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# LASSI: an Australian evaluation of an enduring study skills assessment tool

James GT Marland

*Australian Catholic University, james.marland@acu.edu.au*

Joanne Dearlove

*University of Wollongong, dearlove@uow.edu.au*

Jennifer Carpenter

*Australian Catholic University*

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# LASSI: an Australian evaluation of an enduring study skills assessment tool

## **Abstract**

This study assesses the reliability and validity of the Learning and Study Strategies Inventory (LASSI), an American survey instrument, in an Australian context. The results of this study were compared with those generated by a comparison study held at a different Australian university and also against other internationally published research. There was a high degree of similarity between the LASSI scores from the students at the two Australian universities, however these scores were considerably different from norms published in the LASSI manual. The students' scores in this study were also compared with data on their gender and age and the analysis demonstrated significant differences in both instances. A comparison of the results from this research against its earlier companion study suggests a degree of test-retest reliability for the LASSI instrument in the Australian undergraduate context in which the studies were conducted. However, a principal component analysis of the data in this study raises questions about the validity of the LASSI as a measure of students' study skills and learning strategies.

## **Keywords**

enduring, lassi, study, skills, australian, assessment, tool, evaluation

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# LASSI: An Australian evaluation of an enduring study skills assessment tool

James Marland<sup>a</sup>, Joanne Dearlove<sup>b</sup> and Jennifer Carpenter<sup>a</sup>

a. *National School of Arts, Australian Catholic University, Strathfield NSW 2135, Australia*

b. *Learning, Teaching and Curriculum, University of Wollongong, Wollongong NSW 2522, Australia*

Email: [james.marland@acu.edu.au](mailto:james.marland@acu.edu.au), [dearlove@uow.edu.au](mailto:dearlove@uow.edu.au) and [jennifer.carpenter@acu.edu.au](mailto:jennifer.carpenter@acu.edu.au)

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This study assesses the reliability and validity of the Learning and Study Strategies Inventory (LASSI), an American survey instrument, in an Australian context. The results of this study were compared with those generated by a comparison study held at a different Australian university and also against other internationally published research. There was a high degree of similarity between the LASSI scores from the students at the two Australian universities, however these scores were considerably different from norms published in the LASSI manual. The students' scores in this study were also compared with data on their gender and age and the analysis demonstrated significant differences in both instances. A comparison of the results from this research against its earlier companion study suggests a degree of test-retest reliability for the LASSI instrument in the Australian undergraduate context in which the studies were conducted. However, a principal component analysis of the data in this study raises questions about the validity of the LASSI as a measure of students' study skills and learning strategies.

**Key Words:** LASSI, learning and study strategies, Bradley students.

## 1. Introduction

This paper investigates aspects of the reliability and validity, in an Australian context, of the Learning and Study Strategies Inventory (LASSI), an American questionnaire designed to evaluate the study skills of university students. The study analyses the LASSI scores of an Australian undergraduate cohort and compares these results with data from an earlier companion study (Carpenter, Dearlove, & Marland, 2015). The two studies tested comparable cohorts from two medium-sized universities in New South Wales, Australia.

The earlier companion study to this research discussed the collective study skills profile provided by the LASSI of an Australian undergraduate cohort in the first weeks of university studies in the context of the broadening of the Australian undergraduate population mandated by the Bradley Review (Bradley, Noonan, Nugent, & Scales, 2008). The potential value of a tool that promises to provide a valid and reliable snapshot of students' learning strategies is clear. This study extends the focus of the companion study on the preparedness of first-year undergraduates in the current demand-driven enrolment system by providing comparative data captured at a similar university. This study also recognises that the considerable potential value of information relating to student profiles provided by survey instruments such as the LASSI depends on the confidence users may reasonably place in the consistency of each survey's results, and its effectiveness in measuring what the survey claims to measure. Our study makes a particular contribution to research on the LASSI as the first investigation to critically examine the instrument's use with Australian undergraduate students.

Instruments designed to test students for predictive, diagnostic and intervention purposes as well as for the evaluation of interventions (using pre-test, post-test designs) are widespread in the United States. The majority of the widely-used American tests were developed by educational psychologists and focus on psychological characteristics such as attitudes, personality traits and behaviours. A minority of instruments measure competence in language use or critical thinking.

Most of the instruments in common use measure students' affective, behavioural and cognitive approaches to study and do this at different points in their enrolments to evaluate their strengths and weaknesses. For example, a number of instruments are used for early (orientation week) prediction of potential difficulties with their studies. These include: the Student Readiness Inventory (SRI) (Southern Illinois University Board of Trustees, 2014); the College Success Factors Index (Cengage Learning Incorporated, 2012); the College Student Inventory (Noel-Levitz, 1998-2014); the Transition to College Inventory (Pickering, Calliotte, Macera, & Zerwas, 2005, p. 2); the EQ-I (Multi-Health Systems Inc., 2004-2014); and the Anticipated Student Adaptation to College Questionnaire (Beyers & Goossens, 2002). In addition to instruments designed to predict academic success, some are designed to diagnose strengths and weaknesses, and these instruments usually provide more information than those intended solely for prediction. Examples include: the Motivated Strategies for Learning Questionnaire (MSLQ) (Artino, n.d.); and the Study Behavior Inventory (SBI) (Bliss, 2003). There are also a number of instruments (Wabash College, 2013) that are normally used to measure academic outcomes and experiences later in students' careers than the predictive instruments, such as: the Collegiate Assessment of Academic Proficiency (CAAP); the Miville-Guzman Universality-Diversity Scale (M-GUDS); the Socially Responsible Leadership Scale (SRLS-R2); the Ryff Scales of Psychological Well-Being; and the National Survey of Student Engagement (NSSE).

