Reliability Generalization of the Motivated Strategies for Learning Questionnaire: A Meta-Analytic View of Reliability Estimates

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Abstract

A reliability generalization meta-analysis was performed to explore the relationship between study factors and levels of alpha reliability for the 15 subscales of the Motivated Strategies for Learning Questionnaire (MSLQ). The MSLQ has been widely adapted over the past 25 years to investigate the role of motivation and strategies in learning, primarily at the postsecondary level. A literature search from the years 1991 to 2015 yielded 295 peer-reviewed journal articles and 1,369 alpha reliability coefficients. Articles were coded for six potential moderator study variables. A novel varying coefficient (VC) model was adopted to determine average reliabilities across studies for each subscale and to perform multiple regression analyses to identify study variables that may moderate alpha reliability estimates. Commonality analyses were used to aid in interpretation of regression results. Meta-analyzed alpha reliabilities were lower than values published in the test manual for all but three of the subscales. Ability of specific moderators to predict score reliability varied across subscales; however, studies in North America, in English, or using a 7-point response scale generally corresponded to increased reliability estimates. Knowledge of expected levels of score reliability under varying sample and study conditions may provide useful information for researchers planning future use of the MSLQ.

Keywords

educational research, education, social sciences, reliability and validity, research methods, social sciences, Motivated Strategies for Learning Questionnaire, measurement and scaling methods, research methodology and design

Student motivation and learning strategies have long been recognized as important predictors to student success. Prior to the mid-1980s, research in this area focused on individual differences and learning styles without providing clear connections to the manner in which students acquire new knowledge through behaviors and cognition (Duncan & McKeachie, 2005). Over time, a recognition emerged that learning occurs through an interplay of various internal and external sources. In response, Pintrich, Smith, Garcia, and McKeachie (1991, 1993) developed the Motivated Strategies for Learning Questionnaire (MSLQ), which was based on a self-regulated learning perspective, taking into account cognitive, motivational, and behavioral factors of learning within a social context (Pintrich, 2004). Thus, the development of the MSLQ grew out of a pragmatic need for a theoretically based instrument for use by faculty and students alike to improve post-secondary learning. Subsequently, the MSLQ has served to emphasize the interplay between cognition and motivation in learning, helped to operationalize the constructs of self-regulated learning theory, and provided a useful tool to perform empirical investigations of these constructs (Credé & Phillips, 2011; Duncan & McKeachie, 2005).

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Prevalence of Use

The MSLQ has enjoyed widespread use in the evaluation of the effects of course designs on student learning, characterization of motivation and use of learning strategies across various target populations, and exploration of motivational constructs and individual differences in self-regulated learning (Duncan & McKeachie, 2005). The instrument has been widely utilized in the United States and internationally, having been translated into at least 11 languages other than English. Although the MSLQ was designed for use in a postsecondary environment, subscales of the instrument have been used in settings ranging from elementary school (Andreou & Metallidou, 2004) through adult online education (Richardson, 2007). Use of the MSLQ has varied widely across research fields, study designs, and populations and on the subscale components administered. The popularity of administering the MSLQ might be attributed to the fact that it is in the public domain, and that the modular nature of the instrument allows for easy use of some or all of the 15 subscales, depending on the needs of the researcher. Indeed, based on Duncan and McKeachie’s (2005) sample of 56 empirical studies using the MSLQ, researchers appear more frequently to use only portions of the instrument, rather than the entire scale.

Structure of the MSLQ

The college version of the MSLQ (Pintrich et al., 1991, 1993) is an 81-item self-report instrument containing 15 subscales divided into motivation and learning strategies sections. Items are scored on a Likert-type scale anchored at 1 (not at all true of me) and 7 (very true of me), and scale scores are based on means across items in the scale, rather than sum totals. After several modifications, the final version was administered in 1990 to 380 college students in the Midwestern United States and scores were subjected to psychometric analysis (Pintrich et al., 1991).

The organizational structure of the MSLQ is provided in Table 1. The motivational scales consist of 31 items addressing three theoretical components of motivation: value beliefs, expectancy, and affect (Duncan & McKeachie, 2005). Value beliefs are assessed with three subscales pertaining to Intrinsic Goal Orientation (four items), Extrinsic Goal Orientation (four items), and Task Value (six items). Expectancy is assessed with two subscales, Self-Efficacy (eight items) and Control Beliefs About Learning (four items). Finally, affect is assessed through a single subscale concerning Test Anxiety (five items). As reported in the test manual (Pintrich et al., 1991), alpha reliabilities for scores obtained from the 380-student sample ranged from .62 for the Extrinsic Goal Orientation subscale to .93 for the Self-Efficacy subscale (Table 1).

