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A Factor-Analytic Study of the Learning and Study Strategies Inventory, Second Edition (Lassi-2) in a Sample of University Students

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A FACTOR-ANALYTIC STUDY OF THE LEARNING AND STUDY STRATEGIES

INVENTORY, SECOND EDITION (LASSI-2) IN A SAMPLE OF UNIVERSITY STUDENTS

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ABSTRACT

The present study sought to provide a better understanding of the factor structure of the Learning and Study Strategies Inventory, Second Edition (LASSI-2) at the item to scale level (via confirmatory factor analysis) and to expand the LASSI-2's psychometric properties (i.e., means, standard deviations, alpha coefficients, and correlations of the LASSI-2's scale scores) as well as examine for potential sex differences in the LASSI-2 scale scores (via t tests with Cohen's d also being calculated) with a sample of 420 university students. The means, standard deviations, and alpha coefficients of the 10 LASSI-2 scales for the current data appeared comparable to those reported in the LASSI-2 manual and studies in the literature examining the LASSI-2. Additionally, the range of the correlations among the LASSI-2 scales in the current study was comparable to the range of correlations that the LASSI-2 manual reported. There were statistically significant sex differences in the scale scores of the LASSI-2's Anxiety, Study Aids, and Attitude scales; however, the effect sizes for these scales suggested that these were only moderately small differences. With regard to the LASSI-2's factor structure, the 10-scale structure proposed in the LASSI-2's manual was not sufficiently supported; however, post hoc analyses examining the LASSI-2's scales individually indicated that the Anxiety, Attitude, Study Aids, and Test Strategies scales had good structural support. Implications of these findings are discussed and suggestions for future research are provided.

ACKNOWLEDGEMENTS

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I. LEARNING AND STUDY STRATEGIES: AN INTRODUCTION

The use of learning and study strategies is associated with academic success (Fleming, 2002; Gettinger & Seibert, 2002; Turner & Husman, 2008; Weinstein, Husman, & Dierking, 2000). Unfortunately, even though it has been reported that teaching students the benefits of effective strategies will likely improve their study habits (Bugg, DeLosh, & McDaniel, 2008), it is rare that students are taught such strategies (Weinstein et al., 2000). In fact, many students that enter college do not have knowledge of the various learning strategies that can be used (Turner & Husman, 2008). Consequently, some students may progress through school and never utilize effective ways in which to study (Gettinger & Seibert, 2002). For example, it has been reported that among 12th graders, 71% of them study for an hour or less per day, while 25% of them do not engage in any form of studying (Gettinger & Seibert, 2002).

Learning and study strategies include the behaviors, thoughts, activities, and/or feelings that an individual engages in when attempting to learn something (Gettinger & Seibert, 2002; Nist & Holschuh, 2000; Weinstein et al., 2000; Weinstein & MacDonald, 1986). Learning and study strategies also include students' thoughts and behaviors associated with the strategies they use and the rules and guidelines that they use for choosing the strategies that they believe are best for a given learning or study situation (Gettinger & Seibert, 2002; Weinstein & MacDonald, 1986). Learning strategies are intentional, require effort, and can be taught and modified (Weinstein et al., 2000; Weinstein & MacDonald, 1986). Overall, effective learning and study

strategies improve the efficiency and effectiveness of learning (Gettinger & Seibert, 2002). Some examples of learning and study strategies include repetition, elaboration, summarizing, underlining, note-taking, outlining, read-recite-review, low anxiety, positive attitude, concentration, information processing, motivation, selecting main ideas, self-testing, study aids, time management, and test strategies (Flippo, Becker, & Wark, 2000; McDaniel, Howard, & Einstein, 2009; Nist & Simpson, 1994; Weinstein et al., 2000; Weinstein & Palmer, 2002).

Learning and Study Strategies and Other Constructs

Many studies have documented the associations between use of learning and study strategies and other constructs. The following sections will provide a sample of the research in various areas related to learning and study strategies. The sections are organized into the following areas: academic variables, nonacademic variables, and internal/affective variables.

Learning and study strategies and academic variables. Awareness of and use of learning and study strategies are associated with academic success and many academic outcomes (Fleming, 2002; Gettinger & Seibert, 2002; Kovach & Wilgosh, 1999; McKeachie, 1988; Palmer & Goetz, 1988; Turner & Husman, 2008; Weinstein et al., 2000). For example, study strategy use has been found to be associated with the ability to complete homework and performance on achievement tests (Gettinger & Seibert, 2002), grades (Fleming, 2002; Kleijn, van der Ploeg, & Topman, 1994; Nist, Mealey, Simpson, & Kroc, 1990; Phan, 2009; Weinstein et al., 2000), rates of graduation (Weinstein et al., 2000), perceived ability (Bråten & Olaussen, 1998), and perception of time usage (Bond & Feather, 1988).

Fleming (2002) found that first-year students who were taught study strategies improved their performance on exams and this improvement continued beyond the point that the strategies were taught (i.e., 13 weeks). Fleming found that before being taught learning strategies, first-year

control group students scored lower on two tests compared to other students. However, after all students were introduced to learning strategies and took the third test, significant differences in scores were no longer found (Fleming, 2002).

Kleijn et al. (1994) reported that the scales of the Study Management and Academic Results Test (SMART), an instrument that measures study strategies, study-related cognitions, exam-related thoughts, and time management, were correlated with students' school performance in all three of their studies. The scores of the Time Management, Test Anxiety, and Test Competence scales accounted for greater than 37 percent of the variance for grade point average (Kleijn et al., 1994).

Dickinson, O'Connell, and Dunn (1996) found that the study strategy pertaining to the way in which study time is distributed was associated with conceptual test scores and essay test scores. The high scoring students studied less and distributed their study time into more short study periods compared to the low scorers (Dickinson et al., 1996).

Yip and Chung (2002) documented differences in scores on the Selecting Main Ideas, Scheduling, Motivation, and Concentration subscales of their revised version of the Learning and Study Strategies Inventory (LASSI), a measure of learning and study strategy use, for high achievement students compared to low achievement students, with high achievement students displaying significantly more learning and study strategies. Similarly, Albaili (1997) found differences in scores on all 10 of the original LASSI learning and study strategy scales when comparing low achievement college students with average achievement and high achievement college students, with the low achievement college students having lower scores.

Proctor, Prevatt, Adams, Hurst, and Petscher (2006) noted that students who were having difficulties in college had poorer learning and study strategies than those without such

difficulties. Along the same lines, Deming, Valeri-Gold, and Idleman (1994) noted research that reported that low scorers on learning strategies such as anxiety, time management, and attitude perceived college as more difficult. Furthermore, Bråten and Olaussen (1998) reported that Norwegian college students with more perceived ability used more learning and study strategies than college students with less perceived ability.

     Learning and study strategies and nonacademic variables. Learning and study strategies have been found to be associated with nonacademic variables as well. For example, study skills contribute to job success (Gettinger & Seibert, 2002). Learning strategies have also been found to be associated with stress-related variables. Gadzella, Masten, and Stacks (1998) found that Elaborative Processing, a learning strategy measured by the Inventory of Learning Processes (ILP), was positively correlated with Cognitive appraisal, which is one category of stress reactions measured by the Student-life Stress Inventory. Negative correlations between Deep Processing (a learning strategy measured by the Inventory of Learning Processes) and Frustration (a stressor measured by the Student-life Stress Inventory), between Methodical Study (a learning strategy measured by the Inventory of Learning Processes) and Conflicts (a stressor measured by the Student-life Stress Inventory), and between Methodical Study and Self-imposed stressor (a stressor measured by the Student-life Stress Inventory) were also found (Gadzella et al., 1998). It was also found that Test Anxiety as measured by the Test Anxiety Inventory was positively correlated with Emotional stress reaction and Physiological stress reaction, both measured by the Student-life Stress Inventory (Gadzella et al., 1998).

     Studies have also found some relations associated with sex of students. Grimes' (1995) research revealed sex differences on many of the LASSI scales, indicating stronger study skills for females on the Attitude, Motivation, Time Management, Study Aids, and Self-Testing scales

and higher scores for males on the Anxiety (low anxiety) scale. Using a Norwegian version of the LASSI, Bråten and Olaussen (1998) found that female college students use more learning and study strategies in the areas of Motivation, Time Management, and Study Aids and male students scored higher on the Anxiety and Information Processing scales. Using the original LASSI, Sizoo, Malhotra, and Bearson (2003) noted significant differences between female business students and male business students in the areas of Motivation, Concentration, Attitude, Time Management, and Study Aids, with females possessing more skills in these areas. Among the students with learning disabilities in Kovach and Wilgosh's (1999) study, significant sex differences were found, with males scoring lower on Motivation, Study Aids, and Self-Testing and with females scoring lower on Anxiety (high anxiety). Schommer-Aikins and Easter (2008) also found significant sex differences, using the second edition of the LASSI (LASSI-2), with males scoring higher on the Anxiety scale and females scoring higher on the Study Aids, Time Management, and Attitude scales.

Learning and study strategies and internal/affective variables. Learning and study strategies have been found to be associated with internal/affective variables as well. For example, relations have been noted between study methods, anxiety, and fear of failure (Entwistle & McCune, 2004). Study strategy awareness has also been shown to improve attitudes (Fleming, 2002), and it has been argued that study habits can enhance or decrease students' motivation (e.g., the resulting success of using good study strategies can influence motivation) (Gettinger & Seibert, 2002). However, motivation also has an influence on studying (Entwistle & McCune, 2004; Gettinger & Seibert, 2002). For example, some early research suggested that students having differing motivation would vary in the ways in which they studied (Entwistle & McCune, 2004). With low motivation, students' study habits are poor; thus, individuals may not

utilize effective study strategies because they lack sufficient motivation (Gettinger & Seibert, 2002).

Study habits can also enhance or decrease students' self-efficacy (Gettinger & Seibert, 2002). Self-efficacy beliefs and the use of study strategies have been moderately correlated (Gettinger & Seibert, 2002). Successful studiers believe that they have control over their academic success; therefore, they are willing to spend their time studying effectively (Gettinger & Seibert, 2002). However, students having academic difficulty tend to be pessimistic about their control of their success and are not motivated to use strategies that would improve their studying (Gettinger & Seibert, 2002).

Methods of assessing study strategies

The evolution of study strategy assessment instruments has been influenced by developments in research in education and concepts in cognitive psychology (Entwistle & McCune, 2004). Entwistle and McCune (2004) reported that the measures of study strategies have changed over time, with newer measures expanding on earlier measures. Thus, succeeding measures provided additional concepts of studying, contributing to a more thorough description of studying than earlier measures (Entwistle & McCune, 2004). Some of these measures are quite complex with various scales and subscales.

