuals exceeding the cutoff prohibited our ability to reveal any pattern that would aid in diagnosing misfit.

In addition to standardized residuals, LISREL 8.54 provides modification indices that reveal information related to the anticipated decrease in chi-square and the adjustment of parameter estimates if paths or error covariances are added. In the present study, modification indices suggested to add 88 paths between items and factors, which would lead to an increasing number of cross-loadings. Additionally, 492 error covariances were recommended suggesting some relationship among items beyond their relationship through the factor(s) to which they were assigned. Again, because of the large number of modification indices, no clear pattern emerged as to where the most problematic model misfit occurred. Because the findings presented here did not provide a clear picture of the structure of the instrument, further analyses were pursued.

Additional Analyses

One-factor models for each subscale. Results for the four-factor model were not useful in determining the areas of misfit. Thus, the researchers decided to test four one-factor models corresponding to each subscale separately. More specifically, a one-factor model with the items assigned to the academic adjustment subscale was tested using CFA. We executed this type of analysis for each of the four subscales. The belief was that analyses of the one-factor models separately would reveal whether the problems with model fit arose from cross loadings and highly related items and/or from certain problematic subscales. Model fit indices for the additional analyses are reported in Table 5. Only the one factor model for personal-emotional adjustment showed tolerable fit, although the RMSEA exceeded the .06 cutoff recommended (Hu & Bentler, 1998) and the 90% confidence interval indicated that the cutoff we used (.06) did not fall within the confidence interval lending more support to rejection of the model.[2] Because this index is sensitive to complex model misspecification, it is likely that it exceeds the cutoff because of the large number of standardized residuals spread out across the matrix, indicating possible error covariances that need to be added among the items. Inspection of the standardized residuals indicated a large residual between item 2 and item 7. This residual is the largest of all those exceeding the cutoff of |3| (9.29) and implies there is some relationship between items 2 and 7, beyond the construct being measured that is not represented by the current model. Table 6 shows that many of the relationships among the items are both overestimated and underestimated. In fact, 17% of the standardized residuals exceed an absolute value of 3. Items associated with such residuals are considered problematic items and since the residuals are associated with a large number of items, it can be concluded that the one-factor model does not do a satisfactory job in explaining the relationships among items on the personal-emotional adjustment subscale.

For the remaining three one-factor models, the standardized residuals were examined in an effort to determine sources of misfit. However, the large number of standardized residuals exceeding |3| made it difficult to simply describe the results. For instance, 31%, 45%, and 42% of the standardized residuals for the social adjustment, institutional attachment and academic adjustment subscales, respectively, exceeded a value of |3|.

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[2] Although the SRMR for the one factor model of social adjustment was smaller than the cutoff of .08, the fact that RMSEA and CFI values exceeded the cutoffs led to the determination that the model did not adequately fit.

Exploratory factor analyses. Because examination of the individual one-factor CFA results did not adequately reveal the causes of misfit for the various models, an exploratory factor analysis (EFA) was also used to determine if there were plausible models, other than the ones previously explored, that could explain the relationships among the items. The data were submitted to an EFA using SPSS 12.0 (2003). Using the eigenvalue greater than one rule for retaining factors would have resulted in 14 factors being retained. However, inspection of the scree plot indicated a four-factor solution, supporting the original number of factors proposed by Baker and Siryk (1999). Yet another method of choosing the number of factors to retain is examination of the proportion of total variance explained. The results here showed the largest proportion of total variance explained for the first factor (~23%) with a large decrease for the second and subsequent factors (all less than 8%). Thus, using the scree plot in combination with the proportion of variance explained by each factor lended moderate support to the notion of a four-factor model or a one-factor model (see Table 7 for results). Because our ultimate goal in choosing a solution was the interpretability of the results, we examined the pattern coefficients for solutions ranging from one to five factors. Solutions retaining more than one factor were rotated for interpretability using oblimin rotation, which allows the factors to be correlated.