### Table 1. Organization of the Motivated Strategies for Learning Questionnaire.

| Sections                        | Scales                                    | Subscales                              | Items | Alpha estimates | Manual | Hilpert |
|---------------------------------|-------------------------------------------|----------------------------------------|-------|-----------------|--------|---------|
| Motivation section              | Value Beliefs Scale                       | Intrinsic Goal Orientation              | 4     | .74             | .80    |         |
|                                 |                                            | Extrinsic Goal Orientation              | 4     | .62             | .72    |         |
|                                 |                                            | Task Value                              | 6     | .90             | .91    |         |
|                                 | Expectancy Scale                          | Control Beliefs About Learning          | 4     | .68             | .79    |         |
|                                 |                                            | Self-Efficacy                           | 8     | .93             | .94    |         |
|                                 | Affect Scale                              | Test Anxiety                            | 5     | .80             | .83    |         |
| Learning strategies section     | Cognitive and Meta-Cognitive Strategies   | Rehearsal                               | 4     | .69             | .70    |         |
|                                 |                                            | Elaboration                             | 6     | .76             | .77    |         |
|                                 |                                            | Organization                            | 4     | .64             | .69    |         |
|                                 |                                            | Critical thinking                       | 5     | .80             | .83    |         |
|                                 |                                            | Meta-cognitive self-regulation          | 12    | .79             | .79    |         |
|                                 | Resource Management Strategies Scale      | Time and Study Environment              | 8     | .76             | .73    |         |
|                                 |                                            | Effort Regulation                       | 4     | .69             | .70    |         |
|                                 |                                            | Peer Learning                           | 3     | .76             | .77    |         |
|                                 |                                            | Help Seeking                            | 4     | .52             | .64    |         |
| Full instrument                 |                                            |                                        | 81    |                 |        |         |

Note. Manual—estimates reported by Pintrich, Smith, Garcia, and McKeachie (1991); Hilpert—estimates reported by Hilpert, Stempien, van der Hoeven Kraft, and Husman (2013).
The learning strategies scales consist of 50 items, which include nine subscales addressing cognitive, meta-cognitive, and resource management strategies. Cognitive strategies are assessed with four subscales measuring Rehearsal (four items), Elaboration (six items), Organization (four items), and Critical Thinking (five items). Meta-cognitive strategies are evaluated with a single, 12-item subscale. The final four subscales address aspects of resource management and include Time and Study Environment Regulation (eight items), Effort Regulation (four items), Peer Learning (three items), and Help Seeking (four items). Alpha reliability estimates for the learning strategies subscales provided in the MSLQ test manual are generally lower than those for the motivational scales, ranging from .52 for the Help Seeking subscale to .80 for the Critical Thinking subscale (Table 1).

Reliability and the MSLQ

Despite the widespread use of the MSLQ, several concerns have been raised about the psychometric properties of the instrument. In terms of the internal consistency reliability estimates obtained for the various subscales, Pintrich et al. (1993) claimed that the “coefficient alphas for the motivational scales are robust, demonstrating good internal consistency” (p. 808) and “the alphas for the learning strategies scales are reasonable” (p. 809). However, they did not explain by what evaluative standard they are determined to be “good” or “reasonable.” Although the authors may have made their robustness determination based on comparison data collected during development of the MSLQ, it is well known that reliability estimates such as coefficient alpha vary with changing sample characteristics, study conditions, and score distributions (Crocker & Algina, 1986; Pedhazur & Schmelkin, 1991; Thompson, 2003; Wilkinson & American Psychological Association [APA] Task Force on Statistical Inference, 1999). Nunnally (1978) provided some often-cited rules of thumb to determine the adequacy of levels of reliability suggesting that “reliabilities of .70 or higher will suffice” when “in early stages of research on predictor tests or hypothesized measures or a construct” (p. 245) and that reliabilities of at least .80 are appropriate for basic research purposes. However, of the 15 MSLQ subscales for which Pintrich et al. (1993) reported reliabilities, nine subscales (60%) demonstrated sufficient score reliability estimates to meet the .70 standard for introductory research and three subscales fell at the .68 or .69 level. Only four subscales (27%) met the more appropriate standard of .80 for basic research in theory testing with an additional subscale at the .79 level.