Entwistle and McCune (2004) reported that many self-report, Likert-type format learning and study strategy measures with similar psychometric characteristics have been developed, with differing purposes and from different theoretical backgrounds. This has resulted in several measures being designed that use different meanings for the same terminology and multiple terms to describe the same concept of studying (Entwistle & McCune, 2004).

Entwistle and McCune (2004) provide a good summary of six of the most popular and

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extensively researched measures of study strategies (i.e., the Approaches to Studying Inventory - ASI, the Study Processes Questionnaire - SPQ, the Inventory of Learning Processes-R - ILP-R, the Learning and Study Strategies Inventory - LASSI, the Inventory of Learning Styles - ILS, and the Motivated Strategies for Learning Questionnaire - MSLQ), along with a conceptual comparison of these multidimensional inventories based on empirical research, conceptual analysis, and item analysis. Entwistle and McCune (2004) concluded based on their analysis that the six measures of study strategies that were analyzed each similarly consisted of three primary conceptual factors (deep processing related variables - activities engaged in for the purpose of understanding, surface processing related variables - activities engaged in for the purpose of recitation, and achieving-related variables) (Entwistle & McCune, 2004).

Cano-Garcia and Justicia-Justicia (1994) demonstrated the similarities between the multidimensional scales of several learning strategy instruments using factor analyses ($N = 991$ first and last year university students). Factor analysis of the scales of the LASSI, the Learning Styles Inventory (LSQ), the Inventory of Learning Processes (ILP), and the Approaches to Studying Inventory (ASI) using the principal-components method with oblique rotation resulted in eight components (eigenvalues exceeding one; total variance explained = 61%). Factor analysis on the scales of the LASSI, the Learning Styles Inventory, the Inventory of Learning Processes, and the Approaches to Studying Inventory using the principal-factors method with oblique rotation yielded four factors with eigenvalues exceeding one, namely Elaborative Processing, Deep Processing, General Learning Styles, and Traditional Study Methods. The results explained 80% of the data's common variance. Factor analysis on only the scales of the LASSI, the Inventory of Learning Processes, and the Approaches to Studying Inventory using the principal-factors method with oblique rotation yielded three factors (eigenvalues exceeding

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one) (Cano-Garcia & Justicia-Justicia, 1994).

Muis, Winne, and Jamieson-Noel (2007) suggested content similarities at the item level for three multidimensional measures (the LASSI, the Motivated Strategies for Learning Questionnaire - MSLQ, and the Meta-cognitive Awareness Inventory - MAI). They identified what they believed were four conceptual components of self-regulated learning (self-regulated learning encompasses one's typical use of learning strategies and one's changes in use of certain strategies to fit a given task) using the subscale content of four subscales of each measure. That is, each component was represented by one subscale from each of the three multidimensional measures (the LASSI, the Motivated Strategies for Learning Questionnaire, and the Meta-cognitive Awareness Inventory) that the researchers chose based on their item content. More specifically, conceptual similarities at the item level (similarities in item content) were found for items on the LASSI's selecting main ideas subscale, the Motivated Strategies for Learning Questionnaire's organization subscale, and the Meta-cognitive Awareness Inventory's planning subscale. Conceptual similarities at the item level were found for items on the LASSI's information processing subscale, the Motivated Strategies for Learning Questionnaire's elaboration subscale, and the Meta-cognitive Awareness Inventory's information management skills subscale. Similarities in item content were found for items on the LASSI's study aid subscale, the Motivated Strategies for Learning Questionnaire's meta-cognitive self-regulation subscale, and the Meta-cognitive Awareness Inventory's debugging strategies subscale. Lastly, conceptual similarities at the item level were found for items on the LASSI's self-testing subscale, the Motivated Strategies for Learning Questionnaire's critical thinking subscale, and the Meta-cognitive Awareness Inventory's evaluation subscale. Muis et al. (2007) termed these conceptual sets of similarities as the following components of self-regulated learning: main

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ideas/organization, elaboration, self-regulation, and evaluation, respectively.

However, Muis et al. (2007) found that there was a lack of consistently high correlations between the self-regulated learning components that they identified through analyzing the contents of the scales' items and their respective scales and among the corresponding scales that represented each component (i.e., there was weak convergent validity for the components). Nevertheless, correlational analysis demonstrated that the LASSI showed the most discriminant validity for its four subscales that were evaluated compared to the Motivated Strategies for Learning Questionnaire's four subscales and the Meta-cognitive Awareness Inventory's four subscales (Muis et al., 2007).

Muis et al. (2007) concluded that measures developed based on different theories produce measurements of different aspects of self-regulated learning. For example, they suggested that the LASSI may be better at measuring self-regulated learning that affects processes of encoding, the Motivated Strategies for Learning Questionnaire may be better at measuring self-regulated learning that affects processes of motivation, and the Meta-cognitive Awareness Inventory may be better at measuring self-regulated learning related to processes of metacognition (Muis et al., 2007).

The above comparisons of the different measures of learning and study strategies are important to consider when choosing which instrument to use. Knowing an instrument's advantages over others is also helpful in making such a decision for its use. For example, the LASSI includes learning and study strategies (based on a study skills training program) that can be trained and taught (Entwistle & McCune, 2004), which seems to make it more practical than instruments that just assess how students study, such as the Approaches to Studying Inventory, the Study Processes Questionnaire, and the Inventory of Learning Processes-R (Entwistle &

McCune, 2004). The LASSI could be used as an assessment instrument for tracking the progress of a learning strategies intervention course or an individual student's progress in the use of learning strategies, as well as serve as an aid that enhances a student's awareness of his or her learning and study strategies so that he or she can take responsibility for them (Sizoo et al., 2003). Additionally, as mentioned above, four of the LASSI scales when compared to four scales of the Motivated Strategies for Learning Questionnaire and four scales of the Meta-cognitive Awareness Inventory showed the most discriminant validity (Muis et al., 2007), which further demonstrates the LASSI's utility in relation to other measures.

　　As noted by Weinstein, Zimmermann, and Palmer (1988), there were many limitations in study skills instruments before the development of the LASSI. Weinstein and Palmer (2002) claimed that the LASSI attempted to address the flaws in previous measures of study skills. For example, some limitations that Weinstein et al. (1988) noted in previous measures were that, in general, the reliabilities of the subscales of measures assessing study skills were low, study practices noted by the instruments were not empirically validated and therefore may not be effective, and most of the assessment tools available were not developed to identify deficient skill areas of students but were only developed to identify how students study (Entwistle & McCune, 2004). The LASSI addressed previous measures' limitations in that LASSI scores are generally considered useful for research, its strategies proved to be valid and effective given their association with performance instruments and students' grades (Albaili, 1997; Nist et al., 1990; Smith & Smith, 2002; Weinstein & Palmer, 2002). The measure has also been effective in learning courses (Nist et al., 1990; Weinstein & Palmer, 2002) because a core function was to assess the strengths and weaknesses of students' learning and study strategies so that individualized remediation could be provided (Weinstein et al., 1988).

The LASSI is currently in its second edition, the LASSI-2, which was developed to improve the original LASSI (Weinstein & Palmer, 2002). It was developed in order to improve psychometrics and the normative sample, update items, broaden scale concepts, include current academic practices and new research findings, and ensure that each scale has the same amount of items (Weinstein & Palmer, 2002). Since its development, little research has been published with the LASSI-2 despite its many potential benefits. The LASSI-2 was designed to provide students with information on their studying and learning strengths, identify learning and studying areas that would benefit from enhancement and remediation, help teachers plan their classroom and student individualized curriculum focus, track progress in the LASSI's content areas, determine the effects of intervention, and advise college students (Weinstein & Palmer, 2002). Given the LASSI-2's wide-ranging utility, it is the focus of the present study. Prior to discussing the 2nd edition in detail, attention is first paid to describing the original LASSI.

Learning and Study Strategies Inventory, 1st Edition (LASSI)

The LASSI (Weinstein, 1987; Weinstein, Schulte, & Palmer, 1987) measures the extent to which postsecondary students use learning and study strategies (Winne & Perry, 2000). It was developed to assess study strategy problem areas and strengths among college students and to provide feedback on areas that may need improvement (Weinstein & Palmer, 2002).

The process of developing the LASSI started with gathering data and examining the existing measures of learning and study strategies (Weinstein & Palmer, 2002). The developers of the LASSI found that there was not a consistent way in which the concepts that made up learning strategies and study skills were being defined by practitioners, assessment instruments, and researchers; therefore, they attempted to develop their own categories (division of learning strategies and study skills areas/topics). In an attempt to help with making the categories, the

developers examined what was covered in books on study skills, programs pertaining to study skills, and study skills manuals. The developers also consulted experts in learning and study strategies (Weinstein & Palmer, 2002).

A 645-item item pool was created from the above sources of information (Weinstein & Palmer, 2002). The items were sorted by expert judges using the initial categories that had been developed. While sorting items, the following problems were noted: several items were nearly identical and several items could be sorted in more than a single category. The developers fixed the former problem by taking out identical items. The plan for the latter problem was to handle it when a revision to the categories (concepts encompassing learning strategies and study skills) could be possible given the descriptive and correlational data that would be available after initial pilot tests. Additionally, items that were not directly related to study skills and items with content that did not reflect student characteristics that could be changed through remediation were taken out. Tests and measures specialists modified items that seemed to address more than a single statement or question in a single item and items that were poorly written and confusing. Item revision procedures resulted in a 291 item pool of pilot test items. These pilot items used a true-false format, with about half the items stated positively and half stated negatively (Weinstein & Palmer, 2002).

To examine the administration process and gather psychometric information on the items, the developers conducted a pilot test with students, administering some of the initial pilot test items (about a third), a questionnaire pertaining to test administration and the items, and a social desirability measure (Weinstein & Palmer, 2002). Some of the pilot test participants were interviewed as well. Changes to the items were made based on the above data collection and related student information. The changes included having the measure reflect a Likert-type

response format, making wording changes, and taking out items with correlations with the social desirability measure that were above .50. Confusing items were modified or removed. Items were also added based on cognitive psychology research literature, students' responses to questionnaires, and practitioners' comments. The resulting item pool of 149 items was examined separately by two psychometricians and by two content specialists, and a revision to the categories was made, with categories (14 categories or learning strategies and study skills areas) consisting of a minimum of seven items per category. The developers administered another pilot test to examine the administration process and the new item properties. Based on descriptive data and students' comments collected on this administration, the 130 items to be used for field testing the LASSI were selected (Weinstein & Palmer, 2002).