The four-factor solution emerged as being the most informative and its results are interpreted below. However, the reader should keep in mind that less than half of the total variance is explained even when as many as four (or five) factors are retained. When looking at the four-factor solution, our goal was to determine if the sets of items proposed by the authors to belong to a given subscale actually loaded on the same factor. Contrary to what the authors' proposed, three factors contained items from more than one subscale. Each of these factors, however, contained a large number of items from a particular subscale. Factors 1, 2, and 4 were defined, respectively, by a large number of social adjustment items, personal-emotional adjustment items, and institutional attachment items. Only Factor 3 consisted of items from a single subscale, the academic adjustment subscale. Not all items from the academic adjustment subscale were represented by this factor, with the remaining academic adjustment items being dispersed throughout Factors 2 and 4. We also identified items that yielded low pattern coefficients (less than |.35|) consistently across the 5 solutions, including the four-factor solution (items 5, 14, 24, 27, 33, 36, 43, 44, 47, 49, 55, and 58). Because these items seem to be weak indicators of the construct of adjustment, they are not included in Table 8, which shows the pattern coefficients for the four-factor solution.

The following is our interpretation of each of the four factors. The content of the items that loaded on Factor 1 seem to be measuring social adjustment or one’s satisfaction with college social life. This factor consists of seven social adjustment items and four items that are shared between the social adjustment and institutional attachment subscale. The presence of items that are currently shared between subscales on this factor may indicate that these items may be better indicators of social adjustment than they are of institutional attachment.

Factor 2 contains items whose content is related to personal-emotional adjustment or well-being. This factor consists predominantly of items from the personal-emotional adjustment subscale. It is of interest to note that the five academic adjustment items on the scale are described by Baker and Siryk as being in a cluster of academic adjustment items that they term "performance" items, which are items assessing the effectiveness of the student to function academically (p. 14). It is not surprising that these items would be related to a factor tapping into one's personal-emotional adjustment, since a student's ability to perform well academically is likely to be related to their physical and psychological well-being. Factor 2 also includes three social adjustment items and two social adjustment items that are shared with the institutional attachment subscale. These items deal with feeling lonely, being homesick, feeling different from or not at ease with other students, and not mixing well with the opposite sex. Again, it is not surprising that items with such content are most strongly related to a well-being factor. It is also noted that item 42 has a split-loading, as it is relating moderately to Factor 1 in addition to Factor 2.

Factor 3 consists of a large proportion of the academic adjustment items, but not all of the academic adjustment items. The majority of the items that are related to this factor have to do with a students' ability to stay on task as well as with the student's overall satisfaction with their academic experience in college. There is one item on this factor, item 52, that is related to Factor 2 almost as strongly as it is related to Factor 3.

Factor 4 consists predominantly of institutional attachment items and seems to be tapping into a student's desire to stay in college altogether or at least at the college that they are presently attending. It should be noted that item 16 has a split-loading and is related to Factor 1 almost as strongly as it is related to Factor 4. Early on in the development of the SACQ the construct of institutional attachment was referred to as a goal commitment construct (Baker, McNeil, & Siryk, 1985). However, in the final version, the authors changed the conceptualization of this subscale to be defined as institutional attachment. Because the items loading on this factor contain content related to degree completion (either at the institution students are currently attending or in general), it is possible that this factor might be more appropriately defined as a goal commitment construct.

Looking at the intercorrelations among the four factors reveals small, positive relationships among the factors. Table 9 shows the strongest relationships between Factors 1 (satisfaction with college social life) and 4 (institutional attachment/goal commitment) and Factors 2 (well-being/personal-emotional adjustment) and 4. If our interpretation of the content of the four factors retained is reasonable, this implies that students with higher satisfaction with their college social life (Factor 1) or with higher physical and psychological well-being (Factor 2), tend to be more committed to completing their college degree. More importantly, the rather weak correlations among the factors imply that the factors are quite distinct and may not be a product of an overarching adjustment construct. The relationships presented here may be further evidence of the lack of theory guiding the development of the items.