Due to its modular nature and ease of administration, researchers have routinely utilized instrument sections (e.g., Nielsen, 2004), scales (e.g., Arend, 2007), subscales (e.g., Hodges & Kim, 2010), and individual test items (e.g., Husman & Hilpert, 2007) of the MSLQ to fit their particular research needs. However, caution should be exercised when selecting items in this manner as researchers should not assume that psychometric properties of instrument components remain consistent across various applications, study designs, samples, and time. For example, MSLQ subscale alpha reliability estimates obtained by Hilpert, Stempień, van der Hoeven Kraft, and Husman (2013) consistently met or exceeded those reported by Pintrich et al. (1991) in the MSLQ manual (Table 1). For three subscales, Extrinsic Goal Orientation, Control of Learning Beliefs, and Help Seeking, the differences were .10 or higher, although both sets of estimates were based on data collected from similar samples of undergraduate college students in the United States. For each study, the consistency of scores as measured by reliability coefficients will vary for different sample characteristics. Thus, a study is warranted that meta-analytically examines the predictors of reliability coefficients for the MSLQ when administered across a variety of samples.

Reliability Generalization (RG)

In general, score validity concerns the degree of trustworthiness of inferences made from the data collected, and to evaluate score validity the consistency of measurement, or reliability, must also be known. Thus, when performing substantive studies, researchers seek to utilize instruments that consistently and accurately measure constructs of interest and a failure to do so may lead to false conclusions (Thompson, 2003).

It has long been known that estimates of reliability vary with changing sample characteristics, study conditions, and score distributions (Crocker & Algina, 1986; Pedhazur & Schmelkin, 1991; Thompson, 2003). For this reason, journal editors (Thompson, 1994; Vacha-Haase, Henson, & Caruso, 2002) and professional organizations (American Educational Research Association, APA, & National Council on Measurement in Education, 1999; APA, 2001; Wilkinson & APA Task Force on Statistical Inference, 1999) have advocated that authors always provide reliability estimates for the data in hand. Such transparent reporting practice encourages researchers to take score reliability into account when interpreting study results, and provides consumers of research critical information necessary to make informed judgments regarding the viability of data interpretations and study conclusions. In instances where primary researchers appropriately have reported psychometric data for administration of a particular instrument, it may be desirable to examine score reliability on multiple occasions to discern how measurement error may vary under fluctuating study conditions. Such an approach requires a quantitative integration of reliability coefficients, which is best suited for meta-analytic methods such as RG (see Sánchez-Meca, López-López, & López-Pina, 2013; Vacha-Haase, 1998; Vacha-Haase & Thompson, 2011).

RG is a meta-analytic method for synthesizing reliability coefficients across studies (Caruso, 2000; Vacha-Haase,
1998) and is “used to explore variability in reliability estimates and characterize the sources of this variance” (Vacha-Haase et al., 2002, p. 562). RG studies provide insight into the nature of score reliability in prior applications of a test, which may help future researchers estimate expected levels of measurement error and inform study design decisions regarding effect sizes, power, and statistical significance (Henson & Thompson, 2002; Nimon, Zientek, & Henson, 2012). It is recommended that authors cite available RG results when describing tests used in substantive studies to provide comparative data to facilitate interpretation of outcomes (Leech, Onwuegbuzie, & O’Conner, 2011). Bonett (2010) encourages researchers planning use of a test to perform a preliminary RG on a small number of carefully selected, high-quality studies to obtain more accurate estimates of expected reliability and to identify potential effects of moderator variables. Such retrospective and prospective practices promote meta-analytic thinking, which serves to build a historical contextual framework in which to better evaluate single-study outcomes (Cumming & Finch, 2001; Henson, 2006; Thompson, 2002). As Bonett (2010) notes, “the use of meta-analysis to statistically incorporate prior information into a current study has the potential to revolutionize behavioral research and help achieve the goals of an integrative and cumulative science” (p. 380).

**RG Method**

Since 1998, well more than 100 RG studies have been published on an assortment of psychological instruments employing a wide variety of meta-analytic and statistical methods; however, there appears to be no firmly established best practice when performing such studies (Holland, 2015; Sánchez-Meca et al., 2013). Several methodological decisions must be made by the RG meta-analyst, including selection of statistical models for coefficient synthesis and moderator analysis, and the transformation and weighting of coefficients within these models.