Field tests were administered, during which time the LASSI items were reduced from 130 to 90; additionally, 10 scales were developed that measured clusters of study skills, learning strategies, beliefs, and attitudes, which were established by experts and further developed by using each scale's psychometric data (e.g., coefficient alpha) (Weinstein & Palmer, 2002). Initial norms were established using Fall 1982 data from freshmen at an eastern college (850 freshmen participated with 780 having complete LASSI data available). The scales were then refined, with 30 more items added before the 1984 field test (Weinstein & Palmer, 2002). The developers further modified the instrument into the original 77-item, 10-scale (Anxiety, Attitude, Concentration, Information Processing, Motivation, Selecting Main Ideas, Self-Testing, Study Aids, Test Strategies, and Time Management) LASSI, with 10 scale scores corresponding to the 10 scales and a normative sample of 880 freshmen from a southern university (Weinstein & Palmer, 2002). The LASSI's (Weinstein et al., 1987) 10 scales included concepts from the components of will, self-regulation, and skill of the Model of Strategic Learning (Weinstein et

al., 2000). The LASSI's (Weinstein, 1987) scales did not overlap one another (Winne & Perry, 2000).

Item responses for the LASSI (Weinstein, 1987; Weinstein et al., 1987) follow a 5-point Likert-type response format ranging from "not at all typical" to "very much typical" (Winne & Perry, 2000). A total score is not produced. Scale scores for each scale are calculated by adding the responses for each item of each scale (Winne & Perry, 2000), with higher scores indicating more effective strategy use (Weinstein & Palmer, 2002). The LASSI's (Weinstein, 1987) scale scores can be converted to percentile scores by using the chart provided in the scoring protocol so that these scores can be compared to other postsecondary students' scores (Winne & Perry, 2000).

Reliability of the LASSI. Alpha coefficients for the final 77-item LASSI (Weinstein, 1987) scales ranged from .68 to .86 (Winne & Perry, 2000). Several subsequent studies have examined the reliability of the LASSI's scales with internal consistencies ranging from .65 (Study Aids) to .85 (Concentration) ($N = 264$) and .65 (Study Aids) to .86 (Time Management) ($N = 143$) (Olejnik & Nist, 1992); .67 (Study Aids) to .86 (Concentration) (Melancon, 2002); .57 (Study Aids) to .85 (Time Management) (Norwegian version of the LASSI) (Bråten & Olaussen, 1998); .60 (Attitude) to .87 (Motivation) (revised version of the LASSI for a Hong Kong context) (Yip & Chung, 2005); .57 (Study Aids) to .85 (Time Management) ($N = 173$) and .63 (Study Aids) to .84 (Time Management) ($N = 176$) (Norwegian version of the LASSI) (Olaussen & Bråten, 1998); .74 (Study Aids) to .85 (Self-Testing) (Time 1) and .69 (Attitude and Test Strategies) to .85 (Time Management, Anxiety, and Information Processing) (Time 2) (Flowers, 2003); and .40 (Study Aids) to .79 (Time Management) (Deming et al., 1994).

Test-retest reliability (3 weeks) was also examined on the original 77-item LASSI's

scales using 209 students (Weinstein & Palmer, 2002), with the LASSI (Weinstein, 1987) scales'

test-retest reliability ranging from .72 to .85 (Winne & Perry, 2000). Olejnik and Nist (1992)

found test-retest reliabilities (10 week interval) ranging from .37 (Study Aids) to .57 (Time

Management), which the researchers suggested could be lower than the proposed test-retest

reliabilities of the LASSI scales due to the effects of study strategy intervention that was

provided during the 10 week interval. Flowers (2003) reported test-retest reliability (2 week

interval) for the LASSI scales ranging from .55 (Test Strategies) to .76 (Concentration);

however, it was suggested that the test-retest reliability may have been influenced by the study

skills intervention students received, thus making the scores appear as if they may not be stable.

Validity and Factor Structure of the LASSI. Initially, to evaluate the LASSI's validity, the

LASSI's scale scores were examined in comparison to tests or subscales of measures that

assessed similar concepts (Weinstein & Palmer, 2002). For instance, the LASSI's Information

Processing scale and the Inventory of Learning Processes' Elaborative Processing scale

correlated at .60 (Weinstein et al., 1988). Some of the LASSI scales were also validated with

performance instruments (Weinstein & Palmer, 2002). User validity tests were also used to

evaluate the LASSI's validity, with reports of the LASSI's usefulness. The developers have also

used the LASSI in a learning course to assist in identifying students' problem areas, facilitate

remediation and enhancement, and monitor students' progress and the contents of the course

(Weinstein & Palmer, 2002).

Subsequent studies have also been conducted to evaluate the LASSI's validity. For

example, Smith and Smith's (2002) study found that LASSI scale scores were correlated with

test scores, test anxiety, and in general, test motivation. It has also been demonstrated that a

greater amount of LASSI study strategy use is associated with greater perceived ability (Bråten

& Olaussen, 1998). Melancon (2002) correlated LASSI scores with scores on the Personality Preference Self-Description Questionnaire (PPSDQ), a Jungian personality preferences measure, and found that a couple of the LASSI scores (Time Management and Motivation) were correlated with the Personality Preference Self-Description Questionnaire scores (Judging-Perceiving), suggesting moderate relations between being more judgmental and being more conscious about time management and more willing to take responsibility for educational achievement.

Ting, Grant, and Plenert (2000) found that freshmen students' LASSI scores increased significantly after an intervention program. Flowers (2003) supported the use of the LASSI for examining the effects of a study skills and reading course and as an adjunct to other tools for measuring and increasing college students' awareness of their study habits and school performance. Research conducted by Nist et al. (1990) indicated that the LASSI was effective in measuring regularly admitted and developmental university students' affective and cognitive changes after taking a course in study strategies. The regularly admitted students showed significant increases on all of the LASSI scales, and significant predictions on grade point average and semester course grades could be made. With regard to the developmental studies students, significant increases were found for all of the scales of the LASSI perceived as cognitive scales (Information Processing, Self-Testing, Study Aids, Test Strategies, Selecting Main Ideas) and for three out of the five scales that were perceived as affective scales (Anxiety, Time Management, Concentration) (Nist et al., 1990).

Nist et al.'s (1990) regularly admitted college student sample's LASSI data revealed that the Motivation scale and grades in a course on study strategies were predictive of grades for the semester. The data revealed that the Anxiety, Self-Testing, Motivation, and Concentration scales

were moderately correlated to grade point averages for the semester. It was reported that 20% of the variance in regularly admitted students' grade point averages were accounted for by LASSI scores. Some significant correlations between Time Management and Concentration scores and grade point average and between Motivation scores and grades in a study strategies course for the developmental studies student sample were also found (Nist et al., 1990).

Albaili's (1997) study showed that significantly lower scores on the scales of the LASSI were associated with low grade point averages. The results of the study indicated that low grade point average students had significantly lower scores on the scales of the LASSI than average grade point average students and high grade point average students. The LASSI scales that most contributed in separating the low achieving college students and the other two higher achieving college students were Motivation, Information Processing, and Selecting Main Ideas, with Motivation separating the groups with the greatest effectiveness. Overall, it was concluded that students that engage in more of the strategies assessed by the LASSI tend to have better academic success. It was also suggested that higher achieving college students seemed to be taking responsibility for their academic success and giving more effort to engage in the LASSI strategies than the low achieving college students (Albaili, 1997).

Schumacker, Sayler, and Bembry (1995) were able to discriminate successful (grade point average of 2.5 and above) from unsuccessful early entrance college students using LASSI scale scores (i.e., Concentration, Anxiety, Information Processing, and Selecting Main Ideas). Yip and Chung (2005) documented that the Concentration and Motivation scales served as variables that discriminated low and high academic achievers.

Kovach and Wilgosh (1999) found that students with learning disabilities with good academic standing scored significantly greater on the scales of Motivation and Time

Management than the students with learning disabilities on academic probation. Additionally, Grimes (1995) found that scores on the LASSI scales differed significantly by risk level for dropping out of college or academic difficulties (i.e., high-risk = athletes, students with grade point averages lower than a 2.0, students with learning disabilities, and students referred by an instructor for academic difficulties; general-risk = entering orientation students; and low-risk = honors students and pre-medical majors students). In general, the low-risk groups scored significantly higher on the scales (i.e., the low-risk groups had more effective strategies) than the high-risk students (Grimes, 1995).

Although the LASSI is organized and scored using a 10-scale structure for its items, studies have examined the LASSI in terms of its component structure (latent factor structure) using its scales. A latent factor structure composed of three factors, namely Effort-related activities (Motivation, Time Management, Concentration); Goal orientation (Anxiety, Selecting Main Ideas, Test Strategies); and Cognitive activities (Information Processing, Study Aids, Self-Testing), has been suggested using exploratory principal component analysis with promax rotation ($N = 264$) and supported using confirmatory factor analysis ($N = 143$) (Olejnik & Nist, 1992). This finding is consistent with the LASSI being multidimensional and discouraged the use of a total score (Olejnik & Nist, 1992).

Olaussen and Bråten (1998) conducted exploratory factor analyses using principal component analysis on two samples of Norwegian students' scale scores (first year and second year student data samples) on a Norwegian version of the LASSI. Results for the first year sample indicated three components using the Kaiser-Guttman rule and the scree plot. Results of the second year sample's data also supported three components (Olaussen & Bråten, 1998).

Exploratory factor analysis using the principal factor method with oblique rotation (i.e.,

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direct oblimin rotation) was also conducted on the two samples to indicate the specific scales that made up the factors of the LASSI for each sample, which resulted in a three-factor model for both of the samples (Olaussen & Bråten, 1998). For the first year student sample, the first factor included the Motivation, Concentration, Attitude, and Time Management scales; the second factor included the Selecting Main Ideas, Anxiety, and Test Strategies scales; and the third factor included the Study Aids, Information Processing, and Self-Testing scales. These factors were the same as the factors proposed by Olejnik and Nist (1992) for their American sample, except the Attitude scale for the American data had low pattern coefficients with all three of their factors. Olaussen and Bråten's (1998) Norwegian second year students' scores indicated a similar factor structure as the first year students', with the exception of the Concentration scale for the second year sample having high pattern coefficients with the first and the second factors. Olaussen and Bråten (1998) concluded that differences in level of education for their samples did not produce differences in the factor structure for the LASSI, and the factor structure for their Norwegian students was comparable to the factor structure for American students.

Olaussen and Bråten (1998) also conducted a confirmatory factor analysis to examine how well the proposed American model (Olejnik and Nist's model) of the LASSI fit their first year Norwegian student data, which resulted in an inadequate fit. A modified model of the Norwegian first year student data was then explored, which resulted in the following model: effort-related activities - Motivation, Concentration, Time Management, and Attitude (main indicators) and Test Strategies (low correlation with effort-related activities); goal orientation - Test Strategies, Selecting Main Ideas, and Anxiety (main indicators) and Information Processing, Attitude, and Concentration (low correlations with goal orientation); and cognitive activities - Self-Testing, Study Aids, and Information Processing (main indicators) and Selecting Main Ideas

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(low correlation with cognitive activities). Among the latent variables, cognitive activities and effort-related activities had the strongest relationship. The modified model allowed the scales of the LASSI to load onto more than one factor. The modified model's factors were identical to Olejnik and Nist's (1992) factors with only small differences in the relationships between the factors and the scale indicators (i.e., some scales were indicators on more than one factor). The modified model was also supported using Olaussen and Bråten's (1998) second year Norwegian student sample data and using Olejnik and Nist's (1992) data. These analyses supported the LASSI as a multidimensional instrument with scales that assess three latent variables (Olaussen & Bråten, 1998).