Discussion

The primary purpose of the present study was to use confirmatory factor analytic techniques to explore the fit of the four-factor model proposed by the authors of the SACQ. Using a large sample of college sophomores, we did not find evidence supporting the fit of the four-factor model. Although alternative models were proposed, these models were more parsimonious and as such, would not exceed the already inadequate fit of the four-factor model. We examined the standardized residuals and modification indices of the four-factor solution in an attempt to identify misfit with disappointing results. The large quantity of modification indices and standardized residuals greater than |3| halted our ability to easily detect sources of misfit. Four separate one-factor models, one for each SACQ subscale, were then fit to the data in an attempt to identify problematic subscales or items. Only moderate support for fit was found for the personal-emotional subscale. However, after inspection of the standardized residuals, we concluded that the one-factor model did not fit satisfactorily enough to reproduce the relationships for this subscale.

We then used principal axis factor analysis in an attempt to reveal other plausible models that might explain the relationships among the items. Although an interpretable four-factor model was found, it explained only 40% of the total variance in items indicating that 60% of the total variance among items was unexplained by the factors. This unexplained variance is due to either random measurement error or, more likely, to systematic error arising from other unmeasured factors. Inspection of the pattern coefficients of the four-factor solution led us to conclude: 1) that several items should be omitted or revised and 2) that the author's assignment of items to subscales should be reconsidered. Specifically, each of the four factors consisted of a large proportion of items from a given subscale, with Factors, 1, 2, 3 and 4 being each largely represented by social adjustment, personal-emotional adjustment, academic-adjustment and institutional attachment items respectively. Items currently shared between the institutional attachment and social adjustment subscales, did not have split loadings between Factor 1 and Factor 4, but instead either loaded only on those factors or on the personal-emotional adjustment factor. While Factor 3 consisted only of academic-adjustment items, other academic adjustment items were found on Factors 2 and 4.

In sum, our attempts to identify a plausible factor structure for the SACQ items were thorough, although unsuccessful. While we were not able to provide a useful model to explain the intercorrelations among the items, we were able to reject the four-factor model proposed by the authors for 65 of the SACQ items. We also were able to reject separate one-factor models for each of the subscales. We do not advocate the four-factor structure found using the EFA, but instead provided the results for readers to have some sense as to how the items were relating to each other and to provide information for those wanting to revise the instrument.

After consideration of the literature on college student adjustment, revision of the instrument is necessary. It was not incredibly surprising that the four-factor and one-factor model, those models advocated most strongly by the instrument's creators, did not fit the data given the lack of theory that was used in instrument development. From the published information provided by the authors, the majority of items on the SACQ were developed by Baker and Siryk in 1980 to allow them to study alienation with adjustment to college. Little information is provided as to how the items where developed at that time and in later revisions in 1985. Giving the authors the benefit of the doubt and assuming that theory did indeed guide their instrument development (if this was done it was unclear in any publications as to the methods used), the most current version of the instrument was developed 20 years ago and may not reflect the current understanding of student's adjustment to college. Possible directions for future researchers include further examination of the college adjustment literature to determine if Baker and Siryk's conceptualization is plausible. Perhaps there are additional constructs that represent adjustment to college or maybe some of the many facets described here can be grouped into a larger category as suggested in some of the results, like well-being or goal commitment. If Baker and Siryk's conceptualization still holds in today's adjustment literature, another direction would be to use backwards translation procedures on the current set of items. This would require experts in the field of college adjustment to examine the items and assign them to the subscale they feel is appropriate.