The Learning and Study Skills Instrument (LASSI) is an example of an instrument designed to diagnose strengths and weaknesses, and as a diagnosis of weakness implies a prediction of difficulty, it is also used for predictive purposes. The widespread use of the LASSI in the United States to guide decisions on the provision of academic support services is of particular significance to the readers of this journal, in a Higher Education environment that places increasing emphasis on the "objective" demonstration of educational outcomes (Marginson, 2009). Similarly significant is the established role the LASSI has played in the evaluation of the educational interventions provided by academic support services.

## **2. LASSI**

The LASSI is designed to provide diagnostic information to inform interventions (by students or institutions) to improve academic outcomes, and like other instruments of this kind, it is sometimes also used for predictive or evaluative purposes. The focus of the LASSI is on individual students' cognitive, behavioural and attitudinal approaches to their studies. The LASSI is an established, norm-referenced instrument that has been used and studied in a number of countries, and there are therefore data for the comparison of LASSI scores across universities and countries (Olaussen & Braten, 1998; Braten & Olaussen, 1998; Melancon, 2002; Flowers, 2003; Yip & Chung, 2005; Cano, 2006; Marrs, Sigler, & Hayes, 2009; Ola, Morakinyo, & Adewuya, 2009; Ning & Downing, 2010; Prevatt, Petscher, Proctor, Hurst, & Adams, 2006; Bender & Garner, 2010; Carson, 2011; Flowers, Bridges, & Moore, 2011).

The LASSI (Version One) was developed in 1987 and revised in 2002 (Version Two). Version Two was norm-referenced against the scores of 1,092 American undergraduate students and included individuals of both sexes and a range of ethnicities and ages (Weinstein & Palmer, 2002, p. 18); however, the developers of the instrument do not provide the dates of the norming tests, so the currency of the data is difficult to evaluate. The reliability and validity of Version One, the precursor of the version used in this study, has been the object of a number of investigations. In his 2006 study, Cano concluded that three latent constructs (namely "Affective

Strategies”, “Goal Strategies” and “Comprehension Monitoring Strategies”) underlie the ten subscales in the LASSI Version One (see Table 1).

**Table 1.** Scale/descriptors for the LASSI from Weinstein, Palmer, and Schulte (2002, p. 13).

| Scale | Description  |
|-------|--|
| ANX   | Anxiety and worry about school performance                           |
| ATT   | Attitude and interest  |
| CON   | Concentration and attention to academic tasks                        |
| INP   | Information processing, acquiring knowledge, and reasoning           |
| MOT   | Motivation, diligence, self-discipline, and willingness to work hard |
| SFT   | Self-testing, reviewing, and preparing for classes                   |
| SMI   | Selecting main ideas and recognizing important information           |
| STA   | Use of support techniques and materials                              |
| TMT   | Use of time management principles for academic tasks                 |
| TST   | Test strategies and preparing for tests                              |

The developers of Version Two have presented the revised instrument as having an underlying structure of three factors, which they designated “Skill”, “Will” and “Self-regulation”. However, this particular three-factor structure was not empirically tested and does not align with the three factors reported in other research (Olaussen & Braten, 1998; Cano, 2006; see also Melancon, 2002). In the revised version of the LASSI, the original 77 items were extended to 80 – eight per subscale and a substantial number of these (42) were new items. This revised LASSI instrument replicated the ten subscales of Version One. These scales and their reliability measures are reported by Weinstein and Palmer (2002) as indicated in Table 2.

**Table 2.** Reliability measures for LASSI as reported by Weinstein and Palmer (2002, pp. 4-6).

| Subscale               | Cronbach’s<br>alpha | Component       |
|------------------------|---------------------|-----------------|
| Information processing | .84                 | Skills          |
| Selecting main ideas   | .89                 | Skills          |
| Test strategies        | .80                 | Skills          |
| Anxiety                | .87                 | Will            |
| Attitude               | .77                 | Will            |
| Motivation             | .84                 | Will            |
| Concentration          | .86                 | Self-Regulation |
| Time management        | .85                 | Self-Regulation |
| Study aids             | .73                 | Self-Regulation |
| Self-testing           | .84                 | Self-Regulation |

The use of these ten subscales to evaluate students’ learning strategies is premised on the assumption that student success is primarily a function of individual cognitive skills and attitudes. It should be noted that scholarship on this area has broadened to include relational and socially-situated analyses – referred to in the literature as “student engagement” (Kuh, Cruce, Shoup, Kinzie, & Gonyea, 2008; Bryson & Hand, 2007; Trowler, 2010). Student engagement is based

on a constructivist view of learning and relies on the assessment of a wide variety of criteria. The LASSI focuses on that part of student engagement that is specifically associated with a student's agency and their approaches to academic tasks.

### **3. Methods**

The study analysed test scores from 223 students at a Sydney campus of a regional university to evaluate the LASSI.

#### **3.1. Research questions**

1. What scores were obtained by the current Australian undergraduate cohort on the LASSI, and how do these results compare with:
  - the scores recently obtained in a study of another Australian undergraduate cohort, and
  - the published American norms for the LASSI?
2. Do the LASSI scores of the present cohort differ by gender and age?
3. What is the reliability of the LASSI subscales for this cohort?
4. What validity do the LASSI subscales have for this cohort?