Two classes of statistical models traditionally have been used in meta-analyses: the fixed-effects (FE) model of Hedges and Olkin (1985) and the random-effects (RE) models of Hedges and Vevea (1998) or Hunter and Schmidt (2004). Classical FE models are based on the assumption that study coefficients are all estimating the same population parameter, and any deviation from the parameter is the result of sampling error (Bonett, 2010; Hedges, 1992). In general, FE models are recommended when one wishes to generalize the results to studies similar to those included in the meta-analysis. FE methods have been determined to exhibit poor performance under conditions typical of many meta-analyses and are generally not recommended for routine use (Bonett, 2008; Hunter & Schmidt, 2004; Rodriguez & Maeda, 2006; Schmidt, Oh, & Hayes, 2009).

RE statistical models are based on the assumption that multiple population parameters exist, and that each study included in the meta-analysis represents a sample of a hypothetical population of past or future studies. Thus, each coefficient is considered to be an estimate of its own population parameter, which may vary from study to study. RE models include two error components in synthesized reliability estimates: the within-study variance and the between-study variance. Due to the additional error accounted for by the between-study variance component, RE models tend to produce wider confidence intervals (CIs) than FE models when synthesizing reliability coefficients across studies (Sánchez-Meca et al., 2013). The application of an RE model in the meta-analysis of coefficient alpha by Rodriguez and Maeda (2006) has been called into question based on the introduction of bias in parameter estimates, lack of interpretable estimates of parameter variance, and violations of sampling assumptions of the model (Bonett, 2010).

First proposed for use in meta-analysis by Laird and Mosteller (1990), a VC statistical model has been applied by Bonett (2010) to the meta-analysis of coefficient alpha. The VC model provides an alternative to traditional FE or RE models, retaining beneficial characteristics of both approaches. As a type of FE model, results from the VC analysis may be generalized only to studies similar to those included in the meta-analysis. However, rather than assuming that alpha estimates are all equal to a single fixed parameter, each study is assumed to estimate its own population reliability coefficient, similar to the RE approach. The magnitude of error components are moderate under the VC model and produce CIs intermediate between those estimated under FE or RE models (Sánchez-Meca et al., 2013). The VC model has excellent small-sample performance characteristics in parameter estimation, provides more accurate CIs, and can be used over a much wider range of problems than traditional models (Bonett, 2010). For these reasons, Bonett’s VC model was utilized for the current study.

To synthesize coefficients across studies, Bonett (2010) recommends calculation of the simple arithmetic mean of unweighted, untransformed alphas. To derive CIs for these means, the VC model utilizes a log-complement transformation, $\ln(1 - \alpha_j)$, where $\alpha_j$ is the alpha estimate of study $j$, to stabilize variance and normalize the distribution of alpha, and applies the delta method to estimate variance from each study. Individual study variances, are then used to determine CIs for the mean (see Bonett, 2010). Krizan (2010) has developed an Excel worksheet for calculation of means and CIs based on Bonett’s proposed methods.

Bonett (2010) recommends use of ordinary least squares (OLS) linear regression to investigate the potential effects of both categorical and continuous moderator variables, using transformed alpha, $\ln(1 - \alpha_j)$, as the outcome variable. The linear function may be expressed as

$$p = Xb + \varepsilon,$$
where $p$ is a vector of log-complement transformed alphas, expressed as $\ln(1 - \alpha_j) - \ln(n / [n - 1])$, where the second term is a correction factor. $X$ represents a design matrix of $k$ potential study moderator variables, $b$ represents a vector of unknown parameters, and $\epsilon$ is a vector of random sampling errors, such that $\text{var}(\epsilon_j) = \text{var}(\ln[1 - \alpha_j])$. OLS estimates for $b$ coefficients are determined as

$$b = (XX')^{-1} X'p$$

and the covariance matrix estimated as

$$\text{cov}(b) = (XX')^{-1} X'VX(XX')^{-1},$$

where $V$ is a diagonal matrix with $\text{var}(\epsilon) \text{ as the } j\text{th element (see Bonett, 2010, for more details). SPSS syntax to perform this moderator analysis is provided in Appendix A.}

Because the dependent variable in this model is based on a normalizing transformation of alpha, it is suggested that $b_j$ be back-transformed as $\exp(b)$ to improve interpretation of regression coefficients. In this manner, $\exp(b)$ may be interpreted as “the multiplicative change in nonreliability for every 1-point increase in the $k$th predictor variable while the values of all other predictor variables are held constant” (Bonett, 2010, p. 372). Thus, $\exp(b)$ values less than 1.0 indicate that the predictor variable is related to decreases in unreliability (i.e., increases in reliability), taking into account all other predictors. Development of a regression model relating study moderator variables to reliability estimates may allow researchers to predict expected values of coefficient alpha in future studies, given known values of predictor variables.