It is prudent to mention some of the limitations of the current study. First, Baker and Siryk (1999) recommend use of the instrument for first-year students. The sample of students presented here were mostly second-year students or students with between 45 and 70 credit hours. This limitation may be of little consequence as Baker and Siryk point out that the instrument was used in a number of studies with non first-year students and showed similar results. Nevertheless, future research could replicate this study with a sample of first-year students. In addition, the sample used here was extremely homogeneous in terms of race. A more heterogeneous sample would likely produce more generalizable results.

Second, there were slight issues with non-normality, particularly multivariate non-normality. These issues could not be corrected using corrections based on the asymptotic covariance matrix (i.e., Satorra-Bentler corrections). Future research would require a much larger sample size (~2,500 to compensate for the large number of observed variables) in order produce this matrix and apply the corrections.

As mentioned earlier, it is important for those students facing difficulty with the transition from high school to college to make use of whatever resources they have available. But, as Baker and Nisenbaum (1979) found, these students most likely need to be targeted for services as they will not seek them out on their own. Thus, an instrument for diagnosing maladjustment or identifying students in need of services is a worthy goal. At this point, however, we would not recommend use of the SACQ as such a tool. It is unclear if the constructs the authors proposed they were measuring are actually being measured, if these constructs are those that actually represent adjustment, or whether there needs to be further development in the theory of adjustment to college. Our recommendations would be first, to pursue further theoretical development of the construct, and second, to either revisit the structure of this instrument or create a new instrument to measure adjustment to college.

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Table 1
Description of SACQ Subscales

Subscale	Description
Academic adjustment	Student’s success in coping with the various educational demands characteristic of the college experience including aspects of motivation, application, performance, and the academic environment
Social adjustment	Student’s success in coping with the interpersonal-societal demands inherent in the college experience including aspects of social activities, relationships with others, nostalgia, and the social environment
Personal-emotional adjustment	Student’s intrapsychic state during his or her adjustment to college, and the degree to which he or she is experiencing general psychological distress and any concomitant somatic problems
Institutional attachment	Student’s degree of commitment to educational-institutional goals and the degree of attachment to the particular institution the student is attending

Table 2

Item Designation to Various Subscales

Subscale	Items	Total Number of Items
Academic adjustment	3, 5, 6, 10, 13, 17, 19, 21, 23, 25, 27, 29, 32, **36**, 39, 41, 43, 44, 50, 52, 54, 58, 62, 66	24
Social adjustment	*1*, *4*, 8, 9, 14, *16*, 18, 22, *26*, 30, 33, 37, *42*, 46, 48, 51, *56*, *57*, 63, *65*	20
Personal-emotional adjustment	2, 7, 11, 12, 20, 24, 28, 31, 35, 38, 40, 45, 49, 55, 64	15
Institutional attachment	*1*, *4*, 15, *16*, *26*, 34, **36**, *42*, 47, *56*, *57*, 59, 60, 61, *65*	15
Full scale	All items above plus 53 and 67	67

Note. Items gray and italicized are shared between Institutional Attachment and Social Adjustment subscales and items in bold are shared between the Institutional Attachment and Academic Adjustment subscales.

Table 3

Model Identification

Model	Parameters Estimated	Degrees of Freedom
Four-factor	6 covariances 74 factor loadings 65 error terms	2000
Higher-order factor	70 factor loadings 65 error terms 4 direct paths 4 disturbances	2002
One-factor	65 factor loadings 65 error terms	2015
Three-factor	3 covariances 66 factor loadings 65 error terms	2011

Table 4

Model Fit of Originally Hypothesized Models

Model	χ^2 (*df*)	*p*	SRMR	RMSEA (90% confidence interval)	CFI
Four-factor	10932.53 (2000)	< .001	.085	.089 (.087, .090)	.91
One-factor	14927.83 (2015)	< .001	.094	.120 (.120, .120)	.87
Three-factor	12010.36 (2011)	< .001	.087	.094 (.093, .096)	.90