#### **3.2. Participants**

The data on LASSI scores were gathered from a census (population) sample of undergraduate students enrolled at a satellite site of a regional university in New South Wales. The sample comprised 223 students, 82 (36.8%) male and 141 (63.2%) female; 85 (38.5%) first-year students, 72 (32.6%) second-year students, 51 (23.1%) third-year students, and 13 (5.9%) fourth- and fifth-year students. This study follows the traditional division in research on student study skills of a student cohort into two genders. The participants were also divided into two groups according to their ages – those less than 20 years old (17 years: 1.4%  $n = 3$ ; 18 years: 17.1%  $n = 38$ ; 19 years: 18.5%  $n = 41$ ), and those 20 years or older (63.1%  $n = 140$ ), with the oldest recorded age being 55 (n.b.: one student failed to specify age). The students were enrolled in the following bachelor degrees: Commerce: 55.7% ( $n = 122$ ); Nursing: 38.8% ( $n = 85$ ); Business: 3.7% ( $n = 8$ ); other degrees: 1.9% ( $n = 4$ ) (n.b.: four students failed to specify the degree courses in which they were enrolled).

#### **3.3. Site**

The site of this study is located in a relatively affluent suburb of Sydney described by Baum, O'Connor, and Stimson (2005) as socio-economically secure. The area has: "high salaries", "more high than low income households", "higher proportions of educated professionals", "low unemployment" (Baum, O'Connor, & Stimson, 2005, p. 68) and is comfortable and "advanced" (Baum, O'Connor, & Stimson, 2005, p. 67).

This study is a companion study to that conducted by Carpenter, Dearlove, and Marland (2015) at a different university's Sydney campus, whose location is described by Baum, O'Connor, and Stimson (2005) as having similar demographics.

#### **3.4. Procedure**

The students were approached at the beginning or end of their core tutorials in week three of first semester 2013 and received explanations about the research. No inducements were used and participation was voluntary, with students completing the inventory anonymously and returning them at the time. They also provided information on their sex, age, year of enrolment and the degree in which they were enrolled.

#### **3.5. Method of analysis**

The inventories were scored and the calculated scores were entered into an Excel spreadsheet. This was imported into SPSS v19 and the data were analysed using descriptive and inferential

statistics. The results were compared against the published norms, the companion study and other related literature.

## 4. Results and Discussion

### 4.1. LASSI scores

The mean scores (see Table 3) of the two Australian undergraduate cohorts across the ten subscales of the LASSI were remarkably similar (Carpenter, Dearlove, & Marland, 2015), suggesting a high degree of test-retest reliability (see discussion in Sub-section 4.3). In Table 4, these mean scores are superimposed as line graphs on the LASSI scoring chart reproduced in Table 1 of the LASSI Inventory (Version Two) (Weinstein, Palmer, & Shulte, 2002).

The mean LASSI scores of the two Australian undergraduate groups in all but one instance fall at or below the 50<sup>th</sup> percentile ranking given in the American LASSI norms (Weinstein & Palmer, 2002). The scores of the Australian cohorts suggest that both cohorts' learning and study skills are relatively (and similarly) weak, when assessed against the norms published by the LASSI. However, these low scores may indicate that the American norms are not culturally appropriate in the Australian context or may be an artefact of the size of the samples used. The two Australian studies were undertaken on samples from similar universities and it would be important to carry out further research using samples from a wider range of Australian universities to provide a more representative analysis.

**Table 3.** Mean scores and standard deviation of the participant group on the LASSI instrument.

| Subscale                      | ANX   | ATT   | CON   | INP   | MOT   | SFT   | SMI   | STA   | TMT   | TST   |
|-------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Mean<br>[Solid line]          | 25.00 | 29.76 | 24.21 | 28.12 | 28.66 | 23.78 | 27.32 | 24.55 | 23.85 | 27.61 |
| Std Deviation                 | 7.642 | 5.002 | 5.848 | 5.385 | 5.560 | 5.270 | 5.745 | 5.502 | 6.310 | 5.362 |
| Study 1 Mean<br>[Dotted line] | 24.02 | 29.66 | 25.73 | 27.68 | 28.81 | 24.45 | 28.24 | 24.46 | 23.25 | 27.70 |

### 4.2. Scores by gender

As Table 5 shows, the mean scores of the two genders in the current research cohort were significantly different in six of the LASSI subscales, namely Anxiety, Attitude, Motivation, Use of Study Aids, Self-Testing Activities, and Time Management. On all of the subscales for which there was a significant difference, women achieved a higher score than men, with the exception of Anxiety. The lower Anxiety score recorded by the female students indicates greater levels of anxiety according to the LASSI. However, evaluating LASSI in terms of Anxiety is complex as higher levels of Anxiety could be either beneficial or detrimental to students. As Downing, Chan, Downing, Kwong, and Lam (2008) have noted: “[D]epending upon the degree of anxiety experienced by female students, this could either improve academic performance by maintaining optimum levels of stress for most efficient functioning or damage performance by exceeding these levels and so become a debilitating factor” (p. 13). In both Australian cohorts, males were significantly less anxious than females and this is consistent with international studies conducted in other countries using both Version One and Version Two of the LASSI (Bråten & Olaussen, 1998 [Version One, Norway]; Agar & Knopfmacher, 1995 [Version One, South Africa]; Downing et al, 2008 [Version Two, Hong Kong]; Bender & Garner, 2010 [Version Two, USA]).