Lastly, Cano (2006) used principal component analysis with oblique rotation to explore the factor structure of the LASSI with data collected from 527 freshmen. This analysis resulted in three factors: Affective Strategies (Attitude, Time Management, Concentration, Motivation), Goal Strategies (Anxiety, Attitude, Test Strategies), and Comprehension Monitoring Strategies (Information Processing, Self-Testing, Study Aids). The factor structure was supported using confirmatory factor analysis with 429 college seniors (Cano, 2006).

Only one study (Melancon, 2002) to date examined the LASSI's proposed 10-scale structure at the item level, with principal component analysis with varimax rotation being used. The researcher concluded based on the results of the analysis that the LASSI did not consist of 10 scales. Large correlations among the scales of the LASSI also supported the suggestion that the measure may assess less than 10 variables. Based on the study's results, it was suggested that a different scoring system for the LASSI may be necessary, which may result in fewer, more reliable scale scores (Melancon, 2002).

Pros and Cons of the LASSI. Many have argued for the LASSI's utility in that it is

standardized and normed, has a user's manual, and has a scoring protocol so that it can be self-scored and self-administered (Winne & Perry, 2000). The user's manual also provides suggestions for how LASSI scores can be used (Winne & Perry, 2000). A student's profile of learning and study strategies can also be produced with the LASSI (Winne & Perry, 2000). Additional arguments for the LASSI's use are in terms of its validity (Albaili, 1997; Bråten & Olaussen, 1998; Nist et al., 1990; Smith & Smith, 2002), relevance to studying adult learning models (Olejnik & Nist, 1992), potential use as a research tool (Bråten & Olaussen, 1998; Melancon, 2002; Olejnik & Nist, 1992), ability to track progress of a learning strategies intervention course and students' progress in using learning and study strategies, as well as its usefulness to increase students' awareness and responsibility for their learning and study strategies (Sizoo et al., 2003).

However, there have been some significant concerns raised with respect to the original LASSI, such as the LASSI's having a limited norm sample (Nist et al., 1990), not being generalizable to developmental studies students (Nist et al., 1990), generally not being effective in measuring changes in skills after a semester in a tutoring program (Landrum & Chastain, 1998), and not being predictive of developmental studies students' grades in regular education classes or in a course in study strategies (Nist et al., 1990). However, Bråten and Olaussen (1998) and Olaussen and Bråten (1998) claimed that the scores of the LASSI generalized to their culturally diverse college student sample, with the exceptions of the LASSI's Attitude and Motivation scales (Bråten & Olaussen, 1998, 2000). Moreover, Nist et al. (1990) and Ting et al. (2000) noted that the LASSI was effective in measuring changes after intervention.

Other concerns raised have been with respect to the LASSI's underlying structure. Although the LASSI is proposed as a 10 scale measure with a 10-scale scoring system, Melancon

(2002) suggested that a different scoring system may be necessary, which may encompass fewer scale scores. In addition, Olejnik and Nist (1992), Olaussen and Bråten (1998), and Cano (2006) have proposed three-factor latent factor structures (component structures) for the LASSI's scales that differ from the 3-component structure of the LASSI suggested in the LASSI manual. These criticisms have implications for the second edition of the LASSI.

LASSI, 2nd Edition (LASSI-2)

Revisions to the LASSI were engineered by the developers via a major learning strategies project (Weinstein & Palmer, 2002). The second edition of the LASSI (LASSI-2) was developed in order to improve upon, and also update, the original (Weinstein & Palmer, 2002). Interview data from professionals who worked with or had done research pertaining to students at-risk for academic difficulties were used to help with improving the LASSI (Weinstein & Palmer, 2002). Educational psychometricians were also consulted. Relevant textbooks, research, internet sites, and learning materials were also examined for potential item content (Weinstein & Palmer, 2002), with the initial item pool including 134 items (77 items from the original LASSI along with 57 items developed to improve the original). The items were evaluated by educators and psychologists, which resulted in some items being reworded, some being removed, and new ones being added. The items were randomly ordered to compose the pilot test version of the LASSI-2 (Weinstein & Palmer, 2002).

Based on the results of pilot testing, the developers further refined the measure with respect to item removal, modification, and construction (Weinstein & Palmer, 2002). The new item pool consisted of 166 items (77 from the original LASSI, 29 from the LASSI-2's pilot test version, and 60 newly developed items), with the form being subject to further scrutiny by educators, psychologists, psychometricians, and students in advance of the LASSI-2's field test

(Weinstein & Palmer, 2002).

The LASSI-2 version for field testing and norming was given to students ($N = 1,092$) from 12 colleges of varying geographic locations (Weinstein & Palmer, 2002). Ultimately 80 items were retained for use in the final version of the LASSI-2 (Weinstein & Palmer, 2002). Ten scales (each scale including eight items) were established for the LASSI-2 by including the items that conceptually best captured each scale's conceptual content and the items that produced the best psychometric properties for each scale (Weinstein & Palmer, 2002).

The following learning and study strategy scales comprised the final version of the LASSI-2: Anxiety, Attitude, Concentration, Information Processing, Motivation, Selecting Main Ideas, Self-Testing, Study Aids, Test Strategies, and Time Management (Weinstein & Palmer, 2002). These learning and study strategy scales are reportedly associated with the strategic learning components of will (Motivation, Anxiety, and Attitude), self-regulation (Study Aids, Concentration, Time Management, and Self-Testing), and skill (Selecting Main Ideas, Test Strategies, and Information Processing). Thus, each scale of the LASSI-2 is suggested to be primarily associated with one of these components (Weinstein & Palmer, 2002).

The will component reflects the extent to which students worry about school performance, the extent to which students want to learn and are interested in school, and their degree of perseverance to meet school requirements (Weinstein & Palmer, 2002). The self-regulation component assesses students' management of their learning through organizing their time, remaining focused, monitoring their progress through school tasks and requirements, and utilizing support resources. The skill component describes the LASSI scales associated with learning new information and displaying knowledge of new information (Weinstein & Palmer, 2002).

Because the conceptual basis of each of the components is strategic learning, the manual suggested that interaction and overlap within and among the components and the scales exists (Weinstein & Palmer, 2002). The manual reported inter-scale correlations ranging from .07 (Anxiety and Study Aids) to .79 (Selecting Main Ideas and Test Strategies). However, the manual indicated that learners need to be aware of and use effectively each of the areas assessed by the LASSI-2, with emphasis on some attributes more than others, depending on the task at hand (Weinstein & Palmer, 2002).

More specifically, Weinstein and Palmer (2002) reported that the Motivation scale measures students' willingness to do what it takes to succeed in school. Examples of possessing motivational skills include not getting behind on school assignments, setting goals for achievement, and not quitting when a class or schoolwork is challenging. Students' thoughts about school and school achievement are reflected in the Attitude scale. Having goals for school and believing that school is important are examples of positive attitudes. The Anxiety scale assesses the extent to which a student ruminates about academic achievement and school (e.g., whether worrying about school makes it difficult to stay focused). The use of materials that facilitate the learning of information is measured by the Study Aids scale. Examples of study aids include making tables or diagrams to facilitate the organization of information, attending study sessions, and using textbook support materials to facilitate learning. The Concentration scale assesses the extent to which a student can focus on schoolwork, including how well a student stays on task in class and while studying. The degree to which students organize their time wisely for school requirements is measured by the Time Management scale. Examples of this skill encompass how well one organizes one's time, even when one has multiple school obligations. Additional examples include setting goals and the plans to accomplish these goals,

as well as making a schedule for studying (Weinstein & Palmer, 2002).

With respect to the remaining LASSI-2 scales, the extent to which students evaluate their comprehension during learning is addressed by the Self-Testing scale (Weinstein & Palmer, 2002). Checking one's understanding as one reads and reviewing lecture notes characterize this area. The Selecting Main Ideas scale captures students' ability to recognize more important information from surrounding details. Examples of this skill include taking notes in class on important concepts and highlighting important text while reading. The Test Strategies scale assesses exam taking strategies (e.g., checking over one's test responses before turning in a test). Finally, the effectiveness of students' use of strategies to facilitate the learning of new topics and to connect what is known with new information is measured by the Information Processing scale. Examples from this scale include being able to summarize what is read and make analogies (Weinstein & Palmer, 2002).

Overall, in its final form, the LASSI-2 is a self-report instrument that assesses students' attitudes, beliefs, motivations, and behaviors associated with learning, that are changeable through intervention (Weinstein & Palmer, 2002). In general, it measures the extent to which students are aware of and use various learning and study strategies. It takes about 15 to 20 minutes to complete and about 10 minutes to hand score. Item responses for the LASSI-2 follow a 5-point Likert-type format ranging from "not at all typical" to "very much typical," with about half of the LASSI-2's items being reverse scored. The LASSI-2 produces 10 raw scores that correspond to each of its 10 scales. Raw scores are calculated by adding the responses for each item of each scale, producing scores that range from eight to 40. These scores are then converted to percentiles by using the chart provided in each LASSI-2 protocol. A percentile higher than 75th indicates that the skill area does not require improvement; whereas, a score in the 75th to 50th

percentile range suggests that enhancement in that particular LASSI-2 skill area should be considered. A score lower than the 50th percentile reflects a need for intervention in the respective area. Thus, via the analysis of the scores of the 10 scales, the LASSI-2 provides information to students about their areas of strength, highlighting areas of difficulty that may benefit from focused intervention (Weinstein & Palmer, 2002).

Reliability of the LASSI-2. With regard to reliability, Weinstein and Palmer (2002) reported that the LASSI-2 scales' coefficient alphas ranged from .73 (Study Aids) to .89 (Selecting Main Ideas). Subsequent studies have reported alphas ranging from .66 (Study Aids) to .89 (Time Management) (Kirby, Silvestri, Allingham, Parrila, & La Fave, 2008), .66 (Study Aids) to .91 (Selecting Main Ideas) (Prevatt, Petscher, Proctor, Hurst, & Adams, 2006), and from .67 (Attitude) to .87 (Anxiety) (first-generation Asian American students), .59 (Study Aids) to .85 (Selecting Main Ideas) (beyond-first-generation Asian American students), and .63 (Study Aids) to .91 (Selecting Main Ideas) (European American students) (Schommer-Aikins & Easter, 2008).