Table 5

Model Fit of Additional Models

Model	χ^2 (*df*)	*p*	SRMR	RMSEA (90% confidence interval)	CFI
1 factor – academic adjustment	3015.64 (252)	< .001	.093	.13 (.13, .14)	.83
1 factor – social adjustment	1749.55 (170)	< .001	.074	.12 (.11, .12)	.92
1 factor – personal-emotional adjustment	450.69 (90)	< .001	.049	.072 (.066, .079)	.95
1 factor – institutional attachment	1880.59 (90)	< .001	.091	.16 (.16, .17)	.84

Table 6

Standardized Residuals for One Factor Model of Personal-Emotional Adjustment

Items	2	7	11	20	24	28	31	35	38	40	45	49	55	64
2	- -													
7	**9.29**	- -												
11	**3.60**	0.15	- -											
20	-0.17	-1.40	-0.56	- -										
24	-0.77	2.83	-2.62	2.81	- -									
28	**-3.40**	-2.78	-0.40	-1.69	**-3.04**	- -								
31	-1.98	**-3.45**	1.78	-0.46	-1.73	**4.21**	- -							
35	-1.82	-1.03	**-3.79**	**3.17**	1.85	0.97	1.77	- -						
38	-1.25	**-4.67**	2.04	1.21	-1.07	2.76	0.99	0.94	- -					
40	**-4.07**	2.17	-2.98	**-3.12**	2.00	-0.67	1.56	-1.05	1.62	- -				
45	-1.14	-1.46	**5.45**	-2.30	-2.78	**3.35**	**3.77**	-1.79	1.04	-0.20	- -			
49	-1.73	-2.94	-0.66	1.35	0.37	0.19	-1.58	0.27	1.26	1.38	0.48	- -		
55	-1.68	-0.74	1.92	-0.58	**-3.06**	0.58	0.81	-0.29	0.97	0.57	1.36	1.36	- -	
64	-1.63	-2.71	1.26	-2.44	-2.57	**6.86**	**4.09**	0.16	**3.75**	1.75	2.34	-1.54	-0.34	- -

Note. Standardized residuals larger than |3| are shown in bold.

Table 7

Units of Variance and Percent of Variance Explained by Factors

Factor	Before Rotation		After Rotation	
	Units of Variance Explained	% Total Variance Explained	Units of Variance Explained *	% Total Variance Explained
1	14.77	22.73	5.82	8.95
2	4.79	7.37	4.42	6.79
3	3.62	5.56	3.71	5.70
4	2.74	4.22	3.68	5.67
5	1.85	2.84	-	-
6	1.78	2.74	-	-
7	1.58	2.43	-	-
8	1.34	2.07	-	-
9	1.30	2.00	-	-
10	1.20	1.85	-	-
11	1.16	1.78	-	-
12	1.10	1.69	-	-
13	1.05	1.61	-	-
14	1.02	1.58	-	-

Note. Information provided before rotation is for the 14 factors with eigenvalues > 1. Only information for the four-factor solution is provided after rotation.

* These values represent the units of variance accounted for once controlling for the correlation between the factors and were calculated for each factor by squaring the semi-partial correlations between the item and the factor and summing across items.

Table 8

EFA Pattern Coefficients for the Four-Factor Model

Item #	I	II	III	IV
1	0.63			
4	0.75			
26	0.39			
65	0.72			
8	0.55			
9	0.52			
18	0.62			
30	0.49			
37	0.57			
46	0.61			
63	0.44			
6		0.38		
10		0.46		
21		0.41		
39		0.52		
41		0.48		
42	0.36	0.48		
56		0.47		
2		0.63		
7		0.70		
11		0.54		
12		0.42		
20		0.70		
28		0.46		
31		0.41		
35		0.36		
38		0.62		
40		0.52		
45		0.59		
64		0.61		
22		0.49		
48		0.36		
51		0.63		
3			0.59	
13			0.49	
17			0.56	
19			0.49	
25			0.53	

29			0.49	
50			0.53	
54			0.45	
62			0.36	
66			0.49	
52		0.37	0.50	
23				0.59
32				0.62
15				0.64
34				0.57
59				0.66
60				0.72
61				0.70
16	0.32			0.55
57				0.43

Note. Pattern coefficients represent the standardized form of the unique relationship between the factor and the item. Only coefficients whose loadings were > |.3| are presented for those items with split loadings. In contrast, only coefficients whose loadings were > |.35| for the factor the item most related to are presented.