**Table 4.** Mean scores of this study's participant group (solid line) compared with mean scores from a recent Australian companion study (dotted line) superimposed on the LASSI scoring chart with American norms (the norms include those scores which fall between the shaded sections on the table).

| Percentiles | ANX | ATT | CON | INP | MOT | SFT | SMI | STA | TMT | TST | Percentiles |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------------|
| 99          | 40  | 40  | 40  | 40  | 40  | 40  | 40  | 38  | 40  | 40  | 99          |
| 95          | 37  | 39  | 37  | 38  | 39  | 36  | 38  | 35  | 37  | 38  | 95          |
| 90          | 35  | -   | 35  | 35  | 38  | 33  | 37  | 33  | 35  | 36  | 90          |
| 85          | 33  | 38  | 34  | 34  | 37  | 31  | 35  | 32  | 33  | 35  | 85          |
| 80          | 32  | 37  | 33  | 33  | 36  | 30  | 34  | 30  | 32  | 34  | 80          |
| 75          | 31  | -   | 32  | 31  | -   | 29  | 33  | 29  | 31  | 33  | 75          |
| 70          | 30  | 36  | 31  | 30  | 35  | 28  | 32  | -   | 30  | 32  | 70          |
| 65          | 29  | -   | 30  | -   | 34  | 27  | 31  | 28  | 29  | -   | 65          |
| 60          | 28  | 35  | 29  | 29  | 33  | 26  | 30  | 27  | 28  | 31  | 60          |
| 55          | 27  | -   | -   | 28  | -   | -   | 29  | 26  | 27  | 30  | 55          |
| 50          | 26  | 34  | 28  | 27  | 32  | 25  | -   | -   | -   | -   | 50          |
| 45          | 25  | -   | 27  | -   | 31  | 24  | 28  | 25  | 26  | 29  | 45          |
| 40          | 24  | 33  | 26  | 26  | 30  | 23  | 27  | 24  | 25  | 28  | 40          |
| 35          | 23  | -   | 25  | 25  | 28  | 22  | 26  | -   | 24  | 27  | 35          |
| 30          | 22  | 32  | 24  | 24  | 27  | -   | 25  | 23  | 23  | 27  | 30          |
| 25          | 21  | -   | 23  | -   | 28  | 21  | 24  | 22  | 22  | 26  | 25          |
| 20          | 20  | 31  | 22  | 23  | 27  | 20  | 23  | 21  | 21  | 25  | 20          |
| 15          | 18  | 30  | 21  | 22  | 26  | 19  | 22  | 20  | 20  | 24  | 15          |
| 10          | 17  | 28  | 19  | 21  | 24  | 17  | 21  | 19  | 18  | 23  | 10          |
| 5           | 14  | 26  | 17  | 19  | 22  | 15  | 18  | 17  | 16  | 21  | 5           |
| 1           | 10  | 21  | 13  | 15  | 18  | 12  | 13  | 13  | 12  | 18  | 1           |



**Table 5.** Mean scores of the participant groups on the LASSI instrument by gender.

|               | ANX   | ATT   | CON   | INP   | MOT   | SFT   | SMI   | STA   | TMT   | TST   |
|---------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Male          | 26.60 | 28.57 | 23.34 | 27.68 | 27.56 | 22.66 | 27.38 | 22.63 | 22.44 | 28.02 |
| Female        | 24.07 | 30.45 | 24.72 | 28.38 | 29.30 | 24.43 | 27.29 | 25.66 | 24.67 | 27.38 |
| <i>p</i>      | .016* | .007* | .088  | .367  | .019* | .040* | .914  | .000* | .009* | .369  |
| Effect size** | 0.336 | 0.380 | 0.238 | 0.128 | 0.322 | 0.285 | 0.016 | 0.563 | 0.362 | 0.121 |

\* Indicates significance at the 0.05 level using a t-test.

\*\* Cohen's *d*, a measure of the influence of gender regardless of the size of each of the groups (small effect = 0.2, medium effect = 0.5; large effect 0.8).

A comparison of the published findings on gender differences on the LASSI subscales overall reveals a complex picture without any definite trend emerging. In the majority of studies, females outperform males, but the scales on which the differences were found and the level of significance for these differences vary considerably between studies, and also between national cohorts. This variability suggests that gender may not be a strong predictor of performance on individual LASSI subscales. Even in the results of this and the companion study, both of which have been conducted in the Australian context, there was a large variation between the levels of significance of difference between the genders on the different individual subscales.

### 4.3. Scores by age

On the five subscales (Concentration, Motivation, Study Aids, Time Management, and Test Strategies) on which there was a significant difference between participants in different age groups, the older participants (students aged 20 or older) scored significantly higher scores than younger students (students aged 17-19) (see Table 6). This contrasts with the companion study that identified significant differences on only two subscales (Attention and Study Aids). Again the older students recorded higher scores than the younger students. Differences in LASSI scores between students in different age groups have received only limited research attention. However, Braten, & Olaussen (1998), using Version One, found that older students scored significantly higher on Information Processing and younger students scored significantly higher on Study Aids. The paucity of information on age differences makes it very difficult to form firm conclusions other than that there is a need to extend research in this area. The variation across these three studies continues the trend of variations between study results reported in relation to gender above.

**Table 6.** Mean scores of the participant groups on the LASSI instrument by age.

|               | ANX   | ATT   | CON   | INP   | MOT   | SFT   | SMI   | STA   | TMT   | TST   |
|---------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 17-19         | 23.77 | 28.99 | 22.59 | 27.85 | 27.46 | 23.00 | 26.50 | 23.35 | 21.51 | 26.44 |
| 20+           | 25.76 | 30.23 | 25.16 | 28.25 | 29.36 | 24.22 | 27.88 | 25.20 | 25.22 | 28.34 |
| <i>p</i>      | .069  | .066  | .001* | .590  | .014* | .149  | .081  | .011* | .000* | .011* |
| Effect size** | 0.258 | 0.253 | 0.455 | 0.075 | 0.345 | 0.197 | 0.242 | 0.348 | 0.615 | 0.360 |

\* Indicates statistical significance between the two age groups at the 0.05 level using a t-test.