Validity and Factor Structure of the LASSI-2. Concerning the validity of the LASSI-2, the manual (Weinstein & Palmer, 2002) reported that the measure's concepts have been found to have a significant effect on learning successfully in college. Subsequent research supported the notion that the LASSI-2 study skills are related to academic performance. Schommer-Aikins and Easter (2008) found that the LASSI-2's Concentration scale significantly predicted business communication course grades, and Test Strategies and Study Aids scores significantly predicted reading comprehension scores. Proctor et al. (2006) found that different categories of students having difficulty in college shared similar learning and study skills profiles as assessed by the LASSI-2. In general, the students that were having academic difficulty [i.e., students with low

GPA's (less than 2.5), students who were referred for a psychoeducational evaluation at the university clinic who were subsequently diagnosed with a learning disability, and students who were referred for a psychoeducational evaluation at the university clinic who were not subsequently diagnosed with a learning disability] all had weaknesses as compared to their comparison groups in Anxiety, Concentration, Motivation, Selecting Main Ideas, and Test Strategies (Proctor et al., 2006).

With regard to the structure of the LASSI-2, as noted above, Weinstein and Palmer (2002) proposed that it consists of 10 scales that are associated with three components (i.e., will, self-regulation, and skill) of the conceptual construct of strategic learning. As of this date, only one study (Prevatt et al., 2006) has been published with regard to the LASSI-2's factor structure. Prevatt et al. (2006) examined their LASSI-2 data to determine if it supported the theoretical strategic learning component model (i.e., will component: Motivation, Anxiety, and Attitude scales; self-regulation component: Study Aids, Concentration, Time Management, and Self-Testing scales; skill component: Selecting Main Ideas, Test Strategies, and Information Processing scales) proposed for the measure by its developers, or the three-factor structure (i.e., Effort-related activities: Motivation, Concentration, Time Management, Attitude, and Test Strategies; Goal orientation: Test Strategies, Selecting Main Ideas, Anxiety, Information Processing, Attitude, and Concentration; Cognitive activities: Self-Testing, Study Aids, Information Processing, and Selecting Main Ideas) proposed by Olaussen and Bråten (1998) in their research focusing on the original LASSI.

Prevatt et al. (2006) conducted confirmatory factor analyses (CFA) with maximum likelihood estimation using LISREL 8.51 on data from 297 undergraduate college students. Factors of the CFA for the Weinstein and Palmer model were not allowed to correlate and the

Olaussen and Bråten model's factors were allowed to be correlated. The results of the confirmatory analyses supported Olaussen and Bråten's (1998) three-factor model, and with some modifications, the model resulted in a better fit for their data (Prevatt et al., 2006). The results did not support Weinstein and Palmer's (2002) theoretical three-component model (Prevatt et al., 2006). These data suggest the need for further research with respect to the measure's underlying dimensionality. For example, as of this time, no studies have been published which examine the LASSI-2's underlying factor structure at the item to scale level.

Pros and Cons of the LASSI-2. Many have argued for the LASSI-2's use in terms of its simple and brief administration and scoring process, as well as its ability to enhance students' awareness about their studying and learning weaknesses and strengths, and identify areas that may need intervention. In addition, the LASSI-2 has apparent utility in planning the development and enhancement of skills on an individual basis, helping teachers monitor students' skills and provide enhancement when needed, measuring the effects of classes or interventions promoting learning and study strategies, monitoring changes in learning and study strategies, and advising students (Weinstein & Palmer, 2002).

The LASSI-2 is also useful as an adjunct to clinical interviews in psychoeducational assessments at the college level. However, one significant concern raised with respect to the LASSI-2 is that the proposed theoretical strategic component model (i.e., will: Motivation, Anxiety, and Attitude scales; self-regulation: Study Aids, Concentration, Time Management, and Self-Testing scales; skill: Selecting Main Ideas, Test Strategies, and Information Processing scales) has not been supported (Prevatt et al., 2006), pointing to the need for further research. Thus, because some research studies (Cano, 2006; Melancon, 2002; Olaussen & Bråten, 1998; Olejnik & Nist, 1992; Prevatt et al., 2006) have documented different factor structures for either

the original LASSI or the 2nd edition, there is a clear need for factor-analytic studies of the LASSI-2 in order to better understand its underlying dimensionality. This need is especially apparent at the item to scale level (i.e., the arrangement of items per scale in order to further support how scores are generated).

II. THE PRESENT STUDY

As noted above, some research studies have documented differing factor structures for the LASSI, with implications for the LASSI-2; however, little research has been conducted with the LASSI-2, with only one study having been published with regard to the measure's factor structure (and indeed, this study did not focus on the item to scale level). Thus, the present study sought to provide a better understanding of the LASSI-2's factor structure and to expand its psychometric properties (i.e., means, standard deviations, alpha coefficients, and correlations of the LASSI-2 scales' raw scores) with a sample of college students. Raw scores of the LASSI-2 scales were also evaluated by sex to examine for potential differences. Because a 10-scale structure (eight items per scale) has been proposed in the manual, the current study utilized confirmatory factor analysis, employing this framework with the student data. Based on the available literature, it was hypothesized that the 10-scale structure of the LASSI-2 would not be supported via confirmatory factor analysis. It was also hypothesized that males would score significantly higher on the Anxiety scale and females would score significantly higher on the scales of Motivation, Study Aids, and Time Management. It should be noted that sex differences on other scales were also possible and were therefore examined (e.g., less consistent sex differences have been found in which males scored higher on the Information Processing scale and females scored higher on the Concentration, Attitude, and Self-Testing scales).

III. METHOD

Participants

Participants in the present study included 420 students enrolled in psychology courses at The University of Mississippi. Of the 417 students who reported their age, the mean age was 19.46 years (*SD* = 1.72), with age ranging from 18 to 33 years. Among the 417 participants who reported their sex, 165 (39.6%) were male and 252 (60.4%) were female. Of the 416 students who reported their race/ethnicity, 77.9% (*n* = 324) were White; 16.1% (*n* = 67) were African American; 1.2% (*n* = 5) were Hispanic/Latino American; 2.2% (*n* = 9) were Asian American/Pacific Islander; and 2.6% (*n* = 11) were biracial/multiracial. Among the 417 participants who reported their academic classification, 67.6% (*n* = 282) were freshman, 14.4% (*n* = 60) were sophomore, 10.1% (*n* = 42) were junior, 7.7% (*n* = 32) were senior, and .2% (*n* = 1) noted other. The study was offered as either course credit or extra credit.

Measures

Demographic Data Sheet (Appendix). A demographic form was used to gather information such as age, sex, race/ethnicity, major, and academic classification.

Learning and Study Strategies Inventory, Second Edition. The Learning and Study Strategies Inventory, Second Edition (LASSI-2; Weinstein & Palmer, 2002) was used to assess learning and study strategies. It includes 80 items representing 10 scales (eight items per scale). Item responses reflect a 5-point Likert-type format. The measure produces 10 raw scores that correspond to the 10 scales. Raw scores are calculated by adding the responses for each item of each scale, producing scale scores that range from eight to 40, with higher scores indicating more

effective strategy use (Weinstein & Palmer, 2002).

Procedure

The present study was a part of a larger study of learning and study strategies and perceived meaning and purpose in life, as well as other variables such as those related to positive psychology. The data collection was conducted at The University of Mississippi in a classroom setting, in a group administration format (up to 55 people per session). Data were collected by the primary investigator along with graduate and undergraduate research assistants. Each data collection session was approximately one hour, earning participants one hour toward course credit requirements or extra credit. Informed consent was obtained from respondents prior to their participation, consistent with the policies of The University of Mississippi's Institutional Review Board. Participants were allowed to discontinue participation at any time and without penalty. To address the potential effects of administration order, measures were counterbalanced.

Data were entered into SPSS. Demographic data of the sample (see above Participants section) were obtained, and descriptive statistics (e.g., means and standard deviations of the LASSI-2's raw scale scores), internal consistency reliability coefficients for the 10 scales, and correlations among the scales were calculated. The LASSI-2's raw scale scores were evaluated by sex (via *t* tests) to examine for potential differences. To evaluate effect sizes, Cohen's *d* was also calculated.

Further, confirmatory factor analysis was utilized with maximum likelihood estimation. Amos 6.0 software was used to examine the 10-scale model (item to scale structure) with the college student data. Fit indices were chosen a priori to determine whether the model is a good fit to the data, and include the goodness of fit index (GFI; Jöreskog & Sörbom, 1981), the adjusted goodness of fit index (AGFI; Jöreskog & Sörbom, 1989), the comparative fit index (CFI;

Bentler, 1990), the Tucker-Lewis index (TLI; Bentler & Bonett, 1980), the normed fit index (NFI; Bentler & Bonett, 1980), the root mean square error of approximation (RMSEA; Steiger, 1990), the root mean square residual (RMSR; Jöreskog & Sörbom, 1981), and the ratio of chi-square to degrees of freedom (Hoelter, 1983). The GFI, AGFI, CFI, TLI, and NFI values usually range from 0 to 1.0, with reasonable fit reflected by values of .90 or greater (with some asserting that values should meet or exceed .95) (Brown, 2006; Bryant & Yarnold, 1995; Hair, Black, Babin, Anderson, & Tatham, 2006; Hoyle, 2000; Kline, 2005; Thompson, 2004). Smaller values of RMSEA and RMSR indicate better model fit. Specifically, values of .06 and lower are desired (Brown, 2006; Browne & Cudeck, 1993; Bryant & Yarnold, 1995; Thompson, 2004). RMSEA is typically reported with a 90% confidence interval; therefore, these data were also calculated. For the ratio of chi-square to degrees of freedom, ratios less than 3 and approaching zero are interpreted as suggesting reasonable model fit (Bollen, 1989; Brown, 2006; Bryant &Yarnold, 1995; Hair et al., 2006; Hoelter, 1983).

In order to be objective in utilizing the above eight fit indices as determinants of whether the 10-scale structure proposed in the LASSI-2 manual is a good/acceptable structure, a decision rule was established. More specifically, for the present study, the criteria for a good/acceptable scale structure was established as being if the 10-scale structure's fit indices met the standards of reasonable model fit for at least six of the eight fit indices that were chosen a priori with one of these indices being RMSEA.

IV. RESULTS

Psychometric Properties of the LASSI-2 Raw Scale Scores

Descriptive statistics were calculated for the 10 LASSI-2 scales with the current data ($N =$ 420). These data are presented in Table 1. Table 1 includes scale names; brief scale descriptions; and means, standard deviations, and alpha coefficients. Means for the present data tended to range from a low of 22.15 (Time Management) to a high of 30.36 (Motivation). In general, the current study's LASSI-2 scales' means appeared comparable to the means reported in the LASSI-2 manual and studies in the literature examining the LASSI-2. Additionally, the current study's LASSI-2 alpha coefficients tended to range from a low of .64 (Study Aids) to a high of .85 (Motivation), which seems in general to be comparable to the overall range of alphas reported in the LASSI-2's manual and other studies in the literature examining the LASSI-2. In the present study, there were five scales with reliabilities above .80 (i.e., Anxiety, Concentration, Motivation, Selecting Main Ideas, and Time Management), four with reliabilities between .70 and .79 (i.e., Attitude, Information Processing, Self-Testing, and Test Strategies), and one scale with a reliability below .69 (i.e., Study Aids).

Correlations Between the LASSI-2 Raw Scale Scores

Correlations among the LASSI-2 scales were calculated with the current data. These data are presented in Table 2. All correlations among the scales were statistically significant except the relationships between Anxiety and Information Processing (.08), Anxiety and Self-Testing (.06), and Anxiety and Study Aids (-.03). The significant correlations among the scales ranged from .12 (Study Aids and Test Strategies) to .73 (Selecting Main Ideas and Test Strategies), with

Table 1

Names, Brief Descriptions, Means, Standard Deviations, and Alpha Coefficients of the LASSI-2 Scales

Scale Name	Brief Description	*M*	*SD*	Alpha
Anxiety	Extent to which a student ruminates about academic achievement and school	24.75	6.61	.81
Attitude	Students' thoughts about school and school achievement	29.81	5.19	.72
Concentration	Extent to which a student can focus on schoolwork	24.14	5.86	.82
Information Processing	Effectiveness of students' use of strategies to facilitate the learning of new topics and to connect what is known with new information	27.31	5.35	.78
Motivation	Students' willingness to do what it takes to succeed in school	30.36	5.70	.85
Self-Testing	Extent to which students evaluate their comprehension during learning	23.33	5.83	.77
Selecting Main Ideas	Students' ability to recognize more important information from surrounding details	27.86	5.66	.83

Scale Name	Brief Description	*M*	*SD*	Alpha
Study Aids	Use of materials that facilitate the learning of information	23.91	5.07	.64
Time Management	Degree to which students organize their time wisely for school requirements	22.15	6.51	.82
Test Strategies	Use of strategies for preparing for and taking tests	28.67	5.28	.76

Table 2

Correlations Between the LASSI-2 Scales

Scale Name	1	2	3	4	5	6	7	8	9	10
1. Anxiety	__	.30**	.48**	.08	.30**	.06	.55**	-.03	.25**	.59**
2. Attitude		__	.57**	.35**	.62**	.34**	.50**	.32**	.46**	.52**
3. Concentration			__	.34**	.55**	.35**	.62**	.30**	.64**	.60**
4. Information Processing				__	.44**	.60**	.35**	.41**	.29**	.29**
5. Motivation					__	.44**	.52**	.38**	.55**	.53**
6. Self-Testing						__	.30**	.53**	.51**	.23**
7. Selecting Main Ideas							__	.21**	.39**	.73**
8. Study Aids								__	.45**	.12*
9. Time Management									__	.38**
10. Test Strategies										__

*p < .05, two-tailed. **p < .01, two-tailed.

all statistically significant relationships being in the positive direction, as would be expected. That is, among the scales that were significantly correlated, the tendency was that as students reported more use of one learning and study strategy, they also reported more use of another learning and study strategy and vice versa, which was as expected given that the LASSI-2's manual reported correlations in the positive direction.

Sex Differences in Raw Scores of the LASSI-2 Scales

The results of the analyses to examine for potential sex differences in the raw scores of the LASSI-2 scales and effect sizes are presented in Table 3. The results were as follows. Males scored statistically higher on the Anxiety scale than females; however, females scored statistically higher on the Study Aids scale than males. Sex also had a statistically significant effect on Attitude scale raw scores, such that females scored higher on this scale than males. However, the effect sizes for these statistically significant effects reflected only moderately small differences, practically speaking, between the scores of males and females on these scales. With regard to the remaining LASSI-2 scales, females and males did not score statistically different on the Motivation, Time Management, Concentration, Information Processing, Self-Testing, Test Strategies, or Selecting Main Ideas scales.

Factor Structure of the LASSI-2

The 10-scale structure (item to scale structure) of the LASSI-2 that was proposed in its manual was examined via confirmatory factor analysis with maximum likelihood estimation. Amos 6.0 software was used to examine the 10-scale model (item to scale structure) with the college student data. The fit indices for the 10-scale structure are presented in Table 4. The 10-scale structure was not sufficiently supported. That is, the 10-scale structure did not meet the present study's established criteria for a good/acceptable scale structure (i.e., fit indices meeting

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Table 3

Sex Differences in the LASSI-2 Scales

Scale	Males: M (SD)	Females: M (SD)	df	t	p	d
Anxiety	25.94 (6.28)	23.98 (6.76)	415	2.98[+++]	< .005	.30
Attitude	28.99 (5.13)	30.35 (5.20)	415	-2.62**	.01	-.26
Concentration	24.38 (5.69)	23.97 (6.01)	415	.69	.49 (two-tailed)	.07
Information Processing	27.17 (5.18)	27.38 (5.49)	415	-.39	.69 (two-tailed)	-.04
Motivation	29.94 (6.03)	30.64 (5.51)	415	-1.23	.11 (one-tailed)	-.12
Self-Testing	23.41 (5.83)	23.28 (5.87)	415	.22	.83 (two-tailed)	.02
Selecting Main Ideas	28.54 (5.34)	27.47 (5.83)	415	1.89	.06 (two-tailed)	.19
Study Aids	22.75 (5.05)	24.61 (4.96)	415	-3.73[++++]	< .001	-.37
Time Management	21.85 (6.36)	22.31 (6.63)	415	-.70	.24 (one-tailed)	-.07
Test Strategies	28.99 (5.31)	28.45 (5.28)	415	1.03	.31 (two-tailed)	.10

*p < .05, two-tailed. **p < .01, two-tailed. [+]p < .05, one-tailed. [++]p < .01, one-tailed. [+++]p < .005, one-tailed. [++++]p < .001, one-tailed.

Table 4

Fit Indices for the Factor Structure of the LASSI-2

Scale Structure	GFI	AGFI	CFI	TLI	NFI	RMSEA (90% CI)	RMSR	χ^2/df
10-Scale Structure of the LASSI-2	.70	.68	.74	.73	.60	.05 (.049 - .052)	.10	2.08
Anxiety Scale Structure	.96	.93	.95	.93	.93	.08 (.057 - .096)	.07	3.41
Attitude Scale Structure	.97	.95	.95	.93	.92	.05 (.032 - .075)	.05	2.21
Concentration Scale Structure	.95	.91	.93	.91	.92	.09 (.069 - .107)	.06	4.20
Information Processing Scale Structure	.95	.91	.91	.87	.89	.09 (.072 - .110)	.06	4.42
Motivation Scale Structure	.95	.92	.95	.93	.93	.08 (.065 - .103)	.04	3.92
Self-Testing Scale Structure	.79	.62	.62	.47	.61	.21 (.192 - .229)	.19	19.52
Selecting Main Ideas Scale Structure	.94	.89	.91	.87	.89	.11 (.089 - .127)	.06	5.84
Study Aids Scale Structure	.97	.95	.90	.86	.85	.06 (.040 - .082)	.06	2.54
Time Management Scale Structure	.93	.88	.91	.88	.90	.11 (.087 - .124)	.08	5.64
Test Strategies Scale Structure	.97	.95	.96	.95	.93	.05 (.032 - .075)	.05	2.21

Note. GFI = goodness of fit index; AGFI = adjusted goodness of fit index; CFI = comparative fit index; TLI = Tucker-Lewis index; NFI = normed fit index; RMSEA (90% CI) = root mean square error of approximation (90% confidence interval); RMSR = root mean square residual; χ^2/df = ratio of chi-square to degrees of freedom.

the standards of reasonable model fit for at least six of the eight fit indices that were chosen a priori with one of these indices being RMSEA). More specifically, only two of the fit indices (i.e., RMSEA and the ratio of chi-square to degrees of freedom) suggested reasonable model fit, well below the present study's established decision rule/criteria for a good/acceptable structure. GFI, AGFI, CFI, TLI, and NFI ranged from .60 (NFI) to .74 (CFI), well below the suggested criteria for reasonable model fit (e.g., Brown, 2006; Bryant & Yarnold, 1995; Hair et al., 2006; Hoyle, 2000; Kline, 2005; Thompson, 2004). The RMSR value was .10, above the criterion suggested for reasonable model fit (e.g., Brown, 2006; Browne & Cudeck, 1993; Bryant & Yarnold, 1995; Thompson, 2004).

In an attempt to further understand the LASSI-2's factor structure, the scales were examined individually via confirmatory factor-analytic methods. While such an approach was done in a post hoc fashion, it is consistent with how the measure is scored and interpreted. The present study's established decision rule for the criteria for a good/acceptable scale structure continued to be utilized with the post hoc analyses (i.e., a good/acceptable scale structure is one with fit indices that meet the standards of reasonable model fit for at least six of the eight fit indices that were chosen a priori with one of these indices being RMSEA). These results are also presented in Table 4. Results indicated that the Anxiety, Attitude, Study Aids, and Test Strategies scales had good/acceptable scale structures according to the present study's established criteria for good/acceptable scale structures; whereas the Concentration, Information Processing, Motivation, Self-Testing, Selecting Main Ideas, and Time Management scales did not result in meeting the present study's criteria for good/acceptable scale structures.

Among the four scales that demonstrated good/acceptable scale structures, all fit indices examined for the Attitude and Test Strategies scales' structures were suggestive of reasonable

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model fit. For the Anxiety scale structure, six of the fit indices (i.e., GFI, AGFI, CFI, TLI, NFI, and the lower 90% confidence interval of RMSEA) suggested reasonable model fit. The RMSR and ratio of chi-square to degrees of freedom values were .07 and 3.41 respectively, above the respective criteria suggested for reasonable model fit. The Study Aids scale structure also resulted in six of the fit indices (i.e., GFI, AGFI, CFI, RMSEA, RMSR, and the ratio of chi-square to degrees of freedom) being suggestive of reasonable model fit. The values for TLI and NFI were .86 and .85 respectively, below the suggested criteria for reasonable model fit.

For the remaining scales' structures, which did not meet the present study's criteria for good/acceptable scale structures, none of the fit indices examined for the Self-Testing scale structure were suggestive of reasonable model fit. GFI, AGFI, CFI, TLI, and NFI ranged from .47 (TLI) to .79 (GFI), well below the suggested criteria for reasonable model fit. RMSEA (.21 with a 90% confidence interval of .192 - .229) and RMSR (.19) were above the criteria suggested for reasonable model fit. Additionally, the ratio of chi-square to degrees of freedom value was 19.52, well above the criterion suggested for reasonable model fit.

The Selecting Main Ideas scale structure resulted in three fit indices (i.e., GFI, CFI, and RMSR) being suggestive of reasonable model fit. AGFI (.89), TLI (.87), and NFI (.89) were below the suggested criterion for reasonable model fit. RMSEA (.11 with a 90% confidence interval of .089 - .127) and the ratio of chi-square to degrees of freedom (5.84) were above the respective criteria suggested for reasonable model fit. The Time Management scale structure also resulted in only three of the fit indices (i.e., GFI, CFI, and NFI) being suggestive of reasonable model fit. The AGFI and TLI values were both .88, below the suggested criteria for reasonable model fit. The RMSEA (.11 with a 90% confidence interval of .087 - .124), RMSR (.08), and ratio of chi-square to degrees of freedom (5.64) values were above the criteria suggested for

reasonable model fit. The Information Processing scale structure resulted in four of the fit indices (i.e., GFI, AGFI, CFI, and RMSR) being suggestive of reasonable model fit. The TLI and NFI values were .87 and .89 respectively, below the suggested criteria for reasonable model fit. RMSEA (.09 with a 90% confidence interval of .072 - .110) and the ratio of chi-square to degrees of freedom (4.42) were above the respective criteria suggested for reasonable model fit.

For the Concentration and Motivation scales' structures, six of the fit indices (i.e., GFI, AGFI, CFI, TLI, NFI, and RMSR) suggested reasonable model fit. The RMSEA (Concentration: .09 with a 90% confidence interval of .069 - .107, Motivation: .08 with a 90% confidence interval of .065 - .103) and ratio of chi-square to degrees of freedom (Concentration: 4.20, Motivation: 3.92) values were above the respective criteria suggested for reasonable model fit.

V. DISCUSSION

Psychometric Properties of the LASSI-2 Raw Scale Scores

Given that little research has been conducted with the LASSI-2, the present study sought to expand the LASSI-2's psychometric properties (e.g., means, standard deviations, alpha coefficients) with a sample of university students. The means of the 10 LASSI-2 scales for the current data appeared comparable to the means reported in the LASSI-2 manual and studies in the literature examining the LASSI-2. The current study's LASSI-2 scales' standard deviations ranged from 5.07 (Study Aids) to 6.61 (Anxiety), which was within the overall range of standard deviations reported in the LASSI-2's manual and other studies in the literature examining the LASSI-2. Additionally, the range of the current study's LASSI-2 scales' alpha coefficients was within the overall range of alphas reported in the LASSI-2's manual and other studies in the literature examining the LASSI-2.

Correlations Between the LASSI-2 Raw Scale Scores

The present study's correlational analyses also further expanded the psychometric properties of the LASSI-2. The range of the correlations among the LASSI-2 scales in the current study was from -.03 (Anxiety and Study Aids) to .73 (Selecting Main Ideas and Test Strategies), which is comparable to the range of correlations that the LASSI-2 manual reported, ranging from .07 (Anxiety and Study Aids) to .79 (Selecting Main Ideas and Test Strategies). In general, most of the scales were related to one another as was expected given that the LASSI-2 manual suggested that there would be an association among the scales. Among the current study's correlations, only three of them were not statistically significant; that is, the relationships

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between Anxiety and Information Processing (.08), Anxiety and Self-Testing (.06), and Anxiety and Study Aids (-.03) were not statistically significant. The remaining correlations were statistically significant and in the positive direction, as was expected. That is, among the scales that were significantly correlated, the tendency was that as students reported more use of one learning and study strategy, they also reported more use of another learning and study strategy and vice versa, which was as expected given that the LASSI-2's manual reported correlations that were all in the positive direction. This positive trend is also consistent with a subsequent study (Prevatt et al., 2006) that reported correlations among the LASSI-2 scales, ranging from .00 to .83.

Sex Differences in Raw Scores of the LASSI-2 Scales

The present study also evaluated the LASSI-2 scales by sex to examine for potential differences, and the present study hypothesized that males would score significantly higher on the Anxiety scale and females would score significantly higher on the scales of Motivation, Study Aids, and Time Management. It was also noted that sex differences on other scales were also possible, although these potential sex differences were not hypothesized in the current study given that these sex differences had not been as consistently found in the literature (e.g., less consistent sex differences have been found in which males scored higher on the Information Processing scale and females scored higher on the Concentration, Attitude, and Self-Testing scales).

Analyses of the present data suggest that there are statistically significant sex differences among some of the learning and study strategies that the LASSI-2 scales assess. Namely, as hypothesized, males scored significantly higher on the Anxiety scale than females, and females scored significantly higher on the Study Aids scale than males. These findings are consistent

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with the literature for both the LASSI and the LASSI-2. The findings suggest that males are less anxious about academics than females and that females use more study aids such as tables, diagrams, textbooks, and study sessions to help them learn academic material than males. Additionally, the data reflected that there is a statistically significant sex difference in the raw scores of the Attitude scale, suggesting that female students have more positive attitudes about school and its importance than male students. This sex difference has been found in previous studies, although this sex difference has not been found consistently in all of the previous studies examining sex differences.

It should be noted that although the present study's data suggest that there are statistically significant differences in the Anxiety, Study Aids, and Attitude scales, these differences did not seem to be practically/clinically significant. That is, the effect sizes for these scales suggested that there are only moderately small differences on these scales' scores for males and females, suggesting that the scores of males and females on these scales have large overlap. Additionally, when converting the mean male and mean female scores for each statistically significant scale to their percentile scores, according to the scoring instructions provided in the LASSI-2 protocol, and then comparing the male percentile with the female percentile score for each scale, it was found that both scores fell in the same interpretative category (e.g., they fell in the category of scores at the 50th percentile or below which are interpreted as learning and study strategy areas that need improvement in order for the skills areas to more likely facilitate in college success). Thus, although there were statistically significant sex differences on the Anxiety, Study Aids, and Attitude scales, users of the LASSI-2 should not be alarmed by these findings because practically/clinically speaking these differences are not significant and thus from an interpretative standpoint, on average males and females would typically fall in the same

interpretative category.

With regard to the remaining LASSI-2 scales, the present data suggest that there are no
statistically significant differences between males and females on the LASSI-2 scales of
Motivation, Time Management, Concentration, Information Processing, Self-Testing, Selecting
Main Ideas, and Test Strategies. Thus, contrary to what was predicted, females did not score
statistically higher than males on the Motivation or Time Management scales. This is generally
inconsistent with the literature. That is, there are studies that have found these sex differences,
but not all studies have. Additionally, there is limited literature (e.g., Schommer-Aikins &
Easter, 2008) examining sex differences using the second edition of the LASSI, the edition
examined in the present study, thus a trend for these sex differences may not yet be established.
For example, Schommer-Aikins and Easter (2008) found sex differences in the Study Aids, Time
Management, Attitude, and Anxiety scales; whereas, the current study revealed similar sex
differences with the exception of the Time Management scale. The other non-significant sex
differences found for the present data are relatively consistent with the literature. For example,
there seems to be no evidence in the literature for statistically significant sex differences for the
Selecting Main Ideas and Test Strategies scales. In addition, although sex differences have been
found for the Concentration, Information Processing, and Self-Testing scales, these sex
differences were not consistently found in all of the studies examining sex differences, and
additionally these sex differences were found in studies examining the first edition of the LASSI
(e.g., Bråten & Olaussen, 1998; Grimes, 1995; Kovach & Wilgosh, 1999; Sizoo et al., 2003), as
opposed to the second edition.

Factor Structure of the LASSI-2

Given that only one study has been published with regard to the LASSI-2's factor

structure (and indeed, this study did not focus on the item to scale level for which the measure is scored), the present study sought to provide a better understanding of the LASSI-2's factor structure by utilizing confirmatory factor analysis. More specifically, because a 10-scale structure (eight items per scale) has been proposed in the LASSI-2's manual, the current study utilized confirmatory factor analysis, employing this framework with the present student data. Based on the available literature, it was hypothesized that the 10-scale structure of the LASSI-2 would not be supported via confirmatory factor analysis.

As hypothesized, in the present study, the 10-scale structure proposed by the LASSI-2's manual was not sufficiently supported. This is consistent with the results of the one study (i.e., Melancon, 2002) to date that examined the proposed 10-scale structure (however using the first edition of the LASSI) that suggested that its data did not support a 10-scale structure. Although the 10-scale structure did not meet the present study's established criteria for a good/acceptable scale structure (i.e., fit indices meeting the standards of reasonable model fit for at least six of the eight fit indices that were chosen a priori with one of these indices being RMSEA), the fact that two of the 10-scale model's indices, one being RMSEA, met the standards of reasonable model fit suggested that the 10-scale structure was not a complete failure and that it seemed to warrant further investigation. Thus, in an attempt to further understand the LASSI-2's factor structure in a way that is consistent with how the measure is scored and interpreted, post hoc analyses were conducted in which the LASSI-2 scales were examined individually via confirmatory factor-analytic methods.

Results of the present study indicated that the Anxiety, Attitude, Study Aids, and Test Strategies scales have good/acceptable scale structures according to the present study's established criteria for good/acceptable scale structures; whereas, the Concentration, Information

Processing, Motivation, Self-Testing, Selecting Main Ideas, and Time Management scales did not meet the present study's criteria for good/acceptable scale structures. Whereas, after Melancon's (2002) analysis did not support a 10-scale structure, the researcher suggested that less than 10 scales are represented by the LASSI; in contrast, after the present study's initial confirmatory factor analysis did not sufficiently support a 10-scale structure for its LASSI-2 data, the present study conducted post hoc analyses in which the findings seemed to shed light on the initial analysis, suggesting that some of the 10 scales of the LASSI-2 are more or less structurally sound than others, according to the fit indices that were chosen a priori and the present study's criteria for good/acceptable scale structures. That is, according to the post hoc analyses, the fit indices for each individual scale ranged from all of the selected fit indices being suggestive of reasonable model fit (i.e., Attitude and Test Strategies scales), indicative of these scales as being the most structurally sound, to none of the selected fit indices being suggestive of reasonable model fit (i.e., Self-Testing), suggesting this scale as being the least structurally sound, according to the present study's criteria for good/acceptable scale structure.

More specifically, the Anxiety, Attitude, Study Aids, and Test Strategies scales all have good/acceptance structural support, according to the fit indices chosen a priori and the present study's criteria for good/acceptable structure, with six or more of the fit indices consistently meeting the standards of reasonable model fit; however, the Attitude and Test Strategies scales seem to especially stand out as having solid structures with strong structural support, with all of their fit indices consistently meeting the standards of reasonable model fit. In contrast, the Self-Testing scale clearly has poor structure, with none of its fit indices being indicative of reasonable model fit. The remaining scales' structures seem to be in between these two extremes, in that their evidence for structural support is insufficient given the present study's criteria but at the

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same time there is not a lack of support by all of the fit indices as with the Self-Testing scale. However, even among these mediocre scales, some seem to be more or less structurally sound than others. For example, the Concentration and Motivation scales both resulted in six fit indices being indicative of reasonable model fit but neither of these scales' RMSEA values were of reasonable fit, making them fall just short of the present study's criteria for good/acceptable scale structures; however, the fact that six fit indices consistently demonstrated good model fit is indicative that these two scales are more structurally sound than the remaining scales of Information Processing, Selecting Main Ideas, and Time Management, which resulted in only three or four fit indices being indicative of reasonable model fit.

Overall, it is suggested that the four scales (Anxiety, Attitude, Study Aids, and Test Strategies) meeting the present study's criteria for good/acceptable scale structure are the scales that users of the LASSI-2 can be the most confident in using, interpreting, and making recommendations; however, users should be slightly less confident in the Concentration and Motivation scales (the scales with six fit indices reflecting reasonable model fit without RMSEA being one of these indices) and even more cautious with regard to the other mediocre scales (Information Processing, Selecting Main Ideas, and Time Management), which have even less structural support. Lastly, with regard to the Self-Testing scale, of which none of its fit indices were suggestive of reasonable model fit, it is suggested that users should take extreme caution.

In sum, with the scales that have been considered in this study to have exhibited good/acceptable structures, users can be the most confident that these scales are assessing students' anxiety, attitude, use of study aids, and test strategies and can thus interpret these scales as such and base recommendations for any deficits in these areas on the general skills area that each assesses. However, as the other scales demonstrate less support for their scales' structures

(i.e., as scales stray further and further away from meeting the present study's criteria for good/acceptable scale structure), users should demonstrate more and more caution in using, interpreting, and giving recommendations for each of these scales based on the general skills areas that they reportedly assess and instead perhaps should base any interpretations or recommendations they may have for improving skills deficits in these skills areas on an item level basis (i.e., base interpretations and make recommendations based on weaknesses exhibited according to students' individual item responses instead of interpreting and giving general recommendations based on having a deficit in the general skills area being reportedly assessed).

Limitations

Given that there has been much research conducted with the first edition of the LASSI, with implications for the second edition however only limited research as of yet has been conducted with the second edition of the LASSI, the present study sought to expand the LASSI-2's psychometric properties, examine for potential sex differences in the LASSI-2's raw scale scores, and provide a better understanding of the LASSI-2's factor structure. It is believed that the present study contributed significantly to the literature in the above intended areas; however, the present study was limited in that its sample lacked diversity (i.e., the sample was comprised of students from only one southern university, enrolled in psychology courses and the sample was mostly White, freshman, and female). Thus, due to the sample's lack of diversity, the present study was not able to add more thoroughly to the literature by examining the LASSI-2's scales by various demographic characteristics that might have been noteworthy based on implications in the literature. For example, the first edition of the LASSI was criticized for its limited normative sample (i.e., the sample consisted of students from only one southern university) and thus to improve the LASSI in terms of generalization, the second edition's

normative sample was improved to include students from 12 institutions from various geographic

locations (Weinstein & Palmer, 2002). Thus, with the present sample only consisting of students

from one southern university, before the ability to generalize the present study's results to

diverse geographic regions can be assumed for the second edition of the LASSI, further

exploration with data from students from various regions may be warranted.

With regard to student enrollment, the literature concerning the first edition of the LASSI

has indicated that the LASSI was able to predict school achievement for early college entrance

students and regularly admitted university students but not for developmental studies students

(Nist et al., 1990; Schumacker et al., 1995). Given the implication of this literature that the

LASSI may contribute differently to the prediction of school achievement depending on the

characteristics of student program enrollment, there is a potential that psychometric properties

and factor structure for the second edition of the LASSI's scales could differ by characteristics of

course enrollment and that these factors could potentially be contributing to differences in the

predictive nature of the LASSI. Thus, the present study's sample of only students enrolled in

psychology courses may be limited in terms of generalizing the current findings to students with

different course enrollment characteristics.

Further, in terms of generalization, the literature for the first edition of the LASSI

indicated that the latent structure and scores for the LASSI have been shown to generalize to

culturally diverse college students (Bråten & Olaussen, 1998; Olaussen & Bråten, 1998). For

example, Olaussen and Bråten (1998) provided some support that the scale to component factor

structure of the LASSI for their Norwegian student data was comparable to the scale to

component factor structure for the LASSI for Olejnik and Nist's (1992) American student data.

However, the LASSI's Motivation scale's generalizability has been questioned for culturally

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diverse college students (Bråten & Olaussen, 1998; 2000). Thus, although the potential

generalizability of the first edition of the LASSI's factor structure is promising, it seems that

more research in terms of the current second edition of the LASSI's psychometric properties and

factor structure needs to be conducted before generalization of the present study's findings can

be more confidently made across diverse ethnic groups, given that limited research has been

conducted as of yet with the second edition of the LASSI and only the present study has

examined the LASSI-2's item to scale factor structure.

Further, Olaussen and Bråten (1998) and Cano (2006) provided some support that

differences in level of education does not produce differences in factor structure for the first

edition of the LASSI at the scale to component level; however, though these findings are

encouraging in terms of the LASSI's generalizability across education levels, these findings were

for the first edition of the LASSI and concerning the LASSI's scale to component factor

structure. As of this date, only one study regarding the second edition of the LASSI's factor

structure has been published, with it examining the LASSI-2's scale to component structure and

not examining for education level factor structure differences; thus, given that the present study

is the only study to examine the second edition of the LASSI's item to scale structure, it seems

necessary for more research in this area with a more diverse sample that will allow for the

examination of potential education level factor structure differences with the second edition of

the LASSI to be conducted before generalizations of the current factor structure findings can be

more confidently made across academic classifications.

Lastly, there are no studies that have examined and thus no implications in the literature

to suggest that there are sex differences with regard to the LASSI 10-scale factor structure; thus,

the present study did not set out to explore the potential for this difference and thus did not

collect data from more male and female participants that would allow for such analyses. However, examining for potential sex differences in the LASSI-2's 10-scale structure may be a noteworthy area to explore, especially if one wants to be more confident that the factor structure for the LASSI-2 is the same for both sexes; thus, larger studies that allow for this exploration are needed for generalization purposes.

In conclusion, although the present study contributed significantly to the literature in that it expanded the LASSI-2's psychometric properties, examined for potential sex differences in the LASSI-2's scales, and provided a better understanding of the LASSI-2's factor structure, the present study was limited in that its sample lacked diversity in which to more thoroughly contribute to the literature by allowing for the examination of the LASSI-2's scales by various demographic characteristics that might have been noteworthy based on the implications in the literature. Thus, based on the potentially noteworthy implications in the literature, at this point, caution likely should be taken in terms of generalization of the present study's findings due to the current sample's lack of diversity. In order to be more confident in generalizing the current findings to various groups, more research needs to be conducted with more diverse groups/samples in an attempt to replicate the first edition literature and/or the present study's findings (i.e., establish stable trends in the LASSI-2 data across demographic characteristics).

Directions for Future Research

Given the nature of this study and its implications as well as its limitations, there are several suggestions for future research. In general, the LASSI-2 needs to be studied more, with a more diverse sample. For example, the LASSI-2's psychometric properties (i.e., means, standard deviations, alpha coefficients, and correlations of the LASSI-2 scales' raw scores) should continue to be expanded with various samples. There is also a need for more studies exploring

potential sex differences in the LASSI-2 scales in order to examine if there are noteworthy trends (e.g., sex differences that may not only be statistically different but also clinically/practically different, which might warrant a need for interventions to address/bridge the gap of the sex differences).

Given that the present study is the only study to date to examine the LASSI-2's item to scale structure (i.e., how the measure is scored and interpreted), more item to scale factor-analytic research is needed. Other studies could explore how to improve the LASSI-2's item to scale structure by potentially removing items, creating new items, and/or moving items among the LASSI-2's scales. Then, after working to develop better scales, future studies could then document their psychometric properties in a wide variety of contexts with a wide variety of samples.

Other future research could continue to explore the LASSI-2 in a more practical manner. For example, future studies could continue examining the LASSI-2's associations with other variables (e.g., academic variables, well-being variables). Other studies could further explore the LASSI-2's predictive validity, the LASSI-2's associations with other learning and study strategy measures, and the LASSI-2's discriminant validity. It would also be interesting to examine how LASSI-2 scale scores, which are obtained through self-report, compare to other-reported scores (e.g., reports from teachers or tutors).

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APPENDIX

Appendix

Demographic Data Sheet

Instructions: Please fill out the information below. Be sure to answer all items.

1. **Age:** _____

2. **Sex** (please circle one):   Male   Female

3. **Race/Ethnicity** (please circle all that apply or describe below):

      White

      African American

      Hispanic/Latino American

      Asian American/Pacific Islander

      American Indian/Alaskan Native

      Biracial/Multiracial (describe): _____

      Other (describe): _____

4. **Major:** _____

5. **Academic Classification** (please circle one):   Freshman   Sophomore

                                                     Junior   Senior

6. **Grade Point Average:** _____

VITA

KWONEATHIA RASHA HILL

EDUCATION

The University of Alabama   Tuscaloosa, Alabama
  Bachelor of Science in Psychology, May 2003
  Minor: Business Management

The University of Mississippi   University, Mississippi
  Graduate Student, 2004-present
  Clinical Psychology Program

TEACHING EXPERIENCE

Teaching Assistant Internship, Honors Introduction to Psychology, 2003
Teaching Assistant, Elementary Statistics, 2010-2011
Teaching Assistant, Quantitative Methods in Psychology I & II, 2011-present

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RESEARCH EXPERIENCE

Psychology Undergraduate Research Assistant for Dr. Martha Crowther, 2000-2001
Psychology Undergraduate Research Assistant for Dr. John Lochman, 2001-2003
Psychology Research Assistant for Dr. John Lochman, 2003-2004
Psychology Graduate Research Assistant for Dr. Stefan Schulenberg, 2004-2005
Psychology Graduate Student Research Team Member, Dr. Schulenberg's Lab, 2004-2012
Psychology Graduate Student Research Team Member, Dr. Alan Gross' Lab, present

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CLINICAL/ASSESSMENT/PRACTICUM EXPERIENCE

Graduate Student Social Skills Trainer, Desoto County Public Schools, 2005-2006
Graduate Student Therapist, Psychological Services Center, 2005-present
Graduate Student Psychologist, North Mississippi Regional Center, 2006-2008
Graduate Student Assessment Team Member, Psychological Assessment Clinic, 2007-2008
Graduate Student Behavior Specialist/Consultant, Desoto County Public Schools, 2008-2010