Table 9

Intercorrelations Among the Exploratory Factor Analysis Four-Factor Solution

Factor	1	2	3	4
1	1.00			
2	.19	1.00		
3	.22	.26	1.00	
4	.35	.32	.17	1.00

Figure 1. Four factor model

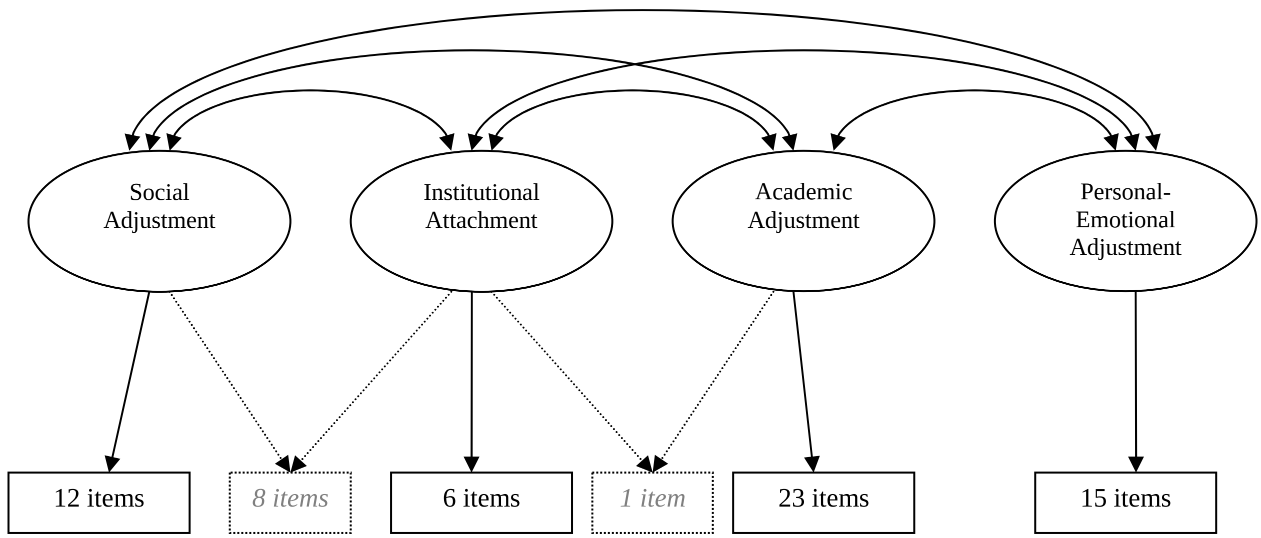

Figure 2. Higher order factor model

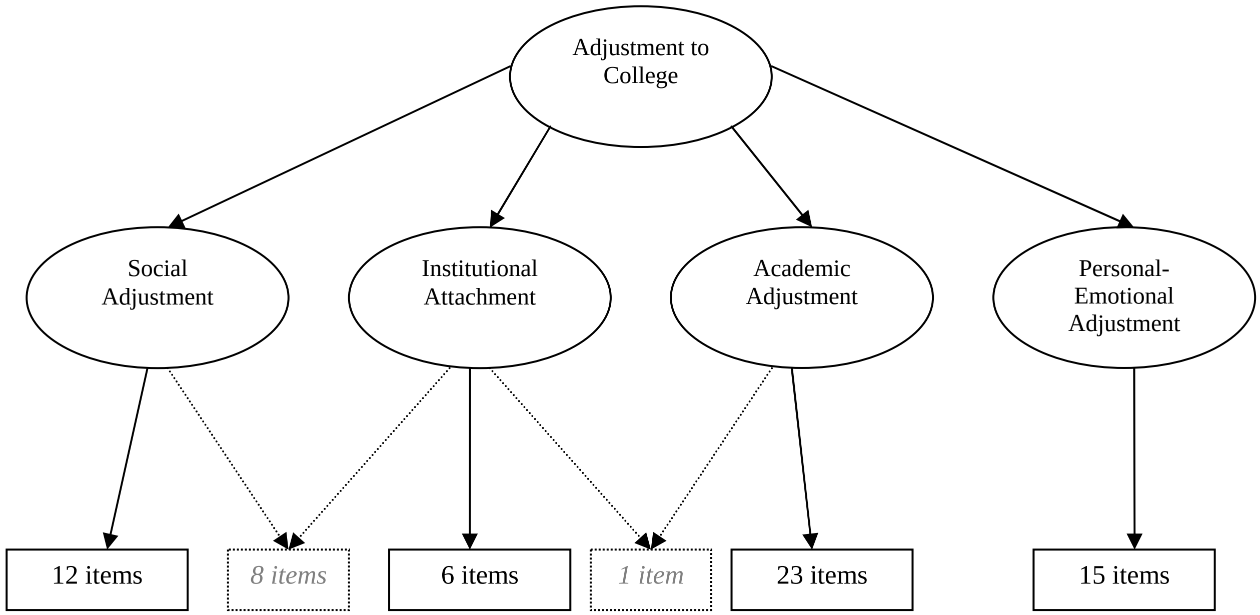

Figure 3. One factor model

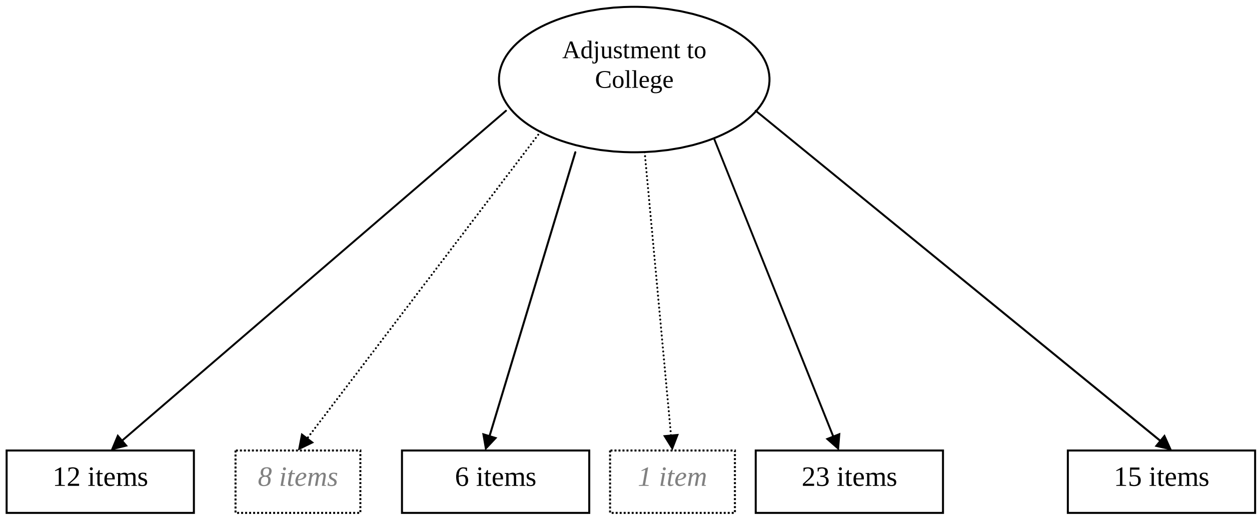

Figure 4. Three factor model