\*\* Cohen's *d*, a measure of the influence of age regardless of the size of each of the groups (small effect = 0.2, medium effect = 0.5; large effect 0.8).

### 4.3. Reliability

The reliability of the LASSI instrument was assessed by comparing the results of the companion study to the results of this current study and by means of Cronbach's alpha, providing an indicator of parallel form reliability (Changing Works, 2002-2015; Trochim, 2006). Cronbach's alpha

is a statistical measure of the extent to which the items in each subscale are measuring the same constructs, that is the homogeneity of the scale's items (Henson, 2001). While the participants of each study were different, it was assumed that the cohorts of first-year undergraduate students under the demand-driven enrolment system in universities of similar standing and of similar geographical and socioeconomic locations were sufficiently alike to allow the results to be considered a measure of test-retest reliability. This measure of reliability appears to be high as the scores of this research cohort and the companion study cohort for each of the ten subscales diverge from each other by more than one mark on only one subscale (and by less than 1.75 in that case), and diverge by less than .5 on five of the LASSI subscales. The differences between the two cohorts are significant only on the subscale of Concentration ( $r = 0.016$ ).

The descriptive and internal consistency analyses are presented below. Cronbach's alpha score across the ten subscales was .853, which indicates strong internal cohesion.<sup>1</sup> When each subscale was in turn excluded from the calculation of Cronbach's alpha, the exclusion of each of the subscales (with the exception of Anxiety) lowered the Cronbach alpha score, indicating that these nine subscales added reliability to the instrument overall (see Table 7 below). This suggests that the subscales are each measuring an underlying construct that is well represented by the items in each subscale and that these subscales are also related to each other, that is, measuring a similar or related phenomenon, although some doubt remains in relation to the use of the Anxiety subscale in this cohort. As the reliability score without Anxiety is higher than the score with Anxiety, it seems that the Anxiety subscale is detracting from the overall reliability of the Inventory in this cohort.

**Table 7.** Item-total statistics.

| Subscale | Scale mean if item deleted | Scale variance if item deleted | Corrected item-total correction | Squared multiple correlation | Cronbach's alpha if item deleted |
|----------|----------------------------|--------------------------------|---------------------------------|------------------------------|----------------------------------|
| ANX      | 237.87                     | 1277.672                       | .307                            | .400                         | .869                             |
| ATT      | 233.11                     | 1266.785                       | .595                            | .427                         | .838                             |
| CON      | 238.66                     | 1165.433                       | .761                            | .692                         | .821                             |
| INP      | 234.75                     | 1284.486                       | .493                            | .408                         | .845                             |
| MOT      | 234.21                     | 1214.858                       | .665                            | .526                         | .831                             |
| SFT      | 239.09                     | 1217.046                       | .565                            | .519                         | .839                             |
| SMI      | 235.55                     | 1224.717                       | .612                            | .540                         | .835                             |
| STA      | 238.32                     | 1308.148                       | .415                            | .412                         | .851                             |
| TMT      | 239.02                     | 1165.423                       | .693                            | .647                         | .827                             |
| TST      | 235.26                     | 1253.200                       | .584                            | .541                         | .838                             |

The inter-item correlations (see Table 8 below) further cloud the interpretation of scores on the Anxiety subscale. Half of the inter-item correlations with the Anxiety subscale are below .300 and one is negative, suggesting that the items on the Anxiety subscale are measuring phenomena unrelated (Kline, 1979) to those five subscales (INP, MOT, SFT, STA, TMT).

<sup>1</sup> While there is no definitive Cronbach's alpha score that indicates reliability in all situations, a score of .8 is generally considered to be quite high (Cano, 2006).

**Table 8.** Inter-item correlation matrix.

| Subscale | ANX   | ATT   | CON   | INP   | MOT   | SFT   | SMI   | STA   | TMT   | TST   |
|----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| ANX      | 1.000 | .244  | .339  | .104  | .131  | .016  | .516  | -.129 | .196  | .538  |
| ATT      | .244  | 1.000 | .580  | .363  | .529  | .318  | .375  | .306  | .465  | .420  |
| CON      | .339  | .580  | 1.000 | .318  | .589  | .449  | .545  | .375  | .752  | .515  |
| INP      | .104  | .363  | .318  | 1.000 | .470  | .566  | .301  | .402  | .325  | .193  |
| MOT      | .131  | .529  | .589  | .470  | 1.000 | .522  | .366  | .443  | .607  | .359  |
| SFT      | .016  | .318  | .449  | .566  | .522  | 1.000 | .313  | .541  | .520  | .256  |
| SMI      | .516  | .375  | .545  | .301  | .366  | .313  | 1.000 | .154  | .385  | .654  |
| STA      | -.129 | .306  | .375  | .402  | .443  | .541  | .154  | 1.000 | .471  | .076  |
| TMT      | .196  | .465  | .752  | .325  | .607  | .520  | .385  | .471  | 1.000 | .417  |
| TST      | .538  | .420  | .515  | .193  | .359  | .256  | .654  | .076  | .417  | 1.000 |

## 5. Validity

Principal component analyses are useful for isolating unrelated variables (called principal components) from a set of data. A principal component analysis (see Table 9) provided a three-factor solution which accounts for 71.581% of the variance. This type of analysis was employed to replicate the method used in Cano's 2006 study of the validity of LASSI Version One.