**Purpose**

The purpose of the current study is to perform an RG meta-analysis to explore the variability of MSLQ subscale score reliability across studies and to determine the potential relationship between study factors and the variability of subscale reliability. In light of the contributions and widespread use of the MSLQ in research surrounding learning motivation theory, an evaluation of factors that predict measurement reliability from MSLQ administrations would be beneficial for researchers who are contemplating using the MSLQ in the future. Results from an RG study will be of value to researchers who will be able to make educated and informed decisions when planning their study on motivational and learning strategies for their given sample.

**Method**

Peer-reviewed journal articles utilizing the MSLQ were collected in two waves. In September 2010, articles were identified using the online search engine, Google Scholar, with filters set to return works published in the years 1991 through 2010 in which either of the two seminal MSLQ publications (i.e., Pintrich et al., 1991, 1993) were cited. In an effort to capture all citations from 2010, this process was repeated in July 2013. The two searches returned 903 unique citations for which articles were procured. Of the available sources, 315 studies were published in peer-reviewed journals and administered one or more subscales of the MSLQ. These articles were inspected for reporting of reliability coefficients. A total of 168 studies were removed from the analysis due to insufficient reliability reporting, including failure to report reliability for data collected, or reporting coefficients in an unusable format, such as ranges of values over several subscales. Alpha coefficients from the remaining 147 articles were collected and study variables coded. The second wave of data collection was performed in September 2017, whereby journal articles published from 2011 to 2015 were identified utilizing Publish or Perish (Version 5; Harzing, 2016), a software program that retrieves citations from Google Scholar. Separate queries using the Lookup Citations function were conducted for each of the two Pintrich et al. (1991, 1993) seminal articles. A total of 625 citations were retrieved and after the removal of duplicates and books, 545 citations remained. Sources for citations were obtained and, on further inspection, 276 studies were not available, not peer-reviewed journal articles, could not be translated, or did not utilize the MSLQ. Of the remaining 269 articles utilizing the MSLQ, 121 did not report alpha reliability coefficients in a manner suitable for meta-analysis, leaving 148 articles suitable for the current study.

Combining articles from both waves of data collection, reliability coefficients from a total of 295 articles were available for further analysis. Thus, among the 584 studies reporting use of the MSLQ, only 51% provided alpha reliability coefficients for the data in hand. We acknowledge that focusing on peer-reviewed journals may potentially create a publication bias—however, we believe it is the most efficient way to focus our search for this popularly used measure. A list of articles included in the study is provided in Appendix B.

**Coding**

Articles initially were coded by four trained raters and then two additional raters were added for the second wave. Coding was verified by two of the authors, who reached agreement in cases where opinions differed. Multiple reliability estimates from a study were utilized if they were obtained from distinct samples. In cases where several estimates were reported for the same sample over multiple administrations (e.g., pretest/posttest), only the first estimate was included in the analysis in an effort to maintain independence of observations (see Romano & Kromrey, 2009, for a discussion of independence issues in RG studies).

Components of the MSLQ have been applied internationally to a variety of research settings and applications that
may vary widely from the original studies performed by Pintrich and colleagues (1991) in the United States. Researchers have also freely modified MSLQ subscales by changing item wording to fit a particular need, adding or deleting items from scales, and translating the instrument into languages other than English. It is of interest in the current study to determine how such varying study applications and instrument modifications may relate to variability in score reliability.

An initial set of coding variables was selected based on those utilized in prior RG studies (Henson & Thompson, 2002; Vacha-Haase & Thompson, 2011), including participant, study, and instrument characteristics. From these, we selected key potential moderator variables that reflected typical modifications of the instrument, and from a practical standpoint, other features most likely to be reported in published studies as recommended by the American Educational Research Association (2006) and the APA (2010). Coded variables included the age, gender, and race/ethnicity of participants; the educational setting and location (country) of the study; and instrument characteristics, including number of response scale choices, wording modifications, and language of translation.

Following the coding process, the data set was inspected to determine which of the coded study variables were reported in sufficient numbers to adequately represent the sample of studies and support the planned moderator analyses. Of the 344 samples described in the primary studies, only 27% included information on participant race/ethnicity and only 62% included the mean age; hence, these predictors were excluded from the analysis. Categorical variables consisting of multiple levels, such as study location, educational setting, and instrument language, were collapsed into dichotomous variables to reduce the number of predictor variables in the model. Ultimately, five categorical variables were dichotomously coded to indicate whether or not the application was similar to the original study by Pintrich et al. (1991). These variables included use of a 7-point response scale, use of original item wording, use of an English version of the instrument, selecting a study population consisting of post-secondary students, and performing the study in North America. In addition a single quantitative variable, percentage of males in the sample was also coded and included in the moderator analysis.

Results

Study Characteristics

Alpha coefficients were reported for 344 unique samples across the 295 articles subjected to review. Although the majority of samples (67%) included undergraduate students, 32% included students from Grades 3 through 12, and 15% included students at a graduate level (Table 2). Studies included in the analysis were performed in 32 different countries, with 52% of samples originating in the United States and Canada; however, all continents were represented. In addition, study authors reported use of translations of the MSLQ into 14 different languages, most commonly Turkish, Dutch, Spanish, and Chinese. In 61% of the studies, researchers utilized the original 7-point Likert-type scale (Table 2).

Because researchers may have used one, several, or all of the 15 MSLQ subscales in their studies, the number of reliability estimates obtained differed markedly across the subscales (Table 3). A total of 1,369 coefficients were meta-analyzed across all studies and subscales. Mean number of coefficients collected for each subscale was 91.2 (SD = 38.6). The most commonly represented subscales were Self-Efficacy, with 199 coefficients collected, and Metacognitive Self-Regulation, with 149 coefficients, whereas the fewest number of coefficients were collected for the Help Seeking and Peer Learning subscales, with 57 and 46 coefficients meta-analyzed, respectively.

Mean Reliability Scores

Following Bonett’s (2010) method, we derived an unweighted average estimator of alpha reliability across studies and a 95% CI for each subscale, based on all study coefficients available. Estimates ranged from .608 for Help Seeking to .879 for the Self-Efficacy subscale (Table 3). Synthesized alpha reliabilities were generally lower than those published in the MSLQ manual (Pintrich et al., 1991), with the exception of the Extrinsic Goal Orientation, Organization, and Help Seeking subscales. Two of the motivation subscales and five of the learning strategy subscales produced mean reliability scores of less than .70. CIs estimated with the VC approach were relatively narrow, with widths ranging from .005 for Self-Efficacy to .032 for Peer Learning. It was not surprising that the subscale with the greatest reliability estimate (Self-Efficacy) had the narrowest CI, as its estimation is dependent on the variance of the estimate, which tends to decrease with increasing reliability, the magnitude of reliability, as well as sample size, which was the largest of any of the subscales.

Moderator Analysis

A general linear model was utilized to examine moderator effects of sample and study characteristics on estimates of reliability. Using Bonett’s (2010) OLS multiple regression method, categorical and quantitative study variables were used as predictors of log-complement, bias-adjusted study reliability estimates.

Multiple regression methods require that all predictor and outcome variables are represented for all records in the data set. An issue commonly encountered in meta-analytic studies is that authors of primary research may not be fully transparent in their description of sample characteristics and study design; thus, data collection is often plagued by missing data...
for potential moderator variables (Thompson & Vacha-Haase, 2000). In this study, missing data were handled through listwise deletion, which had the potential to cause considerable reduction in sample size for some subscales. A summary of the coded predictor variables and number of missing values for each subscale is provided in Table 4. The predictor variable most commonly missing from the data set was percent male, with missing values ranging from 5.3% for the Critical Thinking scale to 21.3% for Test Anxiety, followed by the 7-point scale predictor, which had a maximum of 6.5% missing data for Peer Learning. Despite the loss of records due to missing data, final sample sizes were near or above 60 for all but the Peer Learning and Help Seeking scales. Final sample sizes and results of the OLS moderator analyses are provided in Table 5.

Commonality analysis aids in interpreting regression results by partitioning the total $R^2$ effect size into common and unique variance accounted for by the predictor variables (Nimon, Lewis, Kane, & Haynes, 2008; Zientek & Thompson, 2006). Commonality analyses allow for interpretation of a predictor variable’s contribution to the model both alone and in combination with other predictors. Results of commonality analysis for potential moderator variables are provided in Table 6.

OLS regression on transformed alpha coefficients revealed that reliabilities of all 15 subscales appeared to be moderated by at least one of the study variables, with the exception of Extrinsic Goal Orientation, and most subscales appeared to have several moderating variables. Postsecondary, 7-point response scale, and English most often influence

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### Table 2. Study and Sample Characteristics.

| Country                  | $N$ studies | Language | $N$ studies | Educational setting | $N$ samples | Scale type | $N$ studies |
|--------------------------|-------------|----------|-------------|--------------------|-------------|------------|-------------|
| United States            | 143         | English  | 185         | Undergraduate      | 229         | 7-point    | 181         |
| Canada                   | 36          | Turkish  | 26          | High school        | 49          | 5-point    | 77          |
| Turkey                   | 29          | Dutch    | 12          | Graduate           | 46          | 6-point    | 13          |
| Australia/New Zealand    | 14          | Spanish  | 12          | Middle school      | 14          | 4-point    | 6           |
| Singapore                | 11          | Chinese  | 11          | Nonstudent         | 7           | 100-point  | 1           |
| Taiwan                   | 11          | German   | 7           | Elementary         | 4           | Not stated | 17          |
| United Kingdom           | 11          | Norwegian| 7           | Postgraduate       | 4           |            |             |
| Belgium                  | 10          | French   | 4           |                    |             |            |             |
| The Netherlands          | 9           | Arabic   | 3           |                    |             |            |             |
| Spain                    | 9           | Hebrew   | 3           |                    |             |            |             |
| Norway                   | 8           | Malay    | 2           |                    |             |            |             |
| China                    | 7           | Farsi    | 1           |                    |             |            |             |
| Germany                  | 5           | Greek    | 1           |                    |             |            |             |
| Greece                   | 5           | Japanese | 1           |                    |             |            |             |
| Korea                    | 5           | Slovenian| 1           |                    |             |            |             |
| Israel                   | 4           | Not stated| 24         |                    |             |            |             |
| Oman                     | 4           |          |             |                    |             |            |             |
| France                   | 3           |          |             |                    |             |            |             |
| Malaysia                 | 3           |          |             |                    |             |            |             |
| Argentina                | 2           |          |             |                    |             |            |             |
| Bahrain                  | 2           |          |             |                    |             |            |             |
| Fiji                     | 2           |          |             |                    |             |            |             |
| Philippines              | 2           |          |             |                    |             |            |             |
| Columbia                 | 1           |          |             |                    |             |            |             |
| Croatia                  | 1           |          |             |                    |             |            |             |
| Finland                  | 1           |          |             |                    |             |            |             |
| Iran                     | 1           |          |             |                    |             |            |             |
| Japan                    | 1           |          |             |                    |             |            |             |
| Kuwait                   | 1           |          |             |                    |             |            |             |
| Peru                     | 1           |          |             |                    |             |            |             |
| Slovenia                 | 1           |          |             |                    |             |            |             |
| United Arab Republic     | 1           |          |             |                    |             |            |             |
| Not determined           | 2           |          |             |                    |             |            |             |
| Total                    | 346         | 300      | 353         |                    |             | 295        |

Note. The totals provided exceed the number of studies included in the meta-analysis due to studies conducted in multiple countries, using multiple languages, and samples derived from multiple educational settings.
### Table 3. Summary Statistics for the Meta-Analysis of Alpha Reliability for the Subscales of the MSLQ.

| Subscale                                | m coeff | Total N | Minimum | Maximum | M    | LL   | UL   | Manual |
|-----------------------------------------|---------|---------|---------|---------|------|------|------|--------|
| **Motivation section**                  |         |         |         |         |      |      |      |        |
| Intrinsic Goal Orientation              | 112     | 31,712  | .37     | .88     | .709 | .703 | .719 | .74    |
| Extrinsic Goal Orientation              | 82      | 24,224  | .48     | .92     | .692 | .685 | .703 | .62    |
| Task Value                              | 105     | 36,276  | .51     | .95     | .833 | .829 | .839 | