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LASSI's Great Adventure: A Meta-Analytic Review of the Learning and Study Strategies Inventory and Academic Outcomes

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Abstract:
There have been considerable efforts to describe, examine, and foster the strategies students use while learning. Defined as thoughts, behaviors, beliefs, or emotions that facilitate knowledge acquisition, learning strategies play an essential role in students' achievement. This study reports on a random-effects meta-analysis of 158 studies (2,897 effect sizes; N = 71,852 students) on relationships between learning and study strategies, as measured by ten subscales of an established and prevalent instrument, the Learning and Study Strategies Inventory (LASSI; Weinstein et al., 1987, 2004, 2016), and academic outcomes measured as GPA/grades, test scores, and persistence. Results indicated that motivation strategies had the highest positive correlations with GPA and persistence outcomes. For test scores, test taking strategies, anxiety, and selecting main ideas were the strongest positive correlates. Associations between LASSI subscales and outcomes were moderated by age, indicating lower correlations among students in postsecondary contexts compared to K-12 settings. Implications for research and practice regarding the role of strategic learning are discussed.

Keywords: Learning and Study Strategies Inventory, LASSI, learning strategies, academic achievement, meta-analysis

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1 Introduction

Despite an enduring interest in the science of learning, questions remain regarding which kinds of learning strategies students should use. An important aspect of the learning process involves strategies and attitudes that facilitate positive academic performance (Alexander et al., 1991; Pressley et al., 1989). Since the 1960s, research concerning learning strategies has flourished in K-20 classrooms and beyond (McCombs, 2017). Learning strategies can be defined as "any thought, behaviors, beliefs, or emotions that facilitate the acquisition, understanding, or later transfer of new knowledge and skills" (Weinstein et al., 2005, p. 727). They have various functions ranging from structuring the processing of information, planning of learning tasks, setting and monitoring goals, and evaluating the learning process (Boekaerts, 1997). Most importantly, students' implementation of learning strategies has been positively linked with academic achievement (Alexander et al., 1998) across a variety of settings and among diverse student populations (Antonelli et al., 2020; McCombs, 2017).

Understanding strategic learning in educational research and measuring learning strategies requires instruments with high validity and reliability. Perhaps one of the most prevalent scales measuring strategic learning is the Learning and Study Strategies Inventory (LASSI; Weinstein et al., 1987). Not only can students use LASSI to gauge their own use of learning and study strategies, but instructors and administrators can also examine students' LASSI scores to identify additional support and instruction for students placed at-risk. Despite LASSI's prevalence in research and practice over the last three decades, a comprehensive review and quantitative synthesis on LASSI's validity has not yet been conducted. Moreover, conflicting study results exist—some found strong positive associations between LASSI and achievement (Khalil et al., 2020; Yip, 2013, 2019), whereas others have reported nonsignificant or weak correlations (Flowers et al., 2012). To reconcile such discrepancies and extend research on strategic learning, an exhaustive review is needed.

Although prior reviews have included studies that use LASSI, these syntheses have included constructs broadly related to strategic learning or self-regulation and did not focus on the instrument itself. For instance, Dent and Koenka's (2016) meta-analysis of associations between self-regulated learning and academic achievement in K-12 settings found a few studies that used LASSI as a measure of self-regulated learning. Meta-analyzing the relationships among metacognition, intelligence, and academic performance, Ohtani and Hisasaka (2018) uncovered that metacognition positively predicted academic performance when controlling for intelligence. However, while they included LASSI measures, the LASSI was categorized as an "Other" metacognition measurement and thus not a focal part of their synthesis. A meta-analysis by Credé and Kuncel (2008) explicitly included LASSI studies when examining study habits and skills; however, their synthesis only uncovered six studies that examined LASSI and first-year GPA and 16 studies using general GPA; this small number of studies is not representative of the entire set of studies on this topic. Other meta-analyses like these rely on search strategies designed to capture construct descriptions rather than specific instruments. An omission of specific search terms using names of self-regulated learning and learning strategy measures can lead to incomplete sets of studies for meta-analysts and thereby to inaccurate conclusions about the literature. In contrast, focusing on specific instruments may enhance retrieval of all relevant studies and achieve a more robust and representative sample of studies. Moreover, this approach can also mitigate criticisms of meta-analysis for comparing apples to oranges when combining multiple measures of a particular construct together. Considering these issues, we sought to synthesize the literature on LASSI and associated academic outcomes in the current review.

2 Literature Review

2.1 The Learning and Study Strategies Inventory

The Learning and Study Strategies Inventory was developed in 1987 by the late Claire Ellen Weinstein and colleagues. In the first edition, the measure consisted of 77 questions divided into 10 subscales measuring conceptual aspects of the Model of Strategic Learning (MSL): skill, will, and self-regulation. In 2004, LASSI was revised to its second edition (Weinstein et al., 2002), which included three additional items. A high school version of LASSI (Weinstein & Palmer, 1990) was also created as well as an online version (Weinstein et al., 2006). The most recent version, LASSI 3rd Edition (Weinstein et al., 2016), consists of 60 questions with 10 subscales. Besides a reduction in the survey items, there was a modification of the study aids subscale to encompass academic resources more broadly. Overall, version changes have been minimal over the last three decades (As described later, we controlled for the LASSI version in our moderator analyses).

Learning strategies have been assessed by various instruments. In addition to LASSI, some of the most popular instruments of learning and study strategies include but are not limited to the Motivated Strategies Learning Questionnaire (MSLQ; Pintrich et al., 1993), Survey of Study Habits and Attitudes (SSHA; Brown & Holtzmann, 1967), and Study Process Questionnaire (SPQ; Biggs, 1987). In contrast to these other instruments, LASSI was designed for empirical and diagnostic purposes and has been widely used particularly among low-achieving students, delineating specific learning strategies for students to address. Because of these student-centered aspects, understanding associations between LASSI and academic outcomes is particularly critical for researchers and practitioners to determine which LASSI subscales are most important for student attainment. Although recent research has questioned using self-report assessments of learning strategies amid the emerging usage of trace data and learning analytics, their construct validity still has been firmly established (Berger & Karabenick, 2016).

While there are many other measures of learning strategies in the field of educational psychology ranging from interviews, teacher judgments, and learning analytics, retrospective self-report tools such as the LASSI occupy an important position in the assessment of cognitive, metacognitive, affective, and self-regulated strategies (Vermunt, 2020). Several disadvantages of self-report surveys include the difficulty for students to accurately capture mental processes (Karabenick et al., 2007), especially when asked about how they generally learn across a multitude of concrete, domain- and content-specific experiences. Validity issues notwithstanding, retrospective self-report surveys not only allow researchers to gain scientific knowledge about dimensions of students' learning strategies but also provide students opportunities to reflect on their strategic processing, identify strengths and weaknesses, and potentially improve any areas of underpreparedness (Weinstein et al., 1988). Moreover, the LASSI follows best practices for retrospective self-report tools such as thorough validation studies, high scale reliability, and item phrasing reflective of language the target population uses (Vermunt, 2020).

2.2 Model of Strategic Learning

One model that describes how learning strategies improve academic achievement and serves as the basis for the LASSI is Weinstein's (1994, 2007) Model of Strategic Learning (MSL). The MSL anchors the learner at the center of three components of strategic learning within the student's control: skill, will, and self-regulation (for a historical overview of learning strategies and the MSL, see McCombs, 2017). These components are situated within a fourth component—academic environment—which includes elements of learning that are uncontrollable such as the nature of the learning task, available resources, social context, and teacher expectations. Although not explicitly measured by LASSI, Weinstein and Acee (2018) argued that strategic learners require knowledge of the academic environment. When students understand expectations of school assignments, resources available for students to seek help from, and other contextual aspects that may hinder or support learning, they can more strategically navigate their academic and social environments.

The MSL highlights both direct and interactional effects of these components on successful learning (Weinstein & Acee, 2013); thus, while each component could impact learning, interactions between these components shape strategic learning as well. LASSI was designed to capture a student's awareness and use of elements within the three major, controllable components (skill, will, self-regulation; McCombs, 2017). Table 1 presents an overview of the 10 subscales, sample items, and their three corresponding aspects of the MSL.

First, the *skill* component refers to cognitive elements such as actions, strategies, and thought processes that facilitate learning. This component encompasses learning strategies for identifying important information, participating in deep and meaningful learning of new information, and preparing to demonstrate newly acquired knowledge (Weinstein & Acee, 2013). The process of developing bridges between prior and new knowledge is an important element within the skill component (information processing). According to the MSL, students must not only know what to do but also how and when to use specific strategies (Weinstein & Acee, 2018). Learners need to be proficient and adaptable in three strategies intended to transfer information through the memory continuum: active rehearsal, elaboration, and organizational strategies (Krause & Fong, 2012). Overall, the skill elements involve using strategies to complete learning tasks, including selecting important information when studying and successfully taking tests.

Next, the *will* component includes controllable elements that inform student behaviors, goals, and receptivity to learning. Often categorized within the will component are motivation, attitude, and anxiety (e.g., Krause & Fong, 2012). First, central to the motivation element is the degree to which students take ownership for studying, exert effort into learning, and set and reach academic goals (Weinstein et al., 2010). Part of these motivational processes stem from their self-efficacy--one's confidence in successfully completing a task--which is an important element of will (Bandura, 1997). These beliefs, such as the confidence in one's ability to study well (as measured by LASSI), can generate motivation that affects their activity choice, persistence, and effort, subsequently impacting their goal setting and attainment (Schunk, 1995). Second, attitude, described as an individual's mindset and general emotional responses (both positive and negative) towards learning, is derived from personal interests, values, beliefs about task engagement as related to academic success (Krause & Fong, 2012). Third, anxiety encompasses negative thoughts, beliefs, and emotions that can divert students' attention away from academic tasks and toward self-criticism, which in turn sabotage their efforts towards learning (Weinstein et al., 2010). All in all, the elements within the will component influence the amount of effort that students put forth to sustain motivation to learn.

The third controllable component of the MSL is *self-regulation*. A strategic learner manages their will and skill and makes use of available resources in the learning environment via self-regulation (Weinstein et al., 2010). The various elements of self-regulation inform how a student manages the learning process, which includes planning, monitoring, focusing, reflecting, and evaluating (Weinstein & Acee, 2013). Self-regulated learning involves the awareness of factors that influence learning outcomes, reflection on one's own progress, and control of various learning factors (e.g., Greene, 2017; Panadero, 2017; Winne, 2011). For example, a student might use strategies to improve time management or concentration and avoid procrastination and distractions in their learning environment. According to the MSL, strategic learners not only apply strategies but also evaluate their learning through self-testing and monitoring to check their comprehension. In doing so, learners can seek help or use study aids to support their learning as needed. Although self-regulation is discussed as just one element of the MSL, it is also a recurrent metacognitive process that manages the other MSL aspects of skill and will.

2.3 Distinguishing Between Learning Strategies and Skills

When situating the Model of Strategic Learning within the larger literature of learning strategies, it is important to distinguish the terms *strategies* and *skills*, which are often used interchangeably (e.g., Alexander et al., 1998; Vettori et al., 2018), despite important conceptual differences. An additional layer of confusion can arise because of the MSL's usage of the "skill" component to describe relevant cognitive strategies (Weinstein & Acee, 2013). That being said, most scholars agree that these terms are distinct. Namely, strategies are characterized by deliberate, conscious action to achieve a goal (Afflerbach et al., 2008; Alexander et al., 1998, 2018). In a foundational review integrating knowledge and strategic processing, Alexander and Judy (1988) conceptualized strategies as goal-directed procedures students consciously, intentionally, and effortfully use to facilitate the regulation, execution, or evaluation of a particular task. Unlike skills, which denote automatic, unconscious actions, strategies can be monitored and revised. As students' use of strategies become routinized, these procedures can rise to the level of automaticity and fluidity and thus be deemed as skills (Alexander et al., 2018). Given the MSL's emphasis on factors within a student's control (Weinstein & Acee, 2018), we found that strategies, as a concept, best aligned with the LASSI scales (although we acknowledge the difficulty in measuring skillful versus strategic behaviors). We, therefore, use the term "strategies" in our explanations, but preserve our use of "skill" when referencing the MSL component and other study author-provided terminology.

2.4 Domain-Specific and Domain-General Strategic Processes

As procedural knowledge enacted to improve learning and problem-solving capabilities, learning and study strategies are useful either in a single domain or across multiple domains (Dumas, 2018). This distinction has been discussed as *domain-specific* versus *domain-general* (Cushen & Wiley, 2018). The LASSI subscales are designed to be domain-general, as they aim to measure strategies useful across a variety of domains. For instance, the strategy of selecting main ideas can be used in various subjects such as history, science, or language arts. However, a domain-general strategy such as selecting main ideas is not necessarily identical within each domain; for example, how a student identifies the main idea within a history lesson will differ from how this strategy is implemented within a biology course. The notion of *strategy transfer*, or how well strategies are used across multiple domains, presents theoretical issues regarding the difference between domain-generality and domain-specificity. Although there is some doubt regarding how well students engage in strategy transfer (Dumas, 2020), the LASSI's approach to measuring domain-general strategies can be potentially effective when students are able to identify the contexts in which certain strategies are useful. Similar to other domain-general surveys, LASSI subscales are presented as universally applicable and work well when knowledge about the contextual conditions informs the best strategy selection (Zimmerman, 1995).

2.5 Model of Strategic Learning and Other Theoretical Models

There have been various strategic processing models proposed in the literature including the Good Strategy User Model (Pressley et al., 1987), the Overlapping Waves Model (Siegler, 1996), and the Model of Domain Learning (Alexander, 1998) (for a review, see Rogiers et al., 2020). Moreover, several models of self-regulated learning exist in the literature as well (i.e., Boekaerts & Corno, 2005; Efklides, 2011; Hadwin et al., 2011; Pintrich, 2000; Winne & Hadwin, 1998; Zimmerman, 2000; for a review of these prominent models, see an integrative review by Panadero [2017]). Out of all these models, Zimmerman's (2000) model has been argued to be the most aligned with the MSL and will be discussed in more detail next (Weinstein & Acee, 2013).

There are several points of conceptual overlap between the MSL and Zimmerman's (2000) model of self-regulation. Broadly, both models emphasize factors that learners "intentionally use or modify to improve their learning, such as students' attitudes, beliefs, goals, and strategies related to information processing, comprehension monitoring, motivation regulation, goal setting, selfobservation, and self-reflection" (Weinstein & Acee, 2013, p. 200). Both models are situated within a social-cognitive perspective that emphasizes reciprocal interactions among personal, environmental, and behavioral factors. However, the MSL suggests the environment to be the academic environment and personal and behavioral factors to be students' motivational beliefs and learning strategies. Zimmerman's model is based on the cyclical process of self-regulation and the various processes and strategies learners use to manage their motivation, cognition, and behavior (Zimmerman & Schunk, 2011). Similarly, the MSL is an emergent model of strategic learning, so that successful learning stems from the interaction of skill, will, and self-regulation elements within a learning environment (McCombs, 2017).

Both models emphasize using cognitive learning strategies as an important aspect of both strategic and self-regulated learning. For example, the focus of MSL's skill component is cognitive learning strategies. Likewise, Zimmerman's model of self-regulation addresses students' use of cognitive strategies through three cyclical phases of self-regulation–forethought, performance, and self-reflection; each phase maps onto aspects of the MSL (Weinstein & Acee, 2013). First, the forethought phase overlaps with students' creating strategic plans, according to the MSL, which incorporates their knowledge of learning strategies and how to best apply them across contexts. Second, the performance phase of self-regulated learning may involve students' actual use of strategies such as information processing or selecting main ideas from the *skill* component of the MSL. Third, the self-evaluation phase from Zimmerman's model is at the core of MSL's self-regulation component, which manages the learning process upon reflecting on what strategies are working or not, and in turn, modifying the student's current strategic plan. In sum, while there are some distinctions between the MSL and Zimmerman's conceptualizations, the considerable overlap allows for findings from synthesizing LASSI studies to inform the larger literature on self-regulated learning.

2.6 LASSI and Academic Outcomes

While we discussed some theoretical support for strategies measured by LASSI, there is mixed evidence regarding LASSI's predictive validity with students' grades, GPA, test scores, and persistence. Some studies have shown strong positive associations among LASSI subscales and academic achievement. For instance, Prus et al. (1995) found that LASSI subscales of concentration and self-testing were salient predictors for first-year retention. Additionally, the LASSI motivation subscale was a significant predictor of first-year college student GPA when controlling for student background variables (Bergey et al., 2017). Among Chinese high school students, Yip (2013) observed how test-taking strategies were particularly predictive of students' academic performance when controlling for the other nine LASSI subscales. On the other hand, the anxiety subscale was not significantly associated with academic performance. This small sampling of studies is reflective of the conflicting results in the literature—some supporting the predictive validity of specific LASSI subscales and others casting doubt on it. Considering these discrepant findings, a meta-analysis is necessary to determine the overall associations with academic achievement using the entire corpus of LASSI studies.

Moreover, there have been various academic outcomes used in LASSI studies. The MSL acknowledges that the academic environment partially comprises the requirements of the current learning activity, assignment, or test. Thus, the type of outcome would be a salient factor as it relates to associations with LASSI subscales. Across multiple studies, LASSI has been correlated with GPA/course grades, test scores, and student persistence at both the course and institutional levels. As these outcomes represent distinct but related academic outcomes, we opted to treat each outcome separately; in other words, we meta-analyzed studies examining LASSI subscales with (1) GPA/grades, (2) test scores, or (3) persistence outcomes, separately.

2.7 Potential Moderators

There are a number of moderators we hypothesized to be relevant to the relationship between LASSI subscales and academic achievement, particularly as it relates to the MSL. First, we describe study characteristics followed by a discussion of sample variables that may moderate the relationship between LASSI and academic outcomes. Lastly, we discuss aspects of LASSI variables and the academic outcomes as potentially moderating variables.

2.7.1 Study Characteristics

The primary study characteristics of interest were publication status and year of publication. Due to the file-drawer problem and the tendency for published studies to present larger effect sizes, we wanted to test if the magnitude of studies' correlations differed by publication status (published versus unpublished; Polanin et al., 2016). Additionally, given LASSI's thirty-year history, we were curious to see if the instrument's validity changed over time. Although we do not have a guiding hypothesis regarding these temporal changes, moderation by year may indicate shifts in LASSI's validity.

2.7.2 Sample Characteristics

A variety of sample characteristics may also be potential moderators. Knowing that the MSL underscores the role of individual differences (Weinstein & Acee, 2018), we examined a number of student characteristics. Specifically, we were interested in the moderating role of students' age, educational level, gender, country of origin, and minoritized student status. Regarding students' age, cognitive development is known to change in adulthood and is expected to influence older students' academic performance (Granott, 1998; Justice & Dornan, 2001). For instance, older college students tended to use deeper-level, comprehension-focused strategies; in comparison, younger students' strategies were more surface-level (Richardson, 1994, 1995). Particularly among college-aged students, prior academic and real-world work experiences may influence the metacognitive knowledge and cognitive strategies (Graham & Donaldson, 1999). Given that LASSI was originally intended for college-aged students, age may be an important moderator to consider because of age-related differences on the kinds of strategies students may use. Similarly, students' learning contexts associated with their educational level (K-12 versus postsecondary) may also be an important moderator. Perhaps the types of academic tasks and the more unstructured nature of postsecondary instruction may require a heavier reliance on learning strategies.

Another sample characteristic to consider as a moderator is student gender. Studies have shown that women reported using learning and study strategies more frequently than men (e.g., Richardson, 1993; Ruffing et al., 2015). However, there are mixed findings regarding the role of gender when using learning strategies to predict academic performance. For instance, Rosander and Bäckström (2012), while controlling for general cognitive ability, found that learning strategies explained incremental variance in the academic performance of women compared to men. However, Ruffing et al. (2015) uncovered no gender differences in the predictive role of learning strategies for academic achievement. These conflicting results warrant further exploration of gender's moderating effect.

Students' country of origin and minoritized ethnic status may also be fruitful to examine. By virtue of LASSI's worldwide prevalence, the instrument's validity has been tested with samples from various countries. Although there is little theoretical direction to guide our predictions by country of origin, assessing differences between the U.S. and international settings may illuminate salient cultural differences in learning approaches (Purdie & Hattie, 1996; Purdie et al., 1996). Similarly, in diverse contexts such as the U.S., moderation by students' minoritized ethnic status may be important to examine when assessing LASSI's predictive validity.

2.7.3 LASSI and Academic Outcome Characteristics

The main characteristic of the LASSI we were interested in was its version. Although substantive aspects of the instrument did not vary among versions, there were a few modifications made between the first and second edition of the scale. Assessing moderation by these scale versions may highlight any substantive impacts of the type of scale used. Also, it is unclear whether LASSI differentially predicts domain-specific outcomes (e.g., math or literacy) versus general or unspecified outcomes such as cumulative GPA which may represent a variety of domains (Abulela & Bart, 2020). Considering that LASSI was designed to be domain-general (Acee & Weinstein, 2018), we hypothesized that domain-general or unspecified outcomes would be more highly correlated than domain-specific outcomes (see Dumas, 2020).

2.8 Prior Reviews

There are several prior reviews that overlap to some degree with the current meta-analysis; however, our meta-analysis is distinct in a number of ways. Many reviews have synthesized the literature on a broad array of psychological or psychosocial correlates to academic achievement (Fong et al., 2017; Richardson et al., 2012; Robbins et al., 2004). These reviews do not isolate associations between LASSI subscales, specifically, and academic outcomes, but rather categorize LASSI subscales into broader academic or study strategies among other psychosocial factors. Other reviews have explicitly examined self-regulated learning (i.e., Dent & Koenka, 2016) but they lack a focus on a specific instrument such as LASSI and neglect a large amount of LASSI studies due to the use of general keywords within search strategies. In contrast, our review leverages instrument-specific search terms to uncover a greater number of included studies. Focusing on study skills and habits specifically, Credé and Kuncel (2008) intentionally included LASSI articles but were only able to meta-analyze approximately 20 articles; the current meta-analysis contains a substantially larger number of studies. Another relevant review synthesized associations between GPA/grades and learning strategies as measured by the MSLQ (Credé & Phillips, 2011), but we focused on a different measure of learning strategies with an expanded set of academic outcomes including test scores and academic persistence.

3 Present Study

Despite LASSI's prevalence in thousands of institutions worldwide, the present study is the first comprehensive synthesis that exclusively examines associations between LASSI subscales and three kinds of academic outcomes: GPA/grades, test scores, and student persistence. Whereas other reviews include aspects of LASSI or a fraction of the existing studies that used the instrument, we provide an exhaustive systematic review on the topic. Moreover, we investigate moderators using study, sample, LASSI, and outcome characteristics to explore under which circumstances the magnitude of these correlations may vary. Following recommended meta-analytic practice guidelines (Pigott & Polanin, 2020), this review will contribute to a collective understanding of how domain-general learning strategies (measured by a retrospective instrument) relate to students' academic achievement, yielding direct benefits to educators and researchers when implementing learning strategy training and research. Under the assumption that the way students learn is malleable, it is critical to understand such processes, so that educators can intervene and thereby improve student attainment.

4 Method

4.1 Literature Search and Inclusion Criteria

Studies were collected from multiple sources using search strategies designed to uncover all published and unpublished research. First, *ERIC*, *PsycINFO*, and *Proquest Dissertation and Theses* were searched using keywords "Learning and Study Strategies Inventory" and "LASSI" anywhere in the document to ensure that any study using LASSI would be retrieved. Second, as LASSI is often examined by educational psychologists, we contacted the following organizations for unpublished studies: American Educational Research Association (Division C: Learning and Instruction, Studying and Self-Regulated Learning SIG; Motivation in Education SIG), European Association for Research on Learning and Instruction (EARLI), and American Psychological Association (Educational Psychology). In addition, because LASSI is used widely in postsecondary education and the fields of developmental education and learning assistance, we also solicited studies from the National Association of Developmental Education, College Reading and Learning Association, and the Open Forum for Learning Assistance Professionals.

Third, we conducted backward citation (or ancestry) searching through the reference lists of all included studies. We also performed forward citation (or descendancy) searching using Social Science Citation Index and Google Scholar. In theory, any study using the instrument would cite the instrument or the manual; therefore, we searched for studies that cited the LASSI instrument itself or the manuals, along with the following seminal articles on LASSI: Alexander et al. (1998); Bråten & Olaussen (1998); Olaussen & Bråten (1998); Olejnik & Nist (1992); Olivarez & Tallent-Runnells (1994).

Fourth, LASSI is often used by many institutional researchers who may not publish in academic journals. Thus, we contacted the publisher of LASSI to disseminate a request for studies to approximately 800 former and present LASSI-subscribing institutions. Fifth, we also hand-searched the *LASSI in Action*, an online user-driven newsletter by the publishing company, which provides professionals a forum to present their experiences using LASSI. We checked all articles from the inaugural July 2003 issue to the Fall 2017 issue.

Once potentially relevant studies were identified, titles and abstracts were evaluated using the following inclusion criteria: (1) use of LASSI, (2) an achievement outcome (GPA, grade, achievement test, persistence), and (3) an effect size measure. There was no restriction on language of publication; we included studies written in any language.

4.2 Data Extraction

Next, a total of six coders, grouped in pairs, collected full-text documents of potentially relevant studies and screened them for eligibility. For each included document, pairs of coders independently extracted information. Disagreements were documented to calculate coder reliability and discussed by the coders to reach consensus. Agreement between coders was 92.4% for all the articles coded across all items before discrepancies were resolved.

Coders extracted details pertaining to a range of study characteristics (Table 2). First, we coded aspects of the research report in terms of type of document (dissertation, article, etc.) and whether or not it had been published. Next, to extract information around research design characteristics, coders recorded the type of institution and country. Next, we coded for the educational level as K-12 (primary and secondary) and postsecondary. Likewise, we coded the country where the study was conducted and consolidated these codes to either U.S. and international. For sample characteristics, coders recorded the percentages of women (% female) and racial minorities in a sample. Given the complexity of race and ethnicity reporting, such as differences in categories as well as the large varieties represented across studies, we re-coded for racial minority percentage and defined it as the percentage of students of color in the sample.

Next, coders collected descriptions of both LASSI and outcome variables. For the LASSI instrument, coders collected descriptions of LASSI such as the number of subscales, items, reliability, and LASSI version used. Regarding the LASSI version, because there were few studies that used the LASSI-High School version and the online LASSI, we coded these as either the first or second version given their alignment with these scales. When coding for outcome type, we used three categories: GPA/grades, test, and persistence. GPA/grades consisted of semester or cumulative grade point averages or end-of-course grades for specific classes. Test outcomes ranged from standardized tests required for admissions (i.e., SAT) or credentialing (e.g., nursing license examination) to content-based exams linked to students' coursework. For persistence outcomes, variables operationalized as course completion or re-enrollment in the prior semester (retention) were coded. Lastly, coders extracted the domain of the outcome measure (math, science, general) which was later re-coded to report if the outcome measure was domain-general or -specific.

Finally, coders extracted sample sizes and effect sizes for LASSI and outcome correlations. When data necessary to derive an effect size were missing, we sent inquiries to study authors if their study was published within the last five years. This occurred for 29 studies, from which 14 authors responded with data (48.3%). Eight authors could not locate their data and the remaining seven did not respond.

4.3 Data Analysis: Effect Size Calculation and Data Integration

To combine findings meaningfully from a varied set of studies, effect sizes were computed as a Pearson's *r*. If a correlation was unavailable, we used means, standard deviations, and *t*-statistic conversion formulae to derive correlation effect sizes (e.g., comparing low and high achievers on LASSI scores; Cooper et al., 2009). Due to inherent measurement error in instruments (in our case, LASSI subscales), we also calculated unattenuated correlation effect sizes from the raw correlations reported or derived from studies. Using the reliability coefficient of each LASSI subscale, we converted observed or attenuated correlations to adjusted, unattenuated correlations (Borenstein et al., 2021). We then conducted a second set of overall meta-analyses using the adjusted effect sizes. Lastly, effect sizes were corrected by applying a Fisher's *z* transformation and converted back to *r* after analyses were conducted for interpretative purposes.

4.3.1 Calculating average effect sizes. Before conducting any statistical integration, we examined the distribution of sample sizes and effect sizes to determine whether any studies contained statistical outliers. Grubb's (1950) test was applied to identify outliers, whose values were Winsorized by setting them at the value of their nearest neighbor. After identifying and deriving effect size estimates, we first divided our data by the three outcomes of interest: GPA/grades, test scores, and persistence. Then, average effect sizes were aggregated together using an intercept-only random-effects meta-regression model. A weighting procedure was used to calculate average effect sizes across independent samples. Each effect size was first multiplied by the inverse of its variance; then, the sum of these products was divided by the sum of their inverses. This procedure gives more weight to samples of larger size, which is generally preferred (Borenstein et al., 2021), since larger samples give more precise population estimates. In addition, we present 95% confidence intervals for weighted average effect sizes; if the interval did not contain zero, the null hypothesis was rejected. All analyses were conducted using the *R* package *metafor* (Viechtbauer, 2010).

4.3.2 Identifying Independent Hypothesis Tests

Due to the dependent nature of our data resulting from multiple academic outcomes used in a single study, we used a multivariate model and a sandwich estimator (Pustejovsky, 2021). We fitted multivariate models to account for the multiple correlated effect sizes. Assuming a correlation of .80 between outcome measures, we employed robust variance estimation (RVE; Hedges et al., 2010; Tanner-Smith & Tipton, 2014), which protected against threats of misspecification especially for standard errors and hypothesis testing. RVE uses observed variation in effect sizes to estimate standard errors rather than assuming variance and standard errors. We also used *t*-tests small-sample adjustments for hypothesis testing (Tipton, 2015).

4.3.3 Moderator Analysis and Publication Bias

Effect sizes may vary even if they estimate the same underlying population value. If effect sizes significantly vary from each other and produce heterogeneity in the distributions of effects, moderators can be assessed to explain such variation systematically. To measure heterogeneity, we calculated Q_w statistics, a within-class goodness-of-fit statistic, and σ^2, a measure of the variance of the random intercepts, i.e., the variance of the true effects. We calculated σ^2 at both the effect size and study levels. To explore any detected heterogeneity, meta-regression was employed to assess the influence of all the moderators together in a single random-effects model.

For each LASSI subscale, we created a model of all the specified moderators in one meta-regression model. This approach allows us to control for potentially confounding factors that may arise by simply assessing each moderator in its own meta-regression model. Once again, a multivariate model was selected, and RVE was applied. A weighted least squares approach was used to estimate the regression coefficients using weights based on a random effects model to approximate inverse variance. We also adjusted for small-sample *t*-tests to determine if there was a relationship between focal variables and effect sizes in the population; we also used adjusted *F*-tests to assess model fit (Tipton & Pustejovsky, 2015). As there was not ample variation or power among studies with test scores and persistence outcomes, we only conducted meta-regression moderator tests for studies with GPA/grades as outcomes.

To assess bias in meta-analyses, researchers have used a variety of methods, each with their own limitations. One of the most common techniques is inspection of a funnel plot, a graphical display of effect sizes by standard error. Despite their ubiquity, funnel plots are also often subjective and difficult to interpret as researchers must visually determine asymmetry. Another technique is selection modeling, sensitivity tests that use a weight-function to estimate the effects of different degrees of possible publication bias (Vevea & Hedges, 1995). Both of these techniques also do not model effect size dependency well. Given the nested nature of our meta-analytic dataset, we conducted a series of modified Egger's regression tests (Egger et al., 1997) using sampling variance as a moderator and modeling effect sizes clustered within studies, collapsing all three academic outcomes together.

5 Results

Electronic database searches resulted in an initial pool of 2,471 studies. We added 280 studies from ancestry searching, 14 studies from listservs and the LASSI publisher, and 34 studies from descendancy searches for a total of 2,782 potential studies. After screening titles and abstracts, the research team retrieved full-text documents of 730 documents potentially eligible for inclusion. Further reviewing these reports, we determined our final pool of 158 studies that met inclusion criteria. See Figure 1 for a PRISMA diagram. The majority of the excluded studies did not use LASSI or present viable effect sizes.

Table 3 presents descriptive information about the included studies, which spanned publication years 1988 to 2018. From the 158 studies, there were 2,897 effect sizes based on a combined sample of 71,852 unique students. A slight majority of the included studies were from grey literature sources, consisting mostly of doctoral dissertations. Studies were mainly sampled from postsecondary institutions and within the U.S. But it is noteworthy that over one-third of the studies originated from samples outside the U.S. (see supplementary files for a global distribution map). Studies were mostly written in English, but some were written in Spanish, German, Italian, or Mandarin; these non-English studies were translated by our multilingual author team. All effect size data and study characteristics are provided in the supplementary material.

5.1 Overall and Moderator Results for LASSI and Academic Outcomes

We conducted 30 separate meta-analyses, one for each of the 10 LASSI subscales for three outcomes each (GPA/grades, test scores, persistence). For each subscale, we present overall analyses (presented in Tables 4a-c) as well as discuss any significant moderators (Table 5). We also conducted one additional meta-analysis for studies using LASSI as a total score. For all analyses, all average weighted correlations (r [attenuated] and r^u [unattenuated]) were significant (see 95% confidence intervals) unless otherwise noted. Across all analyses, there was also a significant degree of heterogeneity (Q-statistic), indicating substantial variation among effect sizes and suggesting the potential role of moderating variables in explaining how correlations may vary. Note that due to the relatively fewer number of studies that had test or persistence outcomes, we did not conduct any moderator analyses for these studies due to underpowered analyses. Thus, we present only moderator analyses for studies with GPA/grades outcomes.

5.1.1 Anxiety

For the relationship between anxiety and GPA/grades, the weighted average correlation was r = .152. The unattenuated correlation was estimated to be r^u = .168. For test scores, the average attenuated correlation was $r = .167$, and the average unattenuated correlation was $r^u = .185$. Both correlations were lower for persistence outcomes, $r = .091$ and $r^u = .105$. For GPA/grades outcomes, moderator analyses revealed that studies with postsecondary samples had lower correlations between anxiety and academic outcomes compared to K-12 samples ($\beta = -.18$, $p < .05$). Additionally, older studies had slightly larger associations between anxiety and GPA/grades ($\beta = -.01$, $p < .05$).

5.1.2 Attitude

For correlations between attitude and GPA/grades, the weighted averages were $r = .189$ and $r^u = .227$. Average weighted correlations were notably smaller for attitude and test score outcomes: $r = .055$ and $r^u = .066$. The attitude-persistence correlations were $r = .102$ and $r^u = .129$. Moderator results also indicated moderation by educational level, indicating that, correlations between attitude and GPA/grades outcomes were lower for postsecondary samples compared to K-12 samples ($\beta = -.36$, $p < .05$).

5.1.3 Concentration

The average weighted correlations for concentration and GPA/grades were $r = .207$ and $r^u = .229$. For test score outcomes, the concentration average correlations were lower $r = .08$ and $r^u = .088$. For persistence, the average correlations were $r = .109$ and $r^u = .129$. Moderator tests for GPA/grades also showed a negative moderating effect of educational level ($\beta = -.29$, $p < .05$). There was also a slight moderating effect of age, suggesting as age increases so does the magnitude of the concentration-GPA/grades association ($\beta = .02$, $p < .05$).

5.1.4 Information Processing

For information processing and GPA/grades, the weighted average effect was $r = .134$ (attenuated). The unattenuated correlation was $r^u = .149$. Compared to these associations, correlations between information processing and the other outcomes were substantively smaller: test score outcomes ($r = .063$; $r^u = .068$) and persistence outcomes ($r = .042$; $r^u = .047$). Like the relations between concentration and GPA/grades, there was evidence of positive moderation of age ($\beta = .02$, $p < .05$), suggesting as students' age increased, the correlation between information processing and GPA/grades was larger.

5.1.5 Motivation

Correlations between the motivation subscale and GPA/grades and persistence outcomes were the largest among all LASSI subscales. For GPA/grades, the weighted average correlation was $r = .317$, and the unattenuated average correlation was $r^u = .361$. For persistence outcomes, the weighted average correlation was $r = .15$, and the unattenuated average correlation was $r^u = .169$. For test score outcomes, average correlations were not as robust, $r = .093$ and $r^u = .107$. Similar to prior moderating effects, there was negative moderation by educational level, favoring K-12 contexts ($\beta = -.26$, $p < .05$). The motivation-GPA/grades association was significantly moderated by domain independence ($\beta = -.16$, $p < .05$), indicating that studies using domain-specific GPA/grades outcomes had smaller correlations compared to studies that use general academic outcomes such as overall GPA across subjects. Interestingly, a reversed publication bias was found with unpublished articles reporting larger correlations than published articles ($\beta = .16$, $p < .05$).

5.1.6 Selecting Main Ideas

Weighted average correlations for selecting main ideas and test score outcomes were some of the largest compared to most subscales, with $r = .156$ and $r^u = .178$. For persistence outcomes, attenuated correlations with selecting main ideas were not significantly different from zero ($r = .039$), but unattenuated correlations were significant yet small ($r^u = .043$). For GPA/grades, correlations with selecting main ideas were equivalent to that of test score outcomes ($r = .155$; $r^u = .178$). The only evidence of moderation concerned educational level, in which studies with postsecondary contexts tended to have smaller correlations than K-12 contexts ($\beta = -.27$, $p < .05$).

5.1.7 Self-Testing

Average weighted correlation between self-testing and GPA/grades was $r = .146$ and $r^u = .168$. Like most average correlations with LASSI subscales, test score outcomes and persistence outcomes were notably smaller. For test score outcomes, weighted correlations with self-testing were not significant ($r = .015$; $r^u = .021$). However, for persistence outcomes, weighted correlations were significant and modestly sized: $r = .08$ and $r^u = .110$. There was no evidence of significant moderating effects.

5.1.8 Study Aids

Associations among study aids and all outcomes were the smallest compared to the other nine subscales across outcomes. For GPA/grades, the study aids subscale was correlated at $r = .114$ and $r^u = .14$. For test score outcomes, average correlations were not significantly different from zero ($r = -.038$ and $r^u = -.047$). For persistence outcomes, the attenuated average correlation was also not significant ($r = .065$), but the unattenuated average correlation was significant ($r^u = .085$). Similar to correlations between self-testing and GPA/grades, there was no evidence of any moderation.

5.1.9 Test Taking

Unsurprisingly, average weighted correlations between test taking strategies and test score outcomes were the highest compared to the other nine subscales, $r = .192$ and $r^u = .217$. Test-taking was also positively correlated overall with GPA/grades, $r = .23$ and $r^u = .26$. They were much more modestly correlated with persistence outcomes, $r = .061$ and $r^u = .068$. There also was no evidence of any moderation.

5.1.10 Time Management

Meta-analytic correlations between time management and GPA/grades were $r = .204$ and $r^u = .23$. Time management was not significantly correlated with test score outcomes ($r = -.018$ and $r^u = -.018$). For persistence, weighted average correlations were $r = .076$ (attenuated) and $r^u = .081$ (unattenuated). Also, moderator tests identified that associations between time management and academic outcomes were larger for unpublished studies ($\beta = .11$, $p < .01$).

5.1.11 Total LASSI Score

Although the use of a total LASSI score is unconventional, there were 15 distinct samples and 26 effect sizes measuring associations with total LASSI scores and all three academic outcomes together. The weighted average correlation was $r = .254$. We did not calculate an unattenuated correlation due to unavailable reliability measures for the total LASSI.

5.2 Publication Bias

To assess publication bias, we conducted Egger's regression tests with results presented in Table 6. None of the tests indicated significant moderation by sampling variance of the studies, which suggests a lack of funnel plot asymmetry and selective outcome reporting. When comparing published studies versus unpublished studies in the overall moderator tests, we found some evidence that weighted average correlations for GPA/grades with time management and with motivation were lower in published studies.

6 Discussion

In the current study, we synthesized the extant literature on LASSI and its influence on GPA/grades, test scores, and persistence. From 158 studies, over 30 meta-analyses based on nearly 3,000 correlations yielded important findings regarding domain-general learning strategies and their predictive validity. Overall, LASSI subscales and the total LASSI score were significantly and positively associated with most students' academic outcomes. Correlations among the 10 LASSI subscales and academic outcomes varied quite substantively in their magnitude. For instance, overall, the motivation subscale was the strongest correlate to most academic outcomes, whereas study aids strategy was one of the weakest. Moreover, there was ample heterogeneity that indicated the possible moderating role of study characteristics to explain variability among effect sizes. Most consistently, we found that effect sizes were smaller for postsecondary contexts compared to K-12 settings. In addition, effect sizes were generally reduced when outcomes consisted of test scores or persistence rather than GPA and grades. We also found some support for other moderating variables that we discuss in subsequent sections.

When interpreting the magnitudes of the meta-analytic correlations, we wish to not rely on normative effect size benchmarks that are arbitrarily used without consideration of the topic and context. Instead, it is important to keep in mind prior meta-analytic results related to the current topic to guide such interpretations. For instance, Robbins et al. (2004) found that academic-related strategies were correlated with GPA ($r = .129$) and persistence ($r = .298$). Interestingly, our meta-analysis found the opposite pattern: that learning strategies were more strongly associated with GPA than persistence. Nonetheless, the magnitudes of our meta-analytic correlations were comparable to those found by Robbins et al.'s meta-analytic work. In addition, Richardson et al. (2012) synthesized correlations with GPA and various self-regulatory learning strategies such as concentration ($r = .16$), elaboration ($r = .18$), time/study management ($r = .22$), and metacognition ($r = .18$). Once again, our meta-analytic correlations mirrored some of these findings. However, both prior meta-analyses used roughly a dozen samples for each of their meta-analytic correlations, whereas we used a much larger pool of samples. In a meta-analysis exclusively focused on self-regulated learning, Dent and Koenka (2016) uncovered that among K-12 students, cognitive strategies (*r* = .10) and metacognitive strategies (*r* = .20) were positively related to academic achievement. In comparison, our meta-analytic findings reflected similar levels of magnitude. Whereas other reviews may cluster learning strategies together given the nature of specific instruments, our contribution of meta-analyzing LASSI variables separately highlighted the specific cognitive, metacognitive, and motivation strategies associated with academic outcomes.

Regarding implications for theory, our review uncovers the extent to which learning strategies are associated with student achievement—in other words, an empirical evaluation of the Model of Strategic Learning and its components. The model consists of interactive components which explain strategic learning and determine student learning; results from our meta-analysis demonstrate the validity of many of these components particularly when predicting a range of students' academic outcomes with a retrospective, domain-general instrument.

With regards to student GPA/grades, our results showed that students' motivation strategies, test taking strategies, time management, concentration, and attitude were the most highly correlated LASSI subscales (r^{u}s = .227-.361). These strategies are associated with three different controllable components of the MSL—skill (test taking strategies), will (motivation, attitude), and self-regulation (concentration, time management), which suggests that all three aspects of strategic learning can be positively related to students' academic achievement as measured by their GPA/grades. These results are consistent with the claim that a system of direct (cognitive) and indirect strategies (affective, social, metacognitive) work together and support each other to influence academic performance (McCombs, 2017; Oxford, 1996). Because attaining high course grades across and beyond a semester require a complex set of strategies, it is unsurprising how strategies that help students regulate their affective and goal-related perceptions, their time and attention, and test-taking approaches are positively linked with how well students do in their coursework for a longer period (compared to a single test, for example).

For test score outcomes, other LASSI subscales emerged as positive correlates. Namely, test taking strategies, anxiety, and selecting main ideas had the highest correlations compared to the remaining seven subscales (r^{u}s = .185-.217). Interestingly, our pattern of findings for these three subscales and test score outcomes is well-aligned with other factor analytic studies that have examined LASSI's higher-order factor structure. Although the MSL originally categorized subscales according to skill, will, and self-regulation (Table 1), other researchers have conducted factor analytic studies and found that test-taking strategies, anxiety, and selecting main ideas clustered together into one factor (Cano, 2006; Olaussen & Braten, 1998; Olivarez & Tallent-Runnels, 1994). As Olivarez and Tallent-Runnels (1994) labeled this factor as ANXIETY-ROUSING, we also observed that all three of subscales captured anxiety-inducing processes associated with test-taking and the content students are tested on, which is mainly acquired from selecting main ideas when studying. Challenging Weinstein's (1994) initial categorization of strategies, our findings for test score outcomes may shape how learning strategies can be grouped together into higher-order clusters, perhaps informing how strategies should be taught as related units of content.

When examining links between LASSI subscales and persistence outcomes, it was not surprising that correlations were smaller on average compared to GPA/grades and test score outcomes. This pattern of results supports the initial development of LASSI and how its original intention was to help students cultivate learning strategies that directly influence their achievement in their courses and not necessarily their persistence in their courses or institutions. Although self-regulated learning may enhance persistence at both the course- and institution-level (Fong et al., 2017), this link was not originally posited by Weinstein and her colleagues but could instead be an indirect relationship with academic achievement as a mediating variable. Additionally, the motivation and attitude subscales were still modestly correlated with persistence outcomes, which underscores the power of students' motivations, interests, values and their regulation for the effortful tasks of not only performing well in terms of grades but also persisting in school (Wolters, 2003). This finding was aligned with research on how motivational beliefs can buffer against undergraduates' dropout intentions (Schnettler et al., 2020) and the importance of effort regulation on students' academic outcomes (Boyraz et al., 2016; Muenks et al., 2017; Pintrich & DeGroot, 1990). In Fong et al. (2017)'s meta-analysis on U.S. community college students, their motivation level was also the strongest correlate to students' persistence compared to other psychosocial factors. They underscored the need to conceptualize persistence as a series of smaller persistence-related decisions such as choosing to study, exerting effort on an assignment, and completing a course, which culminates to broader goals of retention and degree attainment (King, 2003).

To determine which learning strategies measured by LASSI are most highly associated with academic outcomes, the solution like in many situations is “it depends.” Across all academic outcomes, the motivation subscale was one of the highest correlates overall, underscoring the importance of students’ effort put into work and how well students regulate their goals. Our finding aligns well with work on motivation regulation strategies, or strategies used to initiate, sustain, and enhance motivation (Wolters, 1998, 2003), which have been shown to increase task persistence, improve affective well-being, and reduce academic procrastination (Grunschel et al., 2016). However, compared to test-taking strategies, motivation was not as highly correlated with test score outcomes; in fact, test-taking strategies had relatively moderate associations with both test score outcomes and GPA/grades. Therefore, teaching strategies to prepare for exams and providing directions for how to navigate a test is likely to benefit student learning.

On the other hand, we also found that some subscales were not as highly correlated with academic outcomes, namely, information processing, self-testing, and study aids. This finding was rather surprising given the foundational work on cognitive strategies that formed the basis of the MSL. Learning new information and metacognitively monitoring the knowledge acquisition process were hallmark strategies for learning strategy researchers, yet these were only modestly correlated with academic outcomes in our synthesis. One interpretation of these modest relations between domain-general strategies and performance is the lack of contextualization of the LASSI subscales, which focus on students’ retrospective self-reports of domain-general strategies. These small correlations for these subscales may suggest students’ low degree of strategy transfer as different domains may require specialized strategies to learn more effectively. Measures that capture domain-specific strategies concurrent with learning tasks may increase their predictive validity with academic outcomes (Bråten et al., 2020), along with triangulation from using different types of measures. In addition, perhaps other more contemporary cognitive study strategies such as interleaving, spaced learning, and desirable difficulties need to be incorporated into how these subscales are conceived. Coincidentally, LASSI developers have recently modified the study aid scale (the weakest correlate with academic outcomes) and renamed it *using academic resources*, which reflects more accurately students’ use of learning centers, writing centers, or tutors when seeking assistance with a course or assignment (Weinstein et al., 2016). Future research should test whether this new subscale is more highly correlated with academic outcomes than its predecessor.

6.1 Moderator Results

One of the most consistent moderating effects across over half the LASSI subscale associations with GPA/grades was educational level. Most LASSI subscales were more highly correlated with GPA/grades when students were in K-12 classes versus postsecondary contexts. This finding is a bit surprising given that Weinstein and her colleagues (1987) primarily designed LASSI to assess college students’ learning strategies. Perhaps this finding underscores the importance of learning strategies for students in earlier grade levels as well. Explicit instruction of learning strategies often occurs in postsecondary settings in the form of first-year orientations, student success courses, study strategy workshops, or supplemental instruction (e.g., Hodges et al., 2019). However, because learning strategies may be more influential for younger students, teaching learning strategies in secondary education may be a worthwhile endeavor. We would like to note that there is a specific LASSI version designed for high school students, but most of the time, the original LASSI was used among K-12 students. It should also be noted that this moderator was treated dichotomously (K-12 vs. postsecondary), but we also included an age variable in the meta-regression that was continuous. For the concentration and information processing subscales, correlations with GPA/grades increased as students’ age increased. These were small effects, but they evince a possible trend in the opposite direction. Given that most studies were based on postsecondary samples, perhaps within the postsecondary studies, correlations were stronger for study samples with a higher mean age. Regarding other sample characteristics, there was no evidence of significant moderation by country of origin, sample percentage of women, or sample percentage of Students of Color. This is encouraging to reveal some evidence that points to LASSI’s relative invariance in their associations with academic outcomes with regards to cultural, gender, or racial groups, given the widespread usage of the instrument.

Another moderating effect to note was a slight moderation effect of publication year for anxiety and GPA/grades, indicating that newer studies reporting lower correlations. LASSI’s anxiety-coping strategies may not be as impactful for newer generations with increasing stress levels (American Psychological Association, 2018). Additionally, the motivation-GPA/grades association was moderated by domain independence, indicating that for domain-specific outcomes, correlations were smaller. This was expected given that the LASSI was designed to be domain independent (or domain-general), and motivation variables tend to be more influential when they are domain-specific to the task (Eccles & Wigfield, 2020). We also indicated when moderators were significant at $p < .10$ level and encourage future research to explore these moderating effects more closely.

6.2 Publication Bias

We found some evidence of bias for stronger associations for unpublished studies on average for correlations between GPA/grades and both motivation and time management. One thing to note is that motivation and time management compared to other subscales were more often used as standalone measures in published studies (Chevalier et al., 2017; De Feyter et al., 2012; Grobler et al., 2014; Lens et al., 2005). Perhaps when studies use individual subscales rather than the entire LASSI, correlations may be attenuated because answering items from other subscales allow students to assess more accurately their motivation and time management in relation to other subscales. Although comparing unpublished and published studies is just one piece of evidence, results from a more precise estimation of publication bias via Egger regression tests indicated a lack of funnel plot asymmetry. We recommend future methodology research to examine publication bias tests such as selection models (Vevea & Woods, 2005) that account for dependent, correlational effect sizes.

6.3 Implications for Educational Practice

To summarize our main findings, total LASSI score and LASSI subscales were positively and significantly associated with most student academic outcomes. In regard to student GPA/grades, our study found that students' motivation strategies, test taking strategies, time management, concentration, and attitude were the most highly correlated LASSI subscales. For test score outcomes, test taking strategies, anxiety, and selecting main ideas had the highest correlations. Overall, the motivation subscale was the strongest correlate to most academic outcomes, while study aids strategy was the weakest. Additionally, effect sizes decreased on average when the outcome consisted of persistence compared to GPA/grades and test scores. On the other hand, LASSI subscales of information processing, self-testing, and study aids were not strong correlates of academic outcomes with the weakest being study aids. Furthermore, education level or grade level (postsecondary vs. K-12) was found to moderate the relationship between LASSI subscales and GPA/grades. Specifically, LASSI subscales were more highly correlated with GPA/grades for K-12 students compared to postsecondary students. Our study converges with prior literature suggesting possible strategies for educational practice, but at the same time calls for further research to discern discrepancies among study findings.

Broadly, the aggregated evidence from our study can guide practitioners to focus on developing the most potent learning strategies for students to use (de Boer et al., 2018). Findings are particularly salient for the field of developmental education, which seeks to optimize learning supports for postsecondary students who may lack requisite academic skills and require holistic support (McCombs, 2017). Regarding practice, by affirming significant yet modest associations between learning strategies and academic achievement, we offer practitioners synthesized evidence to tailor programs, orientations, and courses that focus on enhancing the most potent learning strategies (e.g., Donker et al., 2014). Given the wide range of learning strategies to focus on, our synthesis provides useful direction to guide practitioners and students to cultivate the most influential strategies for student achievement.

Specifically, the most highly correlated learning strategies with students' academic outcomes should be prioritized when fostering learning strategies. First, teaching students how to initiate and regulate their motivation and attitude towards learning can be influential for their course performance and persistence (e.g., Fong et al., 2017; Lazowski & Hulleman, 2015). Increasing the subjective task value and instilling the power of student effort are potential ways to enhance the affective dimensions of strategic learning and decisions to persist through challenges (Linnenbrink-Garcia et al., 2015). Cultivating students' interest might be a useful approach to curbing students' boredom and increasing their concentration to better focus on tasks (Pekrun et al., 2010), which may translate to enhanced academic performance and persistence.

Second, instructors' explicit explanations of the content and structure of examinations may encourage students to approach exam preparation and test-taking more strategically, which was linked with increased test performance and overall GPA/grades. As taking tests can often trigger students' anxiety (i.e., test anxiety), in addition to other anxiety-reducing techniques, psychological interventions in which students write about their concerns before pressure-filled exam situations seem promising to improve exam performance (Ramirez & Beilock, 2011). Supporting students to learn how to best select main ideas can improve reading comprehension and ability, which most likely influences test performance as well (Kirby et al., 2008).

Third, as moderation tests suggested that as grade-level increased from K-12 to postsecondary settings, the correlations between learning strategies and academic outcomes tended to decrease; it follows that cultivating these strategies earlier on before college could maximize the potency of strategic learning. Moreover, if learning strategies are established within students before attending college, the academic demands and relatively independent nature of learning associated with postsecondary education can be addressed by enhanced self-regulated, affective, and cognitive strategies (e.g., Wolters & Brady, 2020).

6.4 Implications for Research Syntheses

One unique approach to our meta-analysis was to focus on a specific instrument. Whereas the majority of meta-analyses focus on constructs rather than instruments, especially when developing search strategies, there is a high probability that a portion of potentially included studies may be inadvertently excluded. Yielding five to ten times the number of included studies, the search and information retrieval results in the present synthesis provided a stark comparison in relation to other syntheses on learning strategies, self-regulated learning, or psychosocial factors. In sum, using an instrument-specific search produced a much larger pool of included studies, which in turn improved the level of systematicity and comprehensiveness in the current meta-analysis. We recommend for future meta-analysts particularly in the field of educational psychology, which is rife with multiple instruments measuring the same constructs, to consider including scale-specific search terms to enhance the completeness of syntheses.

6.5 Limitations and Future Directions

First, it should be noted that our meta-analytic data were correlational, and although theory would suggest that learning strategies would predict academic outcomes, directionality cannot be directly inferred from our study. Relying on correlational data and conducting exploratory analyses of moderators should not be inferred as causal (Cooper, 1998). Moreover, results from moderator tests should be treated as exploratory, guiding the investigations of future primary studies. In addition, there were several important variables that could not be investigated as moderators due to inconsistent and incomplete reporting in the included studies, such as a student's academic major or prior academic achievement.

Second, additional future studies may wish to analyze intercorrelations between LASSI subscales and outcomes via meta-analytic structural equation modeling (metaSEM) for two purposes. The higher-order factor structure of LASSI (i.e., how subscales are clustered as skill, will, and self-regulation or another configuration) could be explored through meta-analytic confirmatory factor analysis. In applied settings, understanding the latent factor structure of these strategies can inform how learning strategies are taught. Determining how the 10 subscales cluster together, these categories can form the basis of units for a course designed to train students in self-regulated learning or support students in need of academic assistance (Hodges et al., 2019). Also, the ten LASSI subscales could be entered into a regression model to assess joint predictive relations between LASSI and academic outcomes. In addition, a path analytic model could be constructed to assess potential mediating relationships among LASSI subscales to predict students' educational outcomes.

Third, although our synthesis captured studies originating from over 20 different countries, we also recognized a lack of LASSI research in other global regions. For instance, no included studies were included in Russia and other Asian countries such as Indonesia and Thailand. Besides South Africa and Egypt, no other countries were sampled in Africa; moreover, no countries in Central America were represented. Among European nations, more research could be conducted in Italy, Ireland, France, and Sweden. While LASSI has already had a global reach, more future work is needed to continue LASSI's great adventure (McCombs, 2017).

References

*References marked with an asterisk indicate studies included in the meta-analysis.

*Abd Ghani, K. (2013). *Working memory performance, learning and study strategies and learning styles of dyslexic and non dyslexic adult learners* (Unpublished doctoral dissertation). University of York, York, UK.

Abulela, M. A., & Bart, W. M. (2020). Learning and study strategies and engagement among Egyptian undergraduates: do gender and discipline matter? *Educational Psychology*. Advanced online publication. https://doi.org/10.1080/01443410.2020.1834076

*Acosta, C. (2013). *Making the grade: A study of academic success* (Unpublished master's thesis). Texas Woman's University, Denton, TX.

Afflerbach, P., Pearson, P. D., & Paris, S. G. (2008). Clarifying differences between reading skills and reading strategies. *The Reading Teacher*, *61*(5), 364-373. https://doi.org/10.1598/RT.61.5.1

*Albaili, M. A. (1997). Differences Among low-, average- and high-achieving college students on learning and study strategies. *Educational Psychology, 17*(1/2), 171-177. https://doi:10.1080/0144341970170112

*Albertini, J. A., Kelly, R. R., & Matchett, M. K. (2012). Personal factors that influence deaf college students' academic success. *Journal of Deaf Studies and Deaf Education, 17*(1), 85-101. https://doi.org/10.1093/deafed/enr016

*Al-Dhobaiban, N. A. (2005). *Exploring the relationship between self-regulation and creativity* (Unpublished doctoral dissertation). The University of Alabama, Tuscaloosa, AL.

Alexander, P. A. (1998). The nature of disciplinary and domain learning: The knowledge, interest, and strategic dimensions of learning from subject matter text. In C. R. Hynd (Ed.), *Learning from texts across conceptual domains* (pp. 263–287). Routledge. https://doi.org/10.4324/9781315045047

Alexander, P. A., & Judy, J. E. (1988). The interaction of domain-specific and strategic knowledge in academic performance. *Review of Educational Research*, *58*(4), 375-404. https://doi.org/10.3102/00346543058004375

Alexander, P. A., Murphy, P. K., & Guan, J. (1998). The learning and study strategies of highly able female students in Singapore. *Educational Psychology*, *18*(4), 391-407. https://doi.org/10.1080/0144341980180403

Alexander, P. A., Schallert, D. L., & Hare, V. C. (1991). Coming to terms: How researchers in learning and literacy talk about knowledge. *Review of Educational Research*, *61*(3), 315-343. https://doi.org/10.3102/00346543061003315

Alexander, P. A., Grossnickle, E. M., Dumas, D., & Hattan, C. (2018). A retrospective and prospective examination of cognitive strategies and academic development: Where have we come in twenty-five years? In A. O'Donnell (Ed.) *The Oxford Handbook of Educational Psychology*. https://doi.org/10.1093/oxfordhb/9780199841332.013.23

*Alkhateeb, H., & Nasser, R. (2014). Assessment of learning and study strategies of university students in Qatar using an Arabic translation of the Learning and Study Strategies Inventory. *Psychological Reports, 114*(3), 947-965. https://doi.org/10.2466/11.03.PR0.114k26w3

American Psychological Association (2018). *Stress in America: Generation Z*. Stress in America™ Survey.

Antonelli, J., Jones, S. J., Burridge, A. B., & Hawkins, J. (2020). Understanding the self-regulated learning characteristics of first-generation college students. *Journal of College Student Development*, *61*(1), 67-83. https://doi.org/10.1353/csd.2020.0004

*Badenier, C. (2003). Confiabilidad y validez del Learning and Study Strategies Inventory (LASSI) en una muestra de estudiantes de la región metropolitana. *Psykhe: Revista de la Escuela de Psicología, 12*(2), 193-206.

*Baker, L. (2018). *Unpacking success: What factors contribute to college student achievement?* Manuscript in preparation.

Bandura, A. (1997). *Self-efficacy: The exercise of control.* New York, NY: W. H. Freeman.

*Barrus, A. (2013). *Does self-regulated learning-skills training improve high-school students' self-regulation, math achievement, and motivation while using an intelligent tutor?* (Unpublished doctoral dissertation). Arizona State University, Tempe, AZ.

*Barton, J. W., Jr. (1999). *Fluid intelligence and use of cognitive learning strategies* (Unpublished doctoral dissertation). The University of Texas at Austin, Austin, TX.

*Beena Daliya, R., & Bhogle, S. (2013). Learning and study strategies: Academic achievement and gender differences. *Artha-Journal of Social Sciences, 12*(4), 49-60.

*Bender, D. S., & Garner, J. K. (2010, April). *Using the LASSI to predict first year college achievement: Is a gender-specific approach necessary?* Paper presented at the annual meeting for the American Research Association, Denver, CO.

Berger, J., & Karabenick, S. A. (2016). Construct validity of self-reported metacognitive learning strategies. *Educational Assessment*, *21*, 19-33. https://doi.org/10.1080/10627197.2015.1127751

*Bergey, B. W., Deacon, S. H., & Parrila, R. K. (2017). Metacognitive reading and study strategies and academic achievement of university students with and without a history of reading difficulties. *Journal of Learning Disabilities, 50*(1), 81-94. https://doi.org/10.1177/0022219415597020

*Bergey, B. W., Parrila, R. K., Laroche, A., & Deacon, S. H. (2019). Effects of peer-led training on academic self-efficacy, study strategies, and academic performance for first-year university students with and without reading difficulties. *Contemporary Educational Psychology*, *56*, 25-39. https://doi.org/10.1016/j.cedpsych.2018.11.001

Biggs, J. B. (1987). *Student approaches to learning*. Hawthorn, Australia: Australian Council for Educational Research.

Boekaerts, M. (1997). Self-regulated learning: A new concept embraced by researchers, policy makers, educators, teachers, and students. *Learning and Instruction*, *7*(2), 161-186. https://doi.org/10.1016/S0959-4752(96)00015-1

Boekaerts, M., & Corno, L. (2005). Self-regulation in the classroom: A perspective on assessment and intervention. *Applied Psychology*, *54*, 199–231. https://doi.org/10.1111/j.1464-0597.2005.00205.x

Borenstein, M., Hedges, L. V., Higgins, J. P., & Rothstein, H. R. (2021). *Introduction to meta-analysis*. John Wiley & Sons.

Boyraz, G., Granda, R., Baker, C. N., Tidwell, L. L., & Waits, J. B. (2016). Posttraumatic stress, effort regulation, and academic outcomes among college students: A longitudinal study. *Journal of Counseling Psychology*, *63*(4), 475-486. https://doi.org/10.1037/cou0000102

Bråten, I., & Olaussen, B. S. (1998). The learning and study strategies of Norwegian first-year college students. *Learning & Individual Differences*, *10*(4), 309-327. https://doi.org/10.1016/S1041-6080(99)80125-3

Bråten, I., Magliano, J. P., & Salmerón, L. (2020). Concurrent and task specific self-reports. In D. L. Dinsmore, L. K. Fryer, & M. M. Parkinson (Eds.), *Handbook of strategies and strategic processing: Conceptualization, intervention, measurement, and analysis* (pp. 275-295). Routledge.

*Breskin, L. (2008). *The relationship among ethnic identity, academic achievement, attitudes toward education and gender* (Unpublished doctoral dissertation). Hofstra University, Long Island, NY.

Brown, W. F., & Holtzman, W. H. (1967). *Survey of Study Habits and Attitudes* manual. The Psychological Corporation.

*Burgin, A. S. (2011). *An analysis of scholar athlete attitudes and behaviors, and academic excellence* (Unpublished doctoral dissertation). Capella University, Minneapolis, MN.

*Campbell, C. L. (2005). *Preparing for college: Identifying the learning and study strategies associated with varying levels of college preparedness in tenth graders* (Unpublished doctoral dissertation). The University of Texas at Austin, Austin, TX.

*Cano, F. (2006). An in-depth analysis of the Learning and Study Strategies Inventory (LASSI). *Educational and Psychological Measurement, 66*(6), 1023-1038. https://doi.org/10.1177/0013164406288167

*Carpenter, J., Dearlove, J., & Marland, J. (2015). Student skills and the Bradley agenda in Australia. *Higher Education Research and Development, 34*(2), 284-297. https://doi.org/10.1080/07294360.2014.956698

*Carson, A. D. (2011). Predicting student successful from the LASSI for learning online (LLO). *Journal of Educational Computing Research, 45*(4), 399-414. https://doi.org/10.2190/EC.45.4.b

*Carter, D. D. G. (1999). *The relationship of study habits, attitude, and motivation to academic achievement in a selected course of study at an historically black university* (Unpublished doctoral dissertation). Morgan State University, Baltimore, MD.

*ChanLin, L.-J. (2012). Learning strategies in web-supported collaborative project. *Innovations in Education and Teaching International, 49*(3), 319-331. https://doi.org/10.1080/14703297.2012.70301

*Chevalier, T. M., Parrila, R., Ritchie, K. C., & Deacon, S. H. (2017). The role of metacognitive reading strategies, metacognitive study and learning strategies, and behavioral study and learning strategies in predicting academic success in students with and without a history of reading difficulties. *Journal of Learning Disabilities, 50*(1), 34-48. https://doi.org/10.1177/0022219415588850

*Cleary, T. J., & Callan, G. L. (2014). Student self-regulated learning in an urban high school: Predictive validity and relations between teacher ratings and student self-reports. *Journal of Psychoeducational Assessment, 32*(4), 295-305. https://doi.org/10.1177/0734282913507653

*Clifton, J. (2007). *Preferential seating for college students with ADHD: Is it an effective accommodation?* (Unpublished doctoral dissertation). Auburn University, Auburn, AL.

*Clow, E. D. (1998). *Two-year college students in interactive distance education classes: The relationship of learning strategies to persistence and performance* (Unpublished doctoral dissertation). University of Georgia, Athens, GA.

Cole, D. E. (2007). Self-regulation and learning strategies in at-risk community college students* (Unpublished doctoral dissertation). Capella University, Minneapolis, MN.

*Cole, S. M. (1988). *A validity study of the use of the Learning and Study Strategies Inventory (LASSI) with college freshmen* (Unpublished doctoral dissertation). The University of North Carolina at Chapel Hill, Chapel Hill, NC.

Cooper, H. (1998). *Synthesizing research: A guide for literature reviews* (3rd ed.). Thousand Oaks, CA: Sage.

Cooper, H., Hedges, L. V., & Valentine, J. C. (Eds.). (2009). *The handbook of research synthesis and meta-analysis* (2nd ed.). New York, NY: Russell Sage Foundation.

Credé, M., & Kuncel, N. R. (2008). Study habits, skills, and attitudes: The third pillar supporting collegiate academic performance. *Perspectives on Psychological Science*, *3*(6), 425-453. https://doi.org/10.1111/j.1745-6924.2008.00089.x

Credé, M., & Phillips, L. A. (2011). A meta-analytic review of the Motivated Strategies for Learning Questionnaire. *Learning and Individual Differences*, *21*(4), 337-346. https://doi.org/10.1016/j.lindif.2011.03.002

*Croft, F. R., Rush, P., LaRue-Atuonah, S., Baechle, C., & Gemmill, J. (1991). Pilot investigation of validation of the modified Learning and Study Strategies Inventory (LASSI) for hearing-impaired preparatory students at Gallaudet University. In D. S. Martin (Ed.), *Advances in Cognition, Education, and Deafness* (pp. 69-81). Washington, DC. Gallaudet University Press.

Cushen, P. J., & Wiley, J. (2018). Both attentional control and the ability to make remote associations aid spontaneous analogical transfer. *Memory & Cognition*, *46*(8), 1398–1412. https://doi.org/10.3758/s13421-018-0845-1

*Daiek, D. B. (1993). *Effects of the California Critical Thinking Skills Test achievement on first semester success of summer academy students* (Unpublished doctoral dissertation). Wayne State University, Detroit, MI.

*Daniel, J. N. (2002). *Predicting nursing student success and retention with the Learning and Study Skills Inventory* (LASSI) (Unpublished master's thesis). University of Wyoming, Laramie, WY.

de Boer, H., Donker, A. S., Kostons, D. D., & van der Werf, G. P. (2018). Long-term effects of metacognitive strategy instruction on student academic performance: A meta-analysis. *Educational Research Review*, *24*, 98-115. https://doi.org/10.1016/j.edurev.2018.03.002

*De Feyter, T., Caers, R., Vigna, C., & Berings, D. (2012). Unraveling the impact of the Big Five personality traits on academic performance: The moderating and mediating effects of self-efficacy and academic motivation. *Learning and Individual Differences, 22*(4), 439-448. https://doi.org/10.1016/j.lindif.2012.03.013

*de Oliveira Filho, G. R., & Vieira, J. E. (2007). The relationship of learning environment, quality of life, and study strategies measures to anesthesiology resident academic performance. *Anesthesia & Analgesia, 104*(6), 1467-1472. https://doi.org/10.1213/01.ane.0000261505.77657.d3

*De Zoysa, A., Chandrakumara, P. M. K., & Rudkin, K. (2014). Learning and study strategies affecting the performance of undergraduate management accounting students in an Australian university. Paper presented at the 2014 Accounting and Finance Association of Australia and New Zealand Conference (pp. 1-9). Retrieved from the University of Wollongong Research Online: http://ro.uow.edu.au/buspapers/483

Dent, A. L., & Koenka, A. C. (2016). The relation between self-regulated learning and academic achievement across childhood and adolescence: A meta-analysis. *Educational Psychology Review*, *28*(3), 425-474. https://doi.org/10.1007/s10648-015-9320-8

Donker, A. S., De Boer, H., Kostons, D., Van Ewijk, C. D., & van der Werf, M. P. (2014). Effectiveness of learning strategy instruction on academic performance: A meta-analysis. *Educational Research Review*, *11*, 1-26. https://doi.org/10.1016/j.edurev.2013.11.002

*Downing, K. J. (2009). Self-efficacy and metacognitive development. *International Journal of Learning, 16*(4), 185-199. https://doi.org/10.18848/1447-9494/CGP/v16i04/46214

*Dugan, R. F., & Andrade, H. L. (2011). Exploring the construct validity of Academic Self-Regulation using a new self-report questionnaire—the Survey of Academic Self-Regulation. *The International Journal of Educational and Psychological Assessment, 7*(1), 45-63.

Dumas, D. (2018). Relational reasoning and divergent thinking: An examination of the threshold hypothesis with quantile regression. *Contemporary Educational Psychology*, *53*, 1–14. https://doi.org/10.1016/j.cedpsych.2018.01.003

Dumas, D. (2020). Strategic processing within and across domains of learning. In D. L. Dinsmore, L. K. Fryer, & M. M. Parkinson (Eds.), *Handbook of strategies and strategic processing: Conceptualization, intervention, measurement, and analysis* (pp. 11-28). Routledge.

Eccles, J. S., & Wigfield, A. (2020). From expectancy-value theory to situated expectancy-value theory: A developmental, social cognitive, and sociocultural perspective on motivation. *Contemporary Educational Psychology*, 101859. https://doi.org/10.1016/j.cedpsych.2020.101859

Efklides, A. (2011). Interactions of metacognition with motivation and affect in self-regulated learning: The MASRL model. *Educational*

Psychologist, *46*(1), 6-25. https://doi.org/10.1080/00461520.2011.538645

Egger, M., Smith, G. D., Schneider, M., & Minder, C. (1997). Bias in meta-analysis detected by a simple, graphical test. *British Medical Journal*, *315*(7109), 629-634. https://doi.org/10.1136/bmj.315.7109.629

*Eilam, B., & Reiter, S. (2014). Long-term self-regulation of biology learning using standard junior high school science curriculum. *Science Education, 98*(4), 705-737. https://doi.org/10.1002/sce.21124

*Eilam, B., Zeidner, M., & Aharon, I. (2009). Student conscientiousness, self-regulated learning, and science achievement: An explorative field study. *Psychology in the Schools, 46*(5), 420-432. https://doi.org/10.1002/pits.20387

*Ellis, K. C. (2013). *Ready for college: Assessing the influence of student engagement on student academic motivation in a first-year experience program* (Unpublished doctoral dissertation). Virginia Polytechnic Institute and State University, Blacksburg, VA.

*Everson, H. T., Tobias, S., & Laitusis, V. (1997, March). Do metacognitive skills and learning strategies transfer across domains? Paper presented at the Annual Meeting of the American Educational Research Association, Chicago, IL. Retrieved from ERIC database. (ED372035)

*Fischer, J. F. B. (1995). *Cognition in pure and applied mathematics: A study of the relationship between success in a basic college mathematics course and computational versus logical reasoning ability* (Unpublished doctoral dissertation). The University of Texas at Austin, Austin, TX.

*Flowers, L. A., Bridges, B. K., & Moore, J. L., III. (2012). Concurrent validity of the Learning and Study Strategies Inventory (LASSI): A study of African American precollege students. *Journal of Black Studies, 43*(2), 146-160. https://doi.org/10.1177/0021934711410881

Fong, C. J., Davis, C. W., Kim, Y., Kim, Y. W., Marriott, L., & Kim, S. (2017). Psychosocial factors and community college student success: A meta-analytic investigation. *Review of Educational Research*, *87*(2), 388-424. https://doi.org/10.3102/0034654316653479

*García-Ros, R., Pérez-González, F., Martínez, T., & Moliner, E. (1996). Una adaptación española del Learning and Study Strategies Inventory (LASSI): Análisis de su relación y capacidad predictiva sobre el rendimiento académico. *Revista de Psicología Universitas Tarraconensis, 18*(1), 39-46.

*Garcia-Ruffin, N. (2003). *The measurement of fear of success and its relationship to personality, perceived parenting, study habits, and academic performance* (Unpublished doctoral dissertation). Fordham University, New York City, NY.

*Gatto, S. L. (2010). *Learning and study strategies of baccalaureate nursing students during first semester nursing courses* (Unpublished doctoral dissertation). University of Arkansas for Medical Sciences, Little Rock, AR.

*Gilles, L. T. (1994). *The assessment of student study skills and learning strategies to prepare teachers for academic advising tasks or the prevalidation of Motivated Strategies for Learning Questionnaire (MSLQ), Learning and Study Strategies Inventory (LASSI), and Test of Reactions and Adaptation to College (TRAC).* (Report No. 143). Quebec City, QC. Retrieved from ERIC database. (ED372035)

*Gormley, M. J., Pinho, T., Pollack, B., Puzino, K., Franklin, M. K., Busch, C., & Anastopoulos, A. D. (2018). Impact of study skills and parent education on first-year GPA among college students with and without ADHD: A moderated mediation model. *Journal of Attention Disorders*, *22*, 334-348. https://doi.org/10.1177/1087054715594422

Graham, S., & Donaldson, J. F. (1999). Adult students' academic and intellectual development in college. *Adult Education Quarterly*, *49*(3), 147-161. https://doi.org/10.1177/074171369904900302

Granott, N. (1998). We learn, therefore we develop: Learning versus development—or developing learning? In M. C. Smith & T. Pourchot (Eds.), *The educational psychology series. Adult learning and development: Perspectives from educational psychology* (p. 15–34). Lawrence Erlbaum Associates Publishers.

Greene, J. A. (2017). *Self-regulation in education*. Routledge.

*Griffin, R., MacKewn, A., Moser, E., & VanVuren, K. W. (2011, May). Learning and study strategies gender differences in academic performance. In *Global Conference on Business and Finance Proceedings,* (Vol. 6, No. 2, pp. 475-482). Institute for Business & Finance Research.

*Griffin, R., MacKewn, A., Moser, E., & VanVuren, K. W. (2012). Do learning and study skills affect academic performance? An empirical investigation. *Contemporary Issues in Education Research, 5*(2), 109-116. https://doi.org/10.19030/cier.v5i2.6928

*Griffin, R., MacKewn, A., Moser, E., & VanVuren, K. W. (2012, July). A study of aspects of learning skills and motivation: Correlates to superior academic performance. In *Global Conference on Business & Finance Proceedings* (Vol. 7, No. 2, p. 310). Institute for Business & Finance Research.

*Griffin, R., MacKewn, A., Moser, E., & VanVuren, K. W. (2013). Learning skills and motivation: Correlates to superior academic performance. *Business Education & Accreditation, 5*(1), 53-65.

*Grimes, S. K. (1997). Underprepared community college students: Characteristics, persistence, and academic success. *Community College Journal of Research and Practice, 21*, 47-56. https://doi.org/10.1080/1066892970210105

*Grobler, A. A., Knight, M. R., Lens, W., & Lacante, M. (2014). Motivational predictors of successful transition from grades 11 to 12 in South Africa. *European Journal of Psychology of Education, 29*, 693-709. https://doi.org/10.1007/s10212-014-0223-8

Grubb, F. E. (1950). Sample criteria for testing outlying observations. *Journal of the American Statistical Association*, *21*, 27-58. https://doi.org/10.1214/aoms/1177729885

Grunschel, C., Schwinger, M., Steinmayr, R., & Fries, S. (2016). Effects of using motivational regulation strategies on students' academic procrastination, academic performance, and well-being. *Learning and Individual Differences*, *49*, 162-170. https://doi.org/10.1016/j.lindif.2016.06.008

Hadwin, A. F., Järvelä, S., & Miller, M. (2011). Self-regulated, co-regulated, and socially shared regulation of learning. In B. J. Zimmerman & D. H. Schunk (Eds.) *Handbook of self-regulation of learning and performance* (pp. 65–84). Routledge.

*Han, P. P. (1990). *The impact of acculturation, study skills, self-esteem, family and home characteristics upon the educational achievement of Japanese-American students* (Unpublished doctoral dissertation). University of Southern California, Los Angeles, CA.

*Hanlon O'Connell, K. A. (2014). *Predictive validity of the Learning and Study Skills Inventory on developmental community college student success* (Unpublished doctoral dissertation). Northcentral University, San Diego, CA.

*Hart, E. R. (1996). *The effects of reciprocal teaching on the reading comprehension of postsecondary students at-risk for academic failure* (Unpublished doctoral dissertation). University of Maryland, College Park, MD.

*Haynes, N. M., Comer, J. P., & Hamilton Lee, M. (1988). Gender and achievement status differences on learning factors among Black high school students. *Journal of Educational Research, 81*, 233-237. https://doi.org/10.1080/00220671.1988.10885828

*Haynes, N. M., Comer, J. P., Hamilton-Lee, M., & Boger, J. (1988). Differences among high, average, and low high school achievers on the Learning and Study Strategies Inventory. *Educational & Psychological Research, 8*, 65-71.

*Healy, M. (2012). *The use of non-cognitives and learning strategies as a predictor for completion of developmental mathematics at a community college* (Unpublished doctoral dissertation). Old Dominion University, Norfolk, VA.

*Heaney, M. J. (1996). *Learning and study strategies, cognitive indicators, and demographic factors as related to academic achievement and retention among college freshmen* (Unpublished doctoral dissertation). Wayne State University, Detroit, MI.

*Heard, M. L. (2002). *The Relationship between learning and study skills and student persistence in a community college* (Unpublished doctoral dissertation). University of Virginia, Charlottesville, VA.

Hedges, L. V., Tipton, E., & Johnson, M. C. (2010). Robust variance estimation in meta-regression with dependent effect size estimates. *Research Synthesis Methods*, *1*(1), 39–65. https://doi.org/10.1002/jrsm.5

*Heller, M. L. (2015). *Predicting first-year college achievement: Evaluation of a self-regulatory coping model* (Unpublished doctoral dissertation). Ball State University, Muncie, IN.

*Hewlett, M. G., Boonstra, J., Bell, J. H., & Zumbo, B. D. (2000). Can LASSI score profiles help identify postsecondary students with underlying reading problems? *Journal of College Reading and Learning, 30*, 135-143. https://doi.org/10.1080/10790195.2000.10850091

Hodges, R., Acee, T. W., Jarrett, S. M., Leblanc, R., Lin, Y., Castillo, A. M., Cox, C. H. T., Lawson, C., Oelschlegel, C. P., Flaggs, D. A. (2019). Characteristics of learning frameworks courses in Texas public community colleges. *Journal of College Academic Support Programs*, *2*(1), 7-23.

*Hoi Kwan Ning, & Downing, K. (2010). The impact of supplemental instruction on learning competence and academic performance. *Studies in Higher Education, 35*(8), 921-939. https://doi.org/10.1080/03075070903390786

*Hoveland, C. M. (2006). *Relationships between learning and study strategies and academic achievement in associate degree nursing students* (Unpublished master's thesis). University of Wyoming, Laramie, WY.

*Huber, P. B. (2006). *Examining retention and academic success among community college developmental Algebra I students* (Unpublished doctoral dissertation). Old Dominion University, Norfolk, VA.

*Huggins, B. (1992). *The relationships between metacognitive-strategies and learning outcomes in an adult basic skills program* (Unpublished doctoral dissertation). Old Dominion University, Norfolk, VA.

*Jakubowski, T. G. (2002). *Social-cognitive factors associated with the academic self-regulation of undergraduate college students in a learning and study strategies course* (Unpublished doctoral dissertation). University of Southern California, Los Angeles, CA.

*Jakubowski, T. G., & Dembo, M. H. (2002, May). Social cognitive factors associated with the academic self-regulation of undergraduate college students in a learning and study strategies course. Paper presented at the annual meeting of the American Educational Research Association, New Orleans, LA. Retrieved from ERIC database. (ED465335)

*Jean-Louis, G. (2014). *Skill, will, and self-regulation: Assessing the learning and study strategies of university summer bridge program students* (Unpublished doctoral dissertation). Temple University, Philadelphia, PA.

*Johnson, D. K. (1992). *The relationship of reading, attitudes and learning strategies to writing in college freshmen* (Unpublished doctoral dissertation). University of Houston, Houston, TX.

*Jouhari, Z., Haghani, F., & Changiz, T. (2016). Assessment of medical students' learning and study strategies in self-regulated learning. *Journal of Advances in Medical Education & Professionalism, 4*(2), 72.

*Jung, J. H. (2011). *A cross cultural investigation of cognitive, metacognitive and motivational factors affecting student achievement* (Unpublished doctoral dissertation). The University of Texas at Austin, Austin, TX.

Justice, E. M., & Dornan, T. M. (2001). Metacognitive differences between traditional-age and nontraditional-age college students. *Adult Education Quarterly*, *51*, 236-249. https://doi.org/10.1177/074171360105100305

Karabenick, S. A., Woolley, M. E., Friedel, J. M., Ammon, B. V., Blazevski, J., Bonney, C. R., … Kelly, K. L. (2007). Cognitive processing of self-report items in educational research: Do they think what we mean? *Educational Psychologist*, *42*(3), 139–151. https://doi.org/10.1080/00461520701416231

*Keane, M. (1993). Preferred learning styles and study strategies in a linguistically diverse baccalaureate nursing student program. *Journal of Nursing Education, 32*, 214-221. https://doi.org/10.3928/0148-4834-19930501-07

*Kellogg, S. D., Durben, D., & Ayars-Junek, S. (2004, October). *Critical factors for success in an introductory astronomy class*. Paper presented at the 34th annual meeting of Frontiers in Education, Savannah, GA. In the *34th ASEE/IEEE Frontiers in Education* (pp. T1F-3). https://doi.org/10.1109/FIE.2004.1408468

*Kern, C. W., Fagley, N. S., & Miller, P. M. (1998). Correlates of college retention and GPA: Learning and study strategies, testwiseness, attitudes, and ACT. *Journal of College Counseling, 1*(1), 26-34. https://doi.org/10.1002/j.2161-1882.1998.tb00121.x

*Khadivezadah, R., Saif, A. A., & Valae, N. (2001). Learning and study strategies of medical students in Mashhad University of Medical Sciences and Health Services. *Journal of Medical Education, 1*(2), 112-120. https://doi.org/10.22037/jme.v1i2.968

*Khalil, M. K., Hawkins, H. G., Crespo, L. M., & Buggy, J. (2017). The design and development of prediction models for maximizing students' academic achievement. *Medical Science Educator,* 1-7. https://doi.org/10.1007/s40670-017-0515-0

*Khalil, M. K., Hawkins, H. G., Crespo, L. M., & Buggy, J. (2017). The relationship between Learning and Study Strategies Inventory (LASSI) and academic performance in medical schools. *Medical Science Educator, 27*(2), 315-320. https://doi.org/10.1007/s40670-017-0400-x

*Khalil, M. K., Williams, S. E., & Hawkins, H. G. (2017). Learning and study strategies correlate with medical students' performance in anatomical sciences. *Anatomical Sciences Education,* 1-7. https://doi.org/10.1002/ase.1742

Khalil, M. K., Williams, S. E., & Hawkins, H. G. (2020). The use of Learning and Study Strategies Inventory (LASSI) to investigate differences between low vs high academically performing medical students. *Medical Science Educator*, *30*, 287-292. https://doi.org/10.1007/s40670-019-00897-w

*Kim, C. W. (1999). *Social-cognitive factors influencing success on college entrance exams in South Korea* (Unpublished doctoral dissertation). University of Southern California, Los Angeles, CA.

King, J. E. (2003). Nontraditional attendance and persistence: The cost of students' choices. *New Directions for Higher Education*, *121*, 69–83. https://doi.org/10.1002/he.102

*Kirby, J. R., Silverstri, R., Allingham, B. H., Parrila, R., & Fave, C. B. L. (2008). Learning strategies and study approaches of postsecondary students with dyslexia. *Journal of Learning Disabilities, 41*(1), 85-96. https://doi.org/10.1177/0022219407311040

*Kladivko, D. J. (1991). *An examination of the role of traditional and non-traditional predictor variables in the academic success of students at an open admission commuter institution* (Unpublished doctoral dissertation). Ohio University, Athens, OH.

*Kochenderfer, L. A. M. (1988). *Learning and study strategies as they relate to academic success in the community college* (Unpublished doctoral dissertation). University of California, Riverside, Riverside, CA.

*Kohler Herrera, J. L. (2013). Rendimiento académico, habilidades intelectuales y estrategias de aprendizaje en universitarios de lima. [Academic, intellectual skills performance and strategies of learning in university students of Lima]. *Liberat, 19*(2), 277-288.

*Kovach, K., & Wilgosh, L. R. (1999). Learning and study strategies, and performance anxiety in postsecondary students with learning disabilities: A preliminary study. *Developmental Disabilities Bulletin, 27*(1), 47-57.

Krause, J. M., & Fong, C. J. (2012). Considerations for student learning: A qualitative analysis of college calculus instruction. *International Journal of University Teaching and Faculty Development*, *2*, 181-198.

*Kuo, Y.-L. (2015). Relationship among study strategies, course grades, and success on the Taiwanese national physical therapy examination. *Journal of Medical Education, 19*(1), 1-10. https://doi.org/10.6145/jme201501

*Landers, M. E. K. (1996). *The predictive effects of certain variables on student learning to translate word problems in developmental college algebra in the community college* (Unpublished doctoral dissertation). East Texas State University, Commerce, TX.

Lazowski, R. A., & Hulleman, C. S. (2016). Motivation interventions in education: A meta-analytic review. *Review of Educational Research*, *86*(2), 602-640. https://doi.org/10.3102/0034654315617832

*Lens, W., Lacante, M., Vansteenkiste, M., & Herrera, D. (2005). Study persistence and academic achievement as a function of the type of competing tendencies. *European Journal of Psychology of Education, 20*(3), 275-287.

*Libutti, D. D. (2005). *First-year academic success: Differences in pre-entry and learning and study skill characteristics for academically successful and unsuccessful students at a public flagship university in New England* (Unpublished doctoral dissertation). Johnson & Wales University, Providence, RI.

Linnenbrink-Garcia, L., Patall, E. A., & Pekrun, R. (2016). Adaptive motivation and emotion in education: Research and principles for instructional design. *Policy Insights from the Behavioral and Brain Sciences*, *3*(2), 228-236. https://doi.org/10.1177/2372732216644450

*Lobb, W. B., Wilkin, N. E., McCaffrey III, D. J., Wilson, M. C., & Bentley, J. P. (2006). The predictive utility of nontraditional test scores for first-year pharmacy student academic performance. *American Journal of Pharmaceutical Education, 70*(6), 128.

*Loong, T. E. (2012). Predicting pre-university international students' math performance by learning strategies and math anxiety in Malaysia. *Journal of Educational and Social Research, 2*(2), 73-83. https://doi.org/10.5901/jesr.2012.v2n2.73

*Loong, T. E. (2012). Self-regulated learning between low-, average-, and high-math achievers among pre-university international students in Malaysia. *European Journal of Social Sciences, 30*(2), 302-312.

*Loong, T. E. (2012). Self-regulated learning strategies and pre-university math performance of international students in Malaysia. *Journal of International Education Research, 8*(3), 223-232. https://doi.org/10.19030/jier.v8i3.7104

*Loong, T. E. (2012). Self-regulated learning strategies and their effects on math performance of pre-university international students in Malaysia. *Journal of Education and Vocational Research, 3*(3), 89-97. https://doi.org/10.22610/jevr.v3i3.54

*Loong, T. E. (2013). International students' self-regulated learning and its relation to mathematics achievement in an offshore Australian program. *Academic Research International, 4*(5), 507.

*Loong, T. E. (2013). Self-regulated learning of pre-university students in mathematics classrooms. *Journal of Educational Sciences & Psychology, 3*(2), 40-47.

*Mancuso, A. F. (2008). *Examining the predictive validity of the Learning and Study Strategies inventory (LASSI) as a measure of college success and retention* (Unpublished doctoral dissertation). Alfred University, Alfred, NY.

*Manfredo, R. A. (1991). *Cognitive control styles and learning strategies as discriminant factors among achieving, learning-disabled, and at-risk high school students* (Unpublished doctoral dissertation). Fordham University, New York City, NY.

*Marrs, H., Sigler, E., & Hayes, K. (2009). Study strategy predictors of performance in introductory psychology. *Journal of Instructional Psychology, 36*(2), 125-133.

*Marschalkó, E. E., & Szamosközi, Ș. (2016). *High achieving undergraduate student's self-regulation and use of strategic learning: What matters?* Paper presented at the 3rd International Multidisciplinary Scientific Conference on Social Sciences & Arts SGEM 2016. https://doi.org/10.13140/RG.2.2.30561.92000

McCombs, B. L. (2017). Historical review of learning strategies research: Strategies for the whole learner-A tribute to Claire Ellen Weinstein and early researchers of this topic. *Frontiers in Education, 2*(6), 1-20. https://doi.org/10.3389/feduc.2017.00006

*McGeever, B. A. (1994). *An analysis of the learning and study strategies of upper division baccalaureate nursing students* (Unpublished doctoral dissertation). Widener University School of Nursing, Chester, PA.

*McKnight, G. L. (1990). *The learning and study strategies of college freshmen* (Unpublished doctoral dissertation). Memphis State University, Memphis, TN.

*McKnight, G. L. (1993). *The influence of learning strategies training upon student strategy use, motivation, and achievement in a university physiology course* (Unpublished doctoral dissertation). The University of Texas at Austin, Austin, TX.

*Moak, C. E. (2002). *The psychometric properties of the Learning and Study Strategies Inventory* (Unpublished doctoral dissertation). Texas A&M University, College Station, TX.

*Moore, J. C. (2014). *Cognitive, learning and study strategy predictors of student-athlete academic success and academic progress rates* (Unpublished doctoral dissertation). The University of Alabama, Tuscaloosa, AL.

*Mosby, T. F. (1991). *An analysis of the academic success of freshmen in selected historically Black public colleges and universities in the state of Maryland* (Unpublished doctoral dissertation). Morgan State University, Baltimore, MD.

Muenks, K., Wigfield, A., Yang, J. S., & O'Neal, C. R. (2017). How true is grit? Assessing its relations to high school and college students' personality characteristics, self-regulation, engagement, and achievement. *Journal of Educational Psychology*, *109*(5), 599-620. https://doi.org/10.1037/edu0000153

*Musso, M., Kyndt, E., Cascallar, E., & Dochy, F. (2012). Predicting mathematical performance: The effect of cognitive processes and self-regulation factors. *Education Research International, 2012*, 1-13. https://doi.org/10.1155/2012/250719

*Musso, M., Kyndt, E., Cascallar, E., & Dochy, F. (2013). Predicting general academic performance and identifying the differential contribution of participating variables using artificial neural networks. *Frontline Learning Research, 1*(1), 42-71. https://doi.org/10.14786/flr.v1i1.13

*Nabors, M. E. (2006). *An examination of freshman participation in a study skills course and retention at a four-year southeastern university* (Unpublished doctoral dissertation). Auburn University, Auburn, AL.

*Newmeyer, M. D. (2006). *Understanding the factors influencing retention among college freshmen using the Learning and Study Strategies Inventory* (Unpublished doctoral dissertation). University of Cincinnati, Cincinnati, OH.

*Ning, H. K., & Downing, K. (2010). Connections between learning experience, study behaviour and academic performance: A longitudinal study. *Educational Research, 52*(4), 457-468. https://doi.org/10.1080/00131881.2010.524754

*Nist, S. L., Mealy, D. L., & Simpson, M. L. (1990). Measuring the affective and cognitive growth of regularly admitted and developmental studies students using the “Learning and Study Strategies Inventory" (LASSI). *Reading Research & Instruction, 30*, 44-49. https://doi.org/10.1080/19388079009558032

*Norouzinia, R., Seidabadi, M., Mohammadi, R., Ghadimi, M., & Aghabarari, M. (2016). The relationship between learning and study strategies with students’ academic performance. *Educational Research in Medical Sciences Journal, 5*(1), 16-23.

Ohtani, K., & Hisasaka, T. (2018). Beyond intelligence: A meta-analytic review of the relationship among metacognition, intelligence, and academic performance. *Metacognition and Learning*, *13*(2), 179-212. https://doi.org/10.1007/s11409-018-9183-8

Olaussen, B. S., & Bråten, I. (1998). Identifying latent variables measured by the Learning and Study Strategies Inventory (LASSI) in Norwegian college students. *The Journal of Experimental Education*, *67*(1), 82-96. https://doi.org/10.1080/00220979809598346

Olejnik, S., & Nist, S. L. (1992). Identifying latent variables measured by the Learning and Study Strategies Inventory (LASSI). *The Journal of Experimental Education*, *60*(2), 151-159. https://doi.org/10.1080/00220973.1991.10806587

Olivarez Jr., A., & Tallent-Runnels, M. K. (1994). Psychometric properties of the Learning and Study Strategies Inventory-High School version. *The Journal of Experimental Education*, *62*(3), 243-257. https://doi.org/10.1080/00220973.1994.9943843

Oxford, R. (1990). *Language learning strategies*. Newbury House Harper Collins.

*Pan, Y., Liu, S., & Gong, Z. (2000). An investigation of the learning strategy levels of middle and high school students. *Psychological Science (China), 23*(6), 694-698.

Panadero, E. (2017). A review of self-regulated learning: Six models and four directions for research. *Frontiers in Psychology*, *8*, 422. https://doi.org/10.3389/fpsyg.2017.00422

Pekrun, R., Goetz, T., Daniels, L. M., Stupnisky, R. H., & Perry, R. P. (2010). Boredom in achievement settings: Exploring control–value antecedents and performance outcomes of a neglected emotion. *Journal of Educational Psychology*, *102*(3), 531-549. https://doi.org/10.1037/a0019243

*Perkins, A. W. (1991). *Learning and Study Strategies Inventory (LASSI): A validity study* (Unpublished doctoral dissertation). College of William and Mary, Williamsburg, VA.

Pigott, T. D., & Polanin, J. R. (2020). Methodological guidance paper: high-quality meta-analysis in a systematic review. *Review of Educational Research*, *90*(1), 24-46. https://doi.org/10.3102/0034654319877153

Pintrich, P. R., & De Groot, E. V. (1990). Motivational and self-regulated learning components of classroom academic performance. *Journal of Educational Psychology*, *82*(1), 33-40. https://doi.org/10.1037/0022-0663.82.1.33

Pintrich, P. R. (2000). The role of goal orientation in self-regulated learning. M. Boekaerts, P. R. Pintrich, and M. Zeidner (Eds.), *Handbook of self-regulation* (pp. 451-501).

Pintrich, P. R., Smith, D. A., Garcia, T., & McKeachie, W. J. (1993). Reliability and predictive validity of the Motivated Strategies for Learning Questionnaire (MSLQ). *Educational and Psychological Measurement*, *53*(3), 801-813. https://doi.org/10.1177/0013164493053003024

Polanin, J. R., Tanner-Smith, E. E., & Hennessy, E. A. (2016). Estimating the difference between published and unpublished effect sizes: A meta-review. *Review of Educational Research*, *86*(1), 207-236. https://doi.org/10.3102/0034654315582067

Pressley, M., Borkowski, J. G., & Schneider, W. (1987). Cognitive strategies: Good strategy users coordinate metacognition and knowledge. *Annals of Child Development*, *4*, 89–129.

Pressley, M., Goodchild, F., Fleet, J., Zajchowski, R., & Evans, E. D. (1989). The challenges of classroom strategy instruction. *The Elementary School Journal*, *89*, 301–342. https://doi.org/10.1086/461578.

*Primus, P. A. (2003). *Use of the Learning and Study Skills Inventory (LASSI) as a predictor of success in associate degree nursing students* (Unpublished master’s thesis). University of Wyoming, Laramie, WY.

*Proctor, B. E., Prevatt, F. F., Adams, K., Hurst, A., & Petscher, Y. (2006). Study skills profiles of normal-achieving and academically-struggling college students. *Journal of College Student Development, 47*(1), 37-51. https://doi.org/10.1353/csd.2006.0011

*Prus, J., Hatcher, L., Hope, M., & Grabiel, C. (1995). The Learning and Study Strategies Inventory (LASSI) as a predictor of first-year college academic success. *Journal of the Freshman Year Experience, 7*(2), 7-26.

Purdie, N., & Hattie, J. (1996). Cultural differences in the use of strategies for self-regulated learning. *American Educational Research Journal*, *33*(4), 845-871. https://doi.org/10.3102/00028312033004845

Purdie, N., Hattie, J., & Douglas, G. (1996). Student conceptions of learning and their use of self-regulated learning strategies: A cross-cultural comparison. *Journal of Educational Psychology, 88*(1), 87-100. https://doi.org/10.1037/0022-0663.88.1.87

Pustejovsky, J. E. (2021). clubSandwich: Cluster-robust (sandwich) variance estimators with small-sample Corrections. R package version 0.5.3. https://CRAN.R-project.org/package=clubSandwich

Ramirez, G., & Beilock, S. L. (2011). Writing about testing worries boosts exam performance in the classroom. *Science*, *331*(6014), 211-213. https://doi.org/10.1126/science.1199427

Reza, M. R. (1990). The relative benefits of a cognitive restructuring technique on anxiety, study skills and academic achievement of high school students* (Unpublished doctoral dissertation). University of Southern California, Los Angeles, CA.

*Rhody, T. W. (1993). *The study skills, habits, and attitudes of high school freshman and their relationship to first-term academic achievement* (Unpublished doctoral dissertation). University of Oregon, Eugene, OR.

Richardson, J. T. (1993). Gender differences in responses to the approaches to studying inventory. *Studies in Higher Education*, *18*(1), 3-13. https://doi.org/10.1080/03075079312331382418

Richardson, J. T. (1994). Mature students in higher education: I. A literature survey on approaches to studying. *Studies in Higher Education*, *19*(3), 309-325. https://doi.org/10.1080/03075079412331381900

Richardson, J. T. (1995). Mature students in higher education: II. An investigation of approaches to studying and academic performance. *Studies in Higher Education*, *20*(1), 5-17. https://doi.org/10.1080/03075079512331381760

Richardson, M., Abraham, C., & Bond, R. (2012). Psychological correlates of university students' academic performance: A systematic review and meta-analysis. *Psychological Bulletin*, *138*(2), 353-387. https://doi.org/10.1037/a0026838

Robbins, S. B., Lauver, K., Le, H., Davis, D., Langley, R., & Carlstrom, A. (2004). Do psychosocial and study skill factors predict college outcomes? A meta-analysis. *Psychological Bulletin*, *130*(2), 261-288. https://doi.org/10.1037/0033-2909.130.2.261

*Rodriguez, D. B. (2013). The influence of student demographics and internal characteristics on GPA, persistence, and academic success of first-time college students (Unpublished doctoral dissertation). Texas A&M University-Corpus Christi, Corpus Christi, TX.

Rogiers, A., Merchie, E., De Smedt, F., De Backer, L., & Van Keer, H. (2020). A lifespan developmental perspective on strategic processing. In D. L. Dinsmore, L. K. Fryer, & M. M. Parkinson (Eds.), *Handbook of strategies and strategic processing: Conceptualization, intervention, measurement, and analysis* (pp. 47-62). Routledge.

Rosander, P., & Bäckström, M. (2012). The unique contribution of learning approaches to academic performance, after controlling for IQ and personality: Are there gender differences? *Learning and Individual Differences*, *22*(6), 820-826. https://doi.org/10.1016/j.lindif.2012.05.011

*Rosenbaum, L. M. (2015). *Best learning and study strategy predictors of GPA for vocational adult and traditional learners* (Unpublished doctoral dissertation). Liberty University, Lynchburg, VA.

*Rugsaken, K. T., Robertson, J. A., & Jones, J. A. (1998). Using the Learning and Study Strategies Inventory scores as additional predictors of student academic performance. *NACADA Journal, 18*(1), 20-26. https://doi.org/10.12930/0271-9517-18.1.20

Ruffing, S., Wach, F., Spinath, F. M., Brünken, R., & Karbach, J. (2015). Learning strategies and general cognitive ability as predictors of gender-specific academic achievement. *Frontiers in Psychology*, *6*, 1238. https://doi.org/10.3389/fpsyg.2015.01238

*Şara, P., & Kocabaş, A. (2012). Correlation between learning and studying strategies, problem solving abilities and locus of control levels of candidates of primary school teachers. *International Journal of New Trends in Arts, Sports & Science Education (IJTASE), 1*(1), 98-110.

*Scameheorn, D. M. (2001). Cognitive and non-cognitive characteristics as predictors of college success among African-American and Caucasian students in a comprehensive community college (Unpublished doctoral dissertation). Andrews University, Berrien Springs, MI.

*Schnedeker, J. A. (1997). *Psychological factors in school achievement* (Unpublished doctoral dissertation). Rutgers-The State University of New Jersey, New Brunswick, NJ.

Schnettler, T., Bobe, J., Scheunemann, A., Fries, S., & Grunschel, C. (2020). Is it still worth it? Applying expectancy-value theory to investigate the intraindividual motivational process of forming intentions to drop out from university. *Motivation and Emotion*, *44,* 491-507. https://doi.org/10.1007/s11031-020-09822-w

*Schultz, C. S. (2002). *Characteristics associated with student achievement in associate degree nursing students in an online nursing course* (Unpublished master's thesis). University of Wyoming, Laramie, WY.

Schunk, D. H. (1995). Self-efficacy and education and instruction. In J. E. Maddux (Ed.), *Self-efficacy, adaptation, and adjustment: Theory, research, and application* (pp. 281-303). New York, NY: Plenum Press.

*Schutz, C., M., Dalton, L., & Tepe, R., E. (2013). Learning and Study Strategies Inventory subtests and factors as predictors of national board of chiropractic examiners part 1 examination performance. *Journal of Chiropractic Education, 27*(1), 5-10. https://doi.org/10.7899/JCE-D-12-01

*Schutz, C. M., Gallagher, M. L., & Tepe, R. E. (2011). Differences in Learning and Study Strategies Inventory scores between chiropractic students with lower and higher grade point averages. *The Journal of Chiropractic Education, 25*(1), 5-10. https://doi.org/10.7899/1042-5055-25.1.5

*Schutz, P. A. L. (1997). Educational goals, strategies use and the academic performance of high school students. *The High School Journal, 80*(3), 193-201.

*Schutz, P. A., & Lanehart, S. L. (1994). Long-term educational goals, subgoals, learning strategies use and the academic performance of college students. *Learning and Individual Differences, 6*(4), 399-412. https://doi.org/10.1016/1041-6080(94)90002-7

*Seabi, J. (2011). Relating learning strategies, self-esteem, intellectual functioning with academic achievement among first-year engineering students. *South African Journal of Psychology, 41*(2), 239-249. https://doi.org/10.1177/008124631104100212

Siegler, R. S. (1996). *Emerging minds: The process of change in children's thinking*. Oxford University Press.

*Sinkavich, F. J. (1994). Metamemory, attributional style, and study strategies: Predicting classroom performance in graduate students. *Journal of Instructional Psychology, 21*(2), 172-182.

*Skinner, D. E., Saylors, C. P., Boone, E. L., Rye, K. J., Berry, K. S., & Kennedy, R. L. (2015). Becoming lifelong learners: Learning a study in self-regulated learning. *Journal of Allied Health, 44*(3), 177-182.

*Slaybaugh, C. E. (2013). *Using the Learning and Study Strategies Inventory to predict learner performance in online and traditional educational psychology courses* (Unpublished doctoral dissertation). Northern Arizona University, Flagstaff, AZ.

*Sleight, D. A., & Mavis, B. E. (2006). Study skills and academic performance among second-year medical students in problem-based learning. *Medical Education Online, 11*(1), 4599. https://doi.org/10.3402/meo.v11i.4599

*Smith, M. L. (1995). *A quantitative analysis of critical thinking abilities, learning and study strategies, and academic achievement in associate degree nursing students* (Unpublished doctoral dissertation). Boston College, Boston, MA.

*Sokenu, J. O. (2004). *Motivations among at risk students in rural community colleges* (Unpublished doctoral dissertation). Boston University, Boston, MA.

*Stamoulis, L. (2009). Relevance of study skill, attitudes and behaviors for first-year freshmen. *LASSI-in-Action.* Retrieved from https://www.hhpublishing.com/ap/_assessments/LASSI-in-Action-Articles/Research-Projects.pdf

*Stano, N. K. (2016). *Improving college students' self-knowledge through engagement in a learning frameworks course* (Unpublished doctoral dissertation). The University of Texas, Austin, TX.

*Stoynoff, S. J. (1990). *English language proficiency and study strategies as determinants of academic success for international students in U.S. universities* (Unpublished doctoral dissertation). University of Oregon, Eugene, OR.

*Stoynoff, S. (1997). Factors associated with international students' academic achievement. *Journal of Instructional Psychology, 24*(1), 56-68.

*Taheri, M., Asadi Louyeh, A., & Hosseini, N. (2017). Learning and Study Strategies Inventory (LASSI) and its relationship with university students' academic achievement. *International Online Journal of Education and Teaching (IOJET), 4*(3). 246-257. Retrieved from http://iojet.org/index.php/IOJET/article/view/150/166

*Tallent-Runnels, M. K., Olivárez, A., Lotven, A. C. C., & Walsh, S. K. (1994). A comparison of learning and study strategies of gifted and average-ability junior high students. *Journal for the Education of the Gifted, 17*(2), 143-160. https://doi.org/10.1177/016235329401700205

Tanner-Smith, E. E., & Tipton, E. (2014). Robust variance estimation with dependent effect sizes: practical considerations including a software tutorial in Stata and SPSS. *Research Synthesis Methods*, *5*(1), 13–30. https://doi.org/10.1002/jrsm.1091

*Tebbe, C. M. (2007). *The effectiveness of a learning strategies course on college student-athletes' and non-athletes' adjustment, academic performance, and retention after the first two years of college* (Unpublished doctoral dissertation). University of North Texas, Denton, TX.

*Thomas, C. E. (2003). *Variations in adult learning strategies: Differences in gender, ethnicity, and age in technical education in a Texas community college* (Unpublished doctoral dissertation). Texas A&M University, College Station, TX.

*Tinajero, C., Lemos, S. M., Araújo, M., Ferraces, M. J., & Páramo, M. F. (2012). Cognitive style and learning strategies as factors which affect academic achievement of Brazilian university students. *Psicologia: Reflexão e Crítica, 25*(1), 105-113. https://doi.org/10.1590/S0102-79722012000100013

*Tincher, J. (2005). *Cognitive and non-cognitive predictors of academic success for conditionally admitted students at Indiana State University* (Unpublished doctoral dissertation). Indiana State University, Terre Haute, IN.

Tipton, E. (2015). Small sample adjustments for robust variance estimation with meta-regression. *Psychological Methods*, *20*(3), 375-393. https://doi.org/10.1037/met0000011

Tipton, E., & Pustejovsky, J. E. (2015). Small-sample adjustments for tests of moderators and model fit using robust variance estimation in meta-regression. *Journal of Educational and Behavioral Statistics*, *40*(6), 604-634. https://doi.org/10.3102/1076998615606099

*Tutor, P. T. (2006). *Factors influencing nursing students' motivation to succeed* (Unpublished doctoral dissertation). University of Southern California, Los Angeles, CA.

*Valenzuela, R. (1994). Estrategias de estudio y aprendizaje: Primera fase en el desarrollode un instrumento de evaluación. *Revista del Centro de Investigación de la Universidad la Salle, 1*(2), 35.

*van Aardt, A. M., & van Wyck, C. K. (1996). Changes in students' strategic learning. *South African Journal of Higher Education, 10*(1), 168-174.

*Vansteenkiste, M., Smeets, S., Soenens, B., Lens, W., Matos, L., & Deci, E. L. (2010). Autonomous and controlled regulation of performance-approach goals: Their relations to perfectionism and educational outcomes. *Motivation and Emotion, 34*(4), 333-353. https://doi.org/10.1007/s11031-010-9188-3

*Van Voorhis, J. L. (1991). *A descriptive study of cooperative learning as it relates to instruction in an undergraduate teacher education course* (Unpublished doctoral dissertation). The University of Akron, Akron, OH.

Vermunt, J. D. (2020). Surveys and retrospective self-reports to measure strategies and strategic processing. In D. L. Dinsmore, L. K. Fryer, & M. M. Parkinson (Eds.), *Handbook of strategies and strategic processing: Conceptualization, intervention, measurement, and analysis* (pp. 259-274). Routledge.

Vettori, G., Vezzani, C., Bigozzi, L., & Pinto, G. (2018). The mediating role of conceptions of learning in the relationship between metacognitive skills/strategies and academic outcomes among middle-school students. *Frontiers in Psychology*, *9*. https://doi.org/10.3389/fpsyg.2018.01985

Vevea, J. L., & Hedges, L. V. (1995). A general linear model for estimating effect size in the presence of publication bias. *Psychometrika, 60*(3), 419-435. https://doi.org/10.1007/BF02294384

Vevea, J. L., & Woods, C. M. (2005). Publication bias in research synthesis: sensitivity analysis using a priori weight functions. *Psychological Methods*, *10*(4), 428-443. https://doi.org/10.1037/1082-989X.10.4.428

Viechtbauer, W. (2010). Conducting meta-analyses in R with the metafor package. *Journal of Statistical Software*, *36*, 1–48. https://doi.org/10.18637/jss.v036.i03

*Wadsworth, L., Husman, J., Duggan, M.A., & Pennington, M.N. (2007). Online mathematics achievement: Effects of learning strategies and self-efficacy. *Journal of Developmental Education, 30*(3), 6–14.

*Wallace, L. H. (1994). *Learning strategies of Bible college freshmen: A case study of Prairie Bible College* (Unpublished doctoral dissertation). Montana State University, Bozeman, MT.

*Wei, H. M., & Huang, C. J. (2009). The study of learning strategies and academic achievements of freshmen at university. *Kaohsiung Normal University Journal, 26*, 1-27.

Weinstein, C. E., Palmer, D. R., & Schulte, A. C. (1987). *LASSI Learning and study strategies inventory*. Clearwater, FL: H&H Publishing.

Weinstein, C. E., Palmer, D. R., & Schulte, A. C. (1990). *LASSI-HS Learning and study strategies inventory High school*. Clearwater, FL: H&H Publishing.

Weinstein, C. E. (1994). Strategic learning/strategic teaching: Flip sides of a coin. In P. R. Pintrich, D. R. Brown, & C. E. Weinstein (Eds.), *Student motivation, cognition, and learning: Essays in honor of Wilbert J. McKeachie* (pp. 257-273). Hillsdale, NJ: Lawrence Erlbaum.

Weinstein, C. E. (2007). *Model of strategic learning*. Clearwater, FL: H&H Publishing.

Weinstein, C. E., & Acee, T. W. (2013). Helping college students become more strategic and self-regulated learners. In H. Bembenutty, T. J. Cleary, & A. Kitsantas (Eds.), *Application of self-regulated learning across diverse disciplines: A tribute to Barry J. Zimmerman* (pp.197-236). Charlotte, NC: Information Age Publishing Inc.

Weinstein, C. E., & Acee, T. W. (2018). Study and learning strategies. R. F. Flippo and T. W. Bean (Eds.) *Handbook of college reading and study strategies research* (3rd ed., pp. 227-240). New York, NY: Routledge.

Weinstein, C. E., Acee, T. W., & Jung, J. H. (2010). Learning strategies. In B. McGaw, P. L. Peterson, & E. Baker (Eds.), *International encyclopedia of education* (3rd ed., pp. 323-329). New York, NY: Elsevier.

*Weinstein, C. E., Acee, T. W., Krause, J. M. & CCLR Team (2009, October). *Relationships among first-generation status, SES, strategic learning, achievement and retention*. Paper presented at the annual

meeting of the College Reading and Learning Association, Richmond, VA.
Weinstein, C. E., Husman, J., & Dierking, D. R. (2000). Self-regulation interventions with a focus on learning strategies. In M. Boekaerts, P. R. Pintrich, & M. Zeidner (Eds.), *Handbook of self-regulation* (p. 727–747). Academic Press. https://doi.org/10.1016/B978-012109890-2/50051-2
Weinstein, C. E., Palmer, D. R., & Schulte, A. C. (2004). *LASSI 2nd Edition Learning and study strategies inventory*. Clearwater, FL: H&H Publishing.
Weinstein, C. E., Palmer, D. R., & Schulte, A. C. (2006). *LASSI Online Learning and study strategies inventory*. Clearwater, FL: H&H Publishing.
Weinstein, C. E., Palmer, D. R., & Acee, T. W. (2016). *LASSI 3rd Edition Learning and Study Strategies Inventory*. Clearwater, FL: H&H Publishing.
Weinstein, C. E., Schulte, A. C., & Palmer, D. R. (1987). *Learning and Study Strategies Inventory*. Clearwater, FL: H&H Publishing.
Weinstein, C. E., Zimmermann, S. A., & Palmer, D. R. (1988). Assessing learning strategies: The design and development of the LASSI. In C. E. Weinstein, E. T. Goetz, & P. A. Alexander (Eds.), *Learning and study strategies: Issues in assessment, instruction, and evaluation* (pp. 25–40). New York: Academic Press.
*Wenger, G. A. (2002). *Learning and study strategies as they relate to success in an open-entry/open-exit college developmental reading course* (Unpublished doctoral dissertation). Andrews University, Berrien Springs, MI.
*West, C., & Sadoski, M. (2011). Do study strategies predict academic performance in medical school? *Medical Education, 45*(7), 696-703. https://doi.org/10.1111/j.1365-2923.2011.03929.x
*West, C., Kurz, T., Smith, S., & Graham, L. (2014). Are study strategies related to medical licensing exam performance? *International Journal of Medical Education, 5*, 199-204. https://doi.org/10.5116/ijme.5439.6491
Winne, P. H. (2011). A cognitive and metacognitive analysis of self-regulated learning. In B. J. Zimmerman & D. H. Schunk. *Handbook of self-regulation of learning and performance* (pp. 15-32). New York, NY: Taylor & Francis.
Winne, P. H., & Hadwin, A. F. (1998). Studying as self-regulated engagement in learning. In D. Hacker, J. Dunlosky, & A. Graesser (Eds). *Metacognition in educational theory and practice* (pp. 277-304). Erlbaum.
Wolters, C. A. (1998). Self-regulated learning and college students' regulation of motivation. *Journal of Educational Psychology*, *90*(2), 224-235. https://doi.org/10.1037/0022-0663.90.2.224
Wolters, C. A. (2003). Regulation of motivation: Evaluating an underemphasized aspect of self-regulated learning. *Educational Psychologist*, *38*(4), 189-205. https://doi.org/10.1207/S15326985EP3804_1
Wolters, C. A., & Brady, A. C. (2020). College students' time management: A self-regulated learning perspective. *Educational Psychology Review*. Advanced online publication. https://doi.org/10.1007/s10648-020-09519-z
*Yip, M. C. W. (2007). Differences in learning and study strategies between high and low achieving university students: A Hong Kong study. *Educational Psychology, 27*(5), 597-606. https://doi.org/10.1080/01443410701309126
*Yip, M. C. W. (2009). Differences between high and low academic achieving university students in learning and study strategies: A further investigation. *Educational Research and Evaluation, 15*(6), 561-570. https://doi.org/10.1080/13803610903354718
*Yip, M. C. W. (2012). Learning strategies and self-efficacy as predictors of academic performance: A preliminary study. *Quality in Higher Education, 18*(1), 23-34. https://doi.org/10.1080/13538322.2012.667263
*Yip, M. C. W. (2013). Learning strategies and their relationships to academic performance of high school students in Hong Kong. *Educational Psychology, 33*(7), 817-827. https://doi.org/10.1080/01443410.2013.794493
Yip, M. C. W. (2021). The linkage among academic performance, learning strategies, and self-efficacy of Japanese university students: A mixed-method approach. *Studies in Higher Education*, *46*(8), 1565-1577. https://doi.org/10.1080/03075079.2019.1695111
*Yip, M. C. W., & Chung, O. L. L. (2002). Relation of study strategies to the academic performance of Hong Kong university students. *Psychological Reports, 90*(1), 338-340. https://doi.org/10.2466/PR0.90.1.338-340
*Yip, M. C. W., & Chung, O. L. L. (2005). Relationship of study strategies and academic performance in different learning phases of higher education in Hong Kong. *Educational Research and Evaluation, 11*(1), 61-70. https://doi.org/10.1080/13803610500110414
*Zhou, Y., Graham, L., & West, C. (2016). The relationship between study strategies and academic performance. *International Journal of Medical Education, 7*, 324-332. https://doi.org/10.5116/ijme.57dc.fe0f
Zimmerman, B. J. (1995). Self-regulation involves more than metacognition: A social cognitive perspective. *Educational Psychologist*, *30*(4), 217-221. https://doi.org/10.1207/s15326985ep3004_8
Zimmerman, B. J. (2000). Attaining self-regulation: A social cognitive perspective In M. Boekaerts, P. R. Pintrich, & M. Zeidner (Eds.), *Handbook of self-regulation* (p. 13-40). Academic Press.
Zimmerman, B. J., & Schunk, D. H. (2011). *Handbook of self-regulation of learning and performance*. Routledge/Taylor & Francis Group.

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Table 1

LASSI Subscales and Sample Items (Weinstein et al., 1987, 2002, 2016)

Component of MSL	LASSI subscale	Description	Sample Items
Skill	Information Processing	The ability to organize new information into meaningful pieces when learning new content and skills.	I try to find relationships between what I am learning and what I already know. To help me remember new principles we are learning in class, I practice applying them.
	Selecting Main Ideas	The ability to identify the salient points from other information that may be unimportant.	When studying, I seem to get lost in the details and miss the important information. I have difficulty identifying the important points in my reading.
	Test Taking Strategies	The use of strategies to prepare for and to complete various kinds of examinations	I have difficulty adapting my studying to different types of subjects. I review my answers during essay tests to make sure I have made and supported my main points.
Will	Anxiety	The degree of worry about coursework and outcomes.	I feel very panicky when I take an important test. When I am studying, worrying about doing poorly in a course interferes with my concentration.
	Attitude	A student's interests, goals, and opinions about school.	I only study the subjects I like. I have a positive attitude about attending my classes.
	Motivation	The effort a student puts into their school work and the goal setting necessary to achieve academic success.	When work is difficult I either give up or study only the easy parts. I set goals for the grades I want to get in my classes.
Self-Regulation	Concentration	Strategies for maintaining attention and engagement in academic tasks.	If I get distracted during class, I am able to refocus my attention. My mind wanders a lot when I study.
	Self-Testing	Strategies for rehearsal, comprehension, and knowledge building.	I try to think of possible test questions when studying my class material. I stop periodically while reading and mentally go over or review what was said.
	Time Management	The use of strategies to manage time on academic tasks.	I set aside more time to study the subjects that are difficult for me. I find it hard to stick to a study schedule.
	Study Aids	The use or creation of tools that support and increase meaningful learning and knowledge retention.	When they are available, I go to study or review sessions. I use special study helps, such as italics and headings, that are in my textbooks.

Table 2

Description of Information Retrieved from Studies

Code Categories	Description
Research report	Journal article, dissertation/thesis, conference paper, report
Year	Publication year
Research setting	
Setting	K-12, postsecondary
Country	U.S., international
Sample	
Age	Years (mean)
% Female	Percentage of female students
% Racially Minoritized	Percentage of racially minoritized students
LASSI variable	
LASSI Subscale	Description of LASSI subscale and scale reliability
Instrument Version	Version number (1, 2, High School, Online)
Outcome	
GPA/Grade	Grade point average or course grade
Test Scores	Standardized or unstandardized exam; course-based test
Persistence	Persisted in one course or to the following term
Domain	Domain-specific, domain-general
Effect size	Correlation
Sample size	Sample size

Table 3

Characteristics of Included Studies

	k	%
Publication type		
Peer-reviewed journal article	79	49.7%
Doctoral dissertation	67	42.1%
Master's thesis	2	1.3%
Report	3	1.9%
Conference paper	7	4.4%
Book chapter	1	0.6%
Publication year		
1980s	3	1.9%
1990s	43	27%
2000s	49	30.8%
2010 - 2018	64	40.3%
Region		
U.S.	101	63.5%
Non-U.S.	57	35.9%
Not reported	1	0.6%
Grade		
K-12	22	13.8%
Postsecondary	137	86.2%

Note. Reports that included multiple studies were counted as separate studies.

Table 4a

Average Weighted Correlations Between LASSI Subscales and Grades/GPA

LASSI Variable	No. ES	*k*	*r*	r^u	*SE*	95% CI	Q_w	σ_1^2	σ_2^2
Anxiety	161	126	.152	.168	.014	.12, .18	3822.85	.11	.07
Attitude	162	129	.189	.227	.017	.13, .19	1264.02	.17	.04
Concentration	160	127	.207	.229	.016	.18, .24	3507.99	.12	.10
Information Processing	164	131	.134	.149	.013	.11, .15	916.43	.10	.06
Motivation	166	133	.317	.361	.019	.28, .35	5583.09	.17	.09
Selecting Main Ideas	163	130	.155	.178	.014	.13, .18	2456.09	.12	.07
Self-Testing	160	127	.146	.168	.014	.12, .17	1206.93	.09	.09
Study Aids	159	126	.114	.140	.012	.09, .14	780.58	.09	.05
Test Taking	162	129	.230	.260	.017	.20, .26	3758.65	.15	.07
Time Management	161	128	.204	.230	.018	.17, .24	3546.99	.10	.16

Note. No. ES = number of effect sizes; *k* = number of studies; *r* = attenuated correlation (reported); r^u = unattenuated correlation (estimation); σ_1^2 = variance at study level; σ_2^2 = variance at ES level. If 95% confidence intervals do not contain zero, correlations were significant. All *Q* statistics were significant.

Table 4b

Average Weighted Correlations Between LASSI Subscales and Testing Outcomes

LASSI Variable	No. ES	*k*	*r*	r^u	*SE*	95% CI	Q_w	σ_1^2	σ_2^2
Anxiety	107	53	.167	.185	.029	.11, .22	945.05	.16	.09
Attitude	102	49	.055	.066	.027	.001, .11	697.56	.14	.08
Concentration	105	51	.080	.088	.024	.03, .13	589.44	.12	.07
Information Processing	105	51	.063	.068	.025	.01, .11	827.68	.13	.08
Motivation	107	53	.093	.107	.028	.04, .15	925.52	.15	.10
Selecting Main Ideas	105	51	.156	.178	.027	.10, .21	1163.21	.15	.07
Self-Testing	103	50	.015	.021	.023	-.03, .06	560.90	.14	.09
Study Aids	101	48	-.038	-.047	.026	-.09, .01	460.40	.14	.06
Test Taking	105	50	.192	.217	.029	.13, .25	1315.89	.15	.11
Time Management	106	52	-.018	-.018	.022	-.06, .03	708.44	.09	.10

Note. No. ES = number of effect sizes; *k* = number of studies; *r* = attenuated correlation (reported); r^u = unattenuated correlation (estimation); σ_1^2 = variance at study level; σ_2^2 = variance at ES level. If 95% confidence intervals do not contain zero, correlations were significant. All *Q* statistics were significant.

Table 4c

Average Weighted Correlations Between LASSI Subscales and Persistence Outcomes

LASSI Variable	No. Es	*k*	*r*	r^u	*SE*	95% CI	Q_w	σ_1^2	σ_2^2
Anxiety	23	15	.091	.105	.057	-.03, .21	206.92	.20	.07
Attitude	25	16	.102	.129	.052	-.01, .21	224.35	.18	.08
Concentration	24	16	.109	.121	.032	.04, .18	141.19	.01	.11
Information Processing	22	14	.042	.047	.020	.001, .08	32.55	.001	.05
Motivation	26	17	.150	.169	.38	.07, .23	144.62	.12	.06
Selecting Main Ideas	22	14	.039	.043[a]	.019	-.001, .08	35.43	.02	.04
Self-Testing	23	15	.080	.093	.022	.03, .13	54.69	.001	.06
Study Aids	23	15	.065	.083[a]	.037	-.01, .14	107.38	.001	.14
Test Taking	22	14	.061	.068	.016	.02, .10	40.93	.001	.05
Time Management	23	15	.076	.081	.021	.02, .12	95.39	.001	.07

Note. No. ES = number of effect sizes; *k* = number of studies; *r* = attenuated correlation (reported); r^u = unattenuated correlation (estimation); σ_1^2 = variance at study level; σ_2^2 = variance at ES level. If 95% confidence intervals do not contain zero, correlations were significant. All *Q* statistics were significant. [a]Although *r* was not significant, the r^u in this case was significant.

Table 5

Meta-Regression Results

	ANX		ATT		CON		INP		MOT		SMI		SFT		STA		TST		TMT	
Moderator	*ß*	*SE*	*ß*	*SE*	*ß*	*SE*	*ß*	*SE*	*ß*	*SE*	*ß*	*SE*	*ß*	*SE*	*ß*	*SE*	*ß*	*SE*	*ß*	*SE*
Publication																				
Published	.05	.05	.09	.05	.08†	.04	.07†	.04	.16*	.06	.03	.04	.09†	.04	.03	.03	.06	.05	.11**	.04
Year	-.01*	.00	.00	.00	-.01	.00	-.00	.00	-.01	.01	-.01	.00	-.00	.00	-.00	.00	-.01	.01	-.00	.00
Context																				
Postsecondary	-.18*	.05	-.36*	.10	-.29*	.10	-.24	.14	-.26*	.08	-.27*	.08	-.36	.19	-.18	.10	-.38	.21	-.30†	.12
Country																				
U.S.	.15†	.08	.04	.07	.07	.07	.02	.06	.08	.11	.12†	.06	.08	.08	.03	.08	.11	.08	.09	.08
Sample																				
%Female	-.08	.18	-.01	.19	.13	.21	.15	.20	.11	.24	.08	.15	-.03	.18	-.21	.16	.16	.18	-.11	.18
%Minority	-.17†	.08	.04	.07	-.05	.09	-.03	.08	-.13†	.14	-.07	.08	-.08	.09	-.00	.08	-.12	.10	-.13	.10
Age	.00	.00	.02†	.01	.02*	.01	.02*	.01	.02	.01	.01†	.00	.02†	.01	.01	.00	.01	.00	.01	.01
Domain independent	.08	.05	.04	.05	-.14	.05	-.05	.10	-.16*	.04	.01	.06	-.14	.08	-.05	.03	.05	.03	-.06	.04
LASSI version	.07	.05	-.03	.08	.02	.07	.04	.07	.07	.11	.04	.05	.06	.07	.03	.06	.02	.09	.02	.07
Model Statistics																				
F statistic; *p*-value	2.87	.06	2.1	.15	2.98	.06	1.28	.35	5.36	.001	1.93	.13	1.74	.21	.969	.52	1.98	.12	1.53	.261

Note. †$p < .10$; *$p < .05$; **$p < .01$. Dummy-coded moderators included: published (reference) vs. unpublished; K-12 (reference) vs. postsecondary; U.S. vs. international (reference); domain independent (reference) vs. domain dependent; LASSI Version 1 (reference) vs. LASSI Version 2.

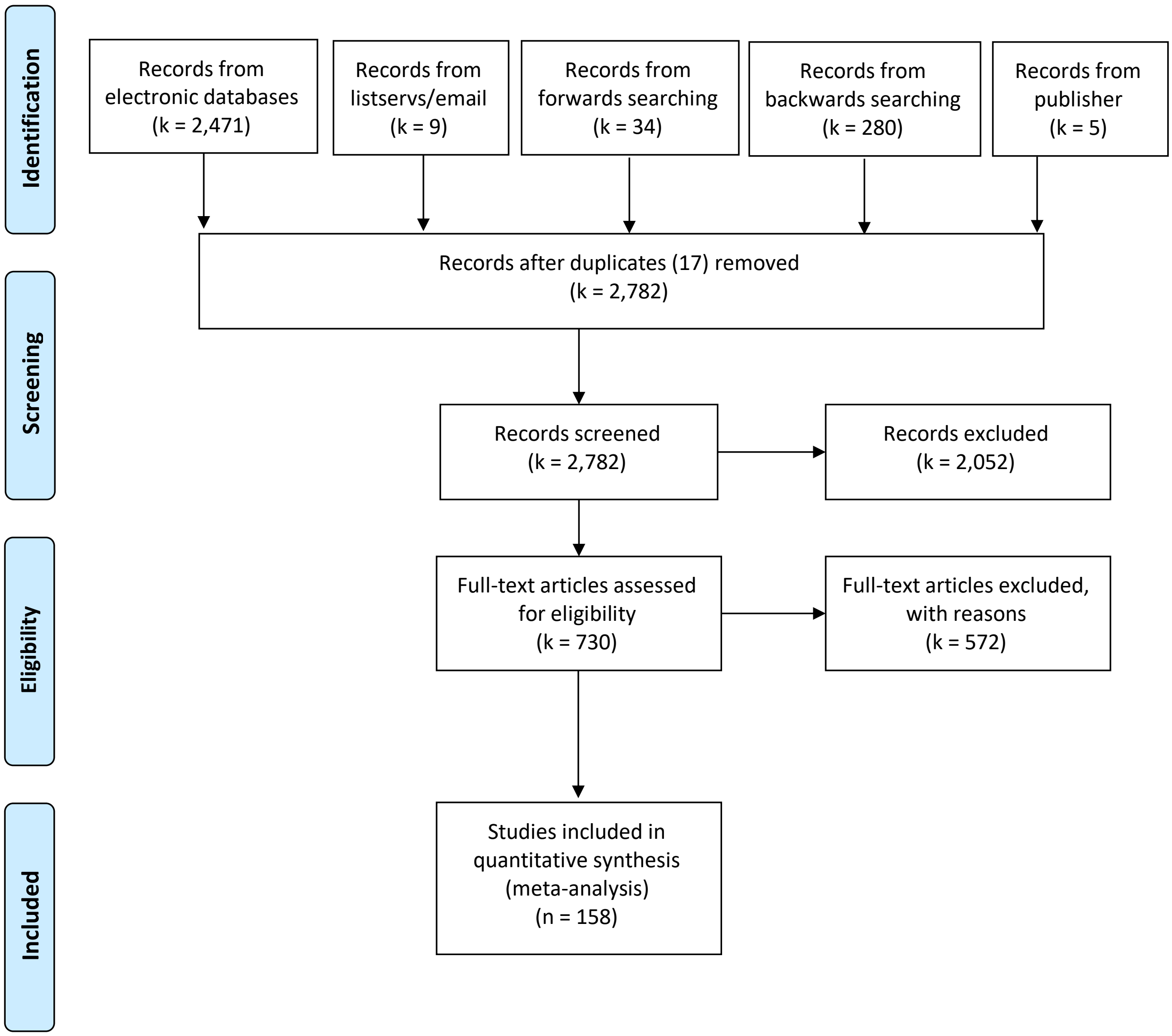
Table 6

Results of Egger's Regression Tests

	ß	*SE*	*t*	*p*
ANX	-0.26	1.05	-.24	.81
ATT	-0.61	1.10	-.55	.58
CON	-0.35	1.07	-.33	.75
INP	-0.21	1.00	-.21	.83
MOT	-1.03	1.14	-.90	.37
SMI	-0.59	1.03	-.57	.57
SFT	-0.19	1.00	-.19	.84
STA	-0.94	0.98	-.96	.34
TST	-0.63	1.10	-.57	.57
TMT	-1.25	1.11	-1.13	.26

Figure 1

PRISMA Diagram



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