**Table 9.** Total variance explained.

| Component | Initial Eigenvalues |               |              | Extraction Sums of Squared Loadings |               |              | Rotation Sums of Squared Loadings |
|-----------|---------------------|---------------|--------------|-------------------------------------|---------------|--------------|-----------------------------------|
|           | Total               | % of Variance | Cumulative % | Total                               | % of Variance | Cumulative % | Total                             |
| 1         | 4.568               | 45.685        | 45.685       | 4.568                               | 45.685        | 45.685       | 4.020                             |
| 2         | 1.765               | 17.652        | 63.337       | 1.765                               | 17.652        | 63.337       | 2.454                             |
| 3         | .824                | 8.244         | 71.581       | .824                                | 8.244         | 71.581       | 2.755                             |
| 4         | .650                | 6.500         | 78.081       |                                     |               |              |                                   |
| 5         | .482                | 4.818         | 82.899       |                                     |               |              |                                   |
| 6         | .458                | 4.584         | 87.483       |                                     |               |              |                                   |
| 7         | .381                | 3.806         | 91.289       |                                     |               |              |                                   |
| 8         | .362                | 3.616         | 94.906       |                                     |               |              |                                   |
| 9         | .310                | 3.097         | 98.002       |                                     |               |              |                                   |
| 10        | .200                | 1.998         | 100.000      |                                     |               |              |                                   |

The pattern matrix (see Table 10) shows which of the subscales combined to form each of the three factors which emerged from the principal component analysis. The first factor accounts for 45.685% of the variance, the second factor accounts for 17.652% and the third for 8.244%. The eigenvalues are less than one on the first two factors, suggesting a two-factor solution is also possible. However, the subscales divide more distinctly into a three-factor solution.

This study's three-factor solution sits alongside several other studies which have also identified three-factor solutions from factor analyses of the LASSI subscales for both Versions One and Two of the inventory. While the studies consistently identified three-factor solutions, the subscales which comprised the three factors were different in each of the studies (see Table 11 be-

low), resulting in different titles for each of the three underlying constructs identified in the studies.

**Table 10.** Pattern matrix.

|     | Component 1 | Component 2 | Component 3 |
|-----|-------------|-------------|-------------|
| ANX | .909        | -.024       | -.045       |
| ATT | .861        | .204        | -.086       |
| CON | .673        | .158        | -.005       |
| INP | .663        | -.008       | .245        |
| MOT | .502        | -.376       | .410        |
| SFT | -.045       | .867        | -.008       |
| SMI | .158        | .726        | .238        |
| STA | .302        | .714        | .011        |
| TMT | -.138       | .154        | .954        |
| TST | .249        | -.047       | .707        |

**Table 11.** Comparison of factor analyses.

| LASSI Version One                     |                            | LASSI Version Two                |                               |
|---------------------------------------|----------------------------|----------------------------------|-------------------------------|
| Cano's (2006) Factor Solution         | Olaussen and Braten (1998) | LASSI (Weinstein & Palmer, 2002) | This Study's Factor Solutions |
| "Affective Strategies"                | "Effort Related"           | "Self-Regulation Component"      |                               |
| Time management                       | Time management            | Time management                  | Time management               |
| Motivation                            | Motivation                 | Concentration                    | Concentration                 |
| Concentration                         | Concentration              | Study Aids                       | Study aids                    |
| Attitude                              | Attitude                   | Self-Testing                     | Attitude                      |
|                                       | Test Strategies            |                                  | Motivation                    |
| "Goal Strategies"                     | "Goal Orientation"         | "Will Component"                 |                               |
| Test strategy                         | Test strategies            | Anxiety                          | Anxiety                       |
| Anxiety                               | Anxiety                    | Attitude                         | Selecting Main Ideas          |
| Attitude                              | Attitude                   | Motivation                       | Test Strategy                 |
|                                       | Concentration              |                                  |                               |
|                                       | Information Processing     |                                  |                               |
|                                       | Selecting Main Ideas       |                                  |                               |
| "Comprehension Monitoring Strategies" | "Cognitive Activities"     | "Skill Component"                |                               |
| Information Processing                | Information Processing     | Information Processing           | Information Processing        |
| Study aids                            | Study Aids                 | Selecting Main Ideas             | Self-testing                  |
| Self-testing                          | Self-testing               | Test Strategies                  |                               |
|                                       | Selecting Main Ideas       |                                  |                               |

However, it is worth noting that in all four of the three-factor solutions in the table above, Time Management and Concentration are in one factor, Anxiety is in a separate factor and Information Processing is in a third factor. These subscales, then, appear to be measuring cross-disciplinary strategies that may warrant further investigation. Given the differences between all four of the three-factor solutions and the relatively small sample used in this study, attempts to identify and name the underlying constructs represented by the three-factor solution that emerged in this study are unlikely to add substance to the scholarship in this area. Thus, it seems that the LASSI is most likely measuring three constructs, but that these constructs are not reliably identifiable individually, as different subscales relate to different constructs for different cohorts. This raises questions about the validity of the LASSI when used in various contexts. These questions have been noted by other researchers (e.g. Urciuoli & Bluestone, 2013) and are in general related to the instrument's concentration on cognitive, behavioural and attitudinal approaches to learning in isolation from individual, national or disciplinary educational contexts.

At the level of the individual student, some of the items in the inventory do not allow students to indicate that the situation described does not, or has not, applied to them and therefore the validity of the items will be dependent on the educational context. For example, item number 20 on the LASSI states: "If there is a web site for my textbook, I use the information provided there to help me learn the material" (p. 3). This item could have been confusing for a student to whose educational context the item is not relevant and who may therefore decide to answer "not at all typical of me" or fail to respond to the item; in both cases the student's overall score would have been lowered by this response.

Further, item number 71 states: "I try to find a study partner or study group for each of my classes" (our emphasis) (p. 7). This item assumes that group study is more effective than individual study for all students. The item also insists that students form a study group for "each" class, rather than any class. When students respond with "not at all typical of me" it is unclear whether they are indicating that they never choose to study in a group or whether they selectively choose the classes for which they study in a group.

The LASSI items do not consider disciplinary context or the year of study of the respondent. The use of the LASSI to predict the future performance of university students at the time of their enrolment assumes that their completion of the inventory on the basis of their high school experience will be valid for the tertiary context. At the same time, while the LASSI may provide a useful "snapshot" of the study skills of a mature-age student returning to study after a break, these results would need to be used with particular care in predicting future outcomes. In addition, many LASSI items appear not to be designed for studies in quantitative disciplines such as mathematics.

Finally, the cultural context in which the LASSI inventory was developed and normed may limit its validity in the Australian context. The results of this study and its companion study indicate that the two Australian undergraduate cohorts are scoring similarly and lower than the American norms suggest are necessary for study success. There are many possible explanations for these results and more research is necessary to investigate these possibilities. It could be that the American norms, developed at a minimum of ten years ago, are out of date with current educational practices and produce similar results in other cohorts. The disparity in the results may for example reflect general changes in methods of content delivery, as well as modes of literacy, attention and study strategies amongst the "digital natives" of the current decade. Alternatively, the samples in the two Australian studies are not representative of all Australian undergraduate students and this may have produced these results. Finally, the norms themselves could reflect an American cultural approach to study and be suited to the American educational system, thus producing the lower results in the Australian studies.

## **6. Conclusion**

This study has investigated the confidence that users may reasonably have in the consistency of the LASSI and in its effectiveness in measuring what it claims to measure: cognitive, behav-

journal and attitudinal study skills and strategies that are relevant to successful study in a university context. The results of this study and its earlier companion study have suggested that the LASSI has a high degree of test-retest reliability in the Australian undergraduate contexts in which the studies were conducted. However, the validity of the LASSI appears to be less certain than its reliability.

The validity of the LASSI is questionable in part as a consequence of its assumptions that study skills and strategies can be successfully measured with relatively little regard for academic discipline or extent of university experience. In this study and its companion, Australian students scored notably lower on LASSI than the (American) norms suggested are adequate for successful university study. It seems *prima facie* implausible that significantly higher numbers of Australian students would not possess sufficient study skills to succeed at university compared with their American undergraduate counterparts and this raises questions over the cultural specificity of the norms and/or the inventory items. Similarly, the failure of the LASSI items to distinguish between disciplinary contexts (especially between text-based and number-based disciplines) or lengths of university experience raises questions about the validity of the instrument.

The validity of the Inventory is further clouded by the inconsistent results of analyses attempting to confirm the three constructs (Skill, Will and Self-regulation) proposed by the Inventory's developers. While there are commonalities between the constructs identified by different research studies and those proposed by the LASSI developers, there are also dissimilarities. This means that the instrument sometimes does, and sometimes does not, reflect the underlying constructs it purports to measure.

The results of this exploratory research are limited by the size of the sample ( $n = 223$ ), which is relatively small for the statistical analysis that has been undertaken. In addition, the sample may not be representative of the Australian higher education population. Further research is necessary to confirm these findings before this instrument can be confidently introduced or rejected for use in the wider Australian educational context. Such research could also identify useful revisions of the Inventory. For example, it would seem useful to amend the Inventory so that it aligns with reliable underlying constructs, to eliminate scales that detract from the internal reliability of the Inventory and in so doing reduce its considerable length, and to consider cultural and disciplinary contexts of student learning.

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## References

- Agar, D.L., & Knopfmacher, N. (1995). The learning and study strategies inventory: A South African application. *Higher Education*, 30(1), 115-126.
- Artino Jr., A.R. (n.d.). *A review of the motivated strategies for learning questionnaire*. Retrieved January 18, 2014, from [http://www.sp.uconn.edu/~aja05001/comps/documents/MSLQ\\_Artino.pdf](http://www.sp.uconn.edu/~aja05001/comps/documents/MSLQ_Artino.pdf)
- Baum, S., O'Connor, K., & Stimson, R. (2005). *Fault lines exposed: Advantage and disadvantage across Australia's settlement system*. Clayton, Victoria: Monash University ePress.
- Bender, D.S., & Garner, J.K. (2010). Using the LASSI to predict first year college achievement: Is a gender-specific approach necessary? Paper presented at the *Annual Meeting of the American Research Association April 30– May 4*, Denver, Colorado.
- Beyers, W., & Goossens, L. (2002). Concurrent and predictive validity of the student adaptation to college questionnaire in a sample of European freshman students. *Educational and Psychological Measurement*, 62, 527-538.
- Bliss, L. (2003). *The study behaviour inventory*. Retrieved January 18, 2014, from <http://www.sc.edu/fye/resources/assessment/essays/Bliss-6.12.03.html>

- Bradley, D., Noonan, P., Nugent, H., & Scales, B. (2008). *Review of Australian higher education: Final report*. Canberra: Commonwealth of Australia. Retrieved April 17, 2014, from [http://www.innovation.gov.au/highereducation/Documents/Review/PDF/Higher%20Education%20Review\\_one%20document\\_02.pdf](http://www.innovation.gov.au/highereducation/Documents/Review/PDF/Higher%20Education%20Review_one%20document_02.pdf)
- Bråten, I., & Olaussen, B.S. (1998). The learning and study strategies of Norwegian first-year college students. *Learning and Individual Differences, 10*(4), 309-327.
- Bryson, C., & Hand, L. (2007). The role of engagement in inspiring teaching and learning. *Innovations in Education and Teaching International, 44*(4), 349-362.
- Cano, F. (2006). An in-depth analysis of the Learning and Study Strategies Inventory (LASSI). *Educational and Psychological Measurement, 66*(6), 1023-1038.
- Carpenter, J., Dearlove, J., & Marland, J. (2015). Student skills and the Bradley agenda in Australia. *Higher Education Research & Development, 34*(2), 284-297. doi: 1080107294360.2014.956698.
- Carson, A.D. (2011). Predicting student success from the LASSI for learning online (LLO). *Journal of Educational Computing Research, 45*(4), 399-414.
- Cengage Learning Incorporated. (2012). *College success factors index (CSFI) 2.0*. Retrieved January 18, 2014, from <http://www.cengage.com/tlconnect/client/product/findProduct.do?productId=515>
- Downing, K., Chan, S.-W., Downing, W.-K., Kwong, T., & Lam, T.-F. (2008). Measuring gender difference in cognitive functioning. *Multicultural Education & Technology Journal, 2*(1), 4-18.
- Flowers, L.A. (2003). Test-retest reliability of the Learning and Study Strategies Inventory (LASSI): New evidence. *Reading Research and Instruction, 43*(1), 31-46.
- Flowers, L.A., Bridges, B.K., & Moore III, J.L. (2011). Concurrent validity of the learning and study strategies inventory (LASSI): A study of African American precollege students. *Journal of Black Studies, 43*(2), 146-160.
- Henson, R.K. (2001). Understanding internal consistency reliability estimates: A conceptual primer on coefficient alpha. *Measurement and evaluation in counseling and development, 34*(3), 177-189.
- Kline, P. (1979). *Psychometrics and psychology*. London: Academic Press.
- Kuh, G.D., Cruce, T.M., Shoup, R., Kinzie, J., & Gonyea, R.M. (2008). Unmasking the effects of student engagement on first-year college grades and persistence. *The Journal of Higher Education, 79*(5), 540-563.
- Marginson, S. (2009). *National system reform in global contexts: The case of Australia*. Paper presented at the Reforms and Consequences in Higher Education Systems: An International Symposium, Centre for National University Finance and Management (CNUFM), National Center of Sciences, Hitotubashi Chiyoda-ku, Tokyo, Japan.
- Marrs, H., Sigler, E., & Hayes, K. (2009). Study strategy predictors of performance in introductory psychology. *Journal of Instructional Psychology, 36*(2), 125-133.
- Melancon, J.G. (2002). Reliability, structure, and correlates of learning and study strategies inventory scores. *Educational and Psychological Measurement, 62*(6), 1020-1027.
- Multi-Health Systems Inc. (2004-2014). *Emotional intelligence assessments and solutions*. Retrieved January 18, 2014, from <http://ei.mhs.com/LeadershipReport.aspx>
- Ning, H.K., & Downing, K. (2010). Stability of the Learning and Study Strategies Inventory: A longitudinal analysis of Hong Kong and mainland Chinese students. *Asia-Pacific Education Researcher, 19*(3), 525-537.
- Noel-Levitz. (1998-2014). *College student inventory*. Retrieved January 18, 2014, from <https://www.noellevitz.com/student-retention-solutions/retention-management-system-plus/college-student-inventory>

- Ola, B.A., Morakinyo, O., & Adewuya, A.O. (2009). A standardisation and validation study of a new study skills questionnaire among Nigerian students. *Ife Psychologia*, 17(2), 1-18.
- Olaussen, B.S., & Bråten, I. (1998). Identifying latent variables measured by the Learning and Study Strategies Inventory (LASSI) in Norwegian College students. *Journal of Experimental Education*, 67(1), 82-96.
- Pickering, J.W., Calliotte, J.A., Macera, S.C., & Zerwas, S.C. (2005). *Manual for the transition to college inventory*. Retrieved January 18, 2014, from [www.odu.edu/ao/universityassessment/tci/pdf/manual05.pdf](http://www.odu.edu/ao/universityassessment/tci/pdf/manual05.pdf)
- Prevatt, F., Petscher, Y., Proctor, B.E., Hurst, A., & Adams, K. (2006). The revised Learning and Study Strategies Inventory: An evaluation of competing models. *Educational and Psychological Measurement*, 66(3), 448-458.
- Southern Illinois University Board of Trustees. (2014). *ACT student readiness inventory*. Retrieved January 18, 2014, from <http://business.siu.edu/services/advantage/act.html>
- Trowler, V. (2010). *Student engagement literature review*. York: The Higher Education Academy.
- Urciuoli, J.A., & Bluestone, C. (2013). Study skills analysis: A pilot study linking a success and psychology course, *Community College Journal of Research and Practice*, 37(5), 397-401.
- Wabash College. (2013). *Wabash national study, (2006-2009). Outcomes and experiences measures*. Retrieved January 18, 2014, from <http://www.liberalarts.wabash.edu/study-instruments/>
- Weinstein, C.E., & Palmer, D.R. (2002). *LASSI user's manual 2<sup>nd</sup> ed.* Retrieved January 18, 2014, from [http://www.hhpublishing.com/assessments/LASSI/LASSI\\_Users\\_Manual.pdf](http://www.hhpublishing.com/assessments/LASSI/LASSI_Users_Manual.pdf)
- Weinstein, C.E., Palmer, D.R., & Schulte, A.E. (2002). *Learning and Study Strategies Inventory (LASSI) 2<sup>nd</sup> ed.* Clearwater, Florida: HandH Publishing Company, Inc.
- Yip, M.C.W., & Chung, O.L.L. (2005). Relationship of study strategies and academic performance in different learning phases of higher education in Hong Kong. *Educational Research and Evaluation*, 11(1), 61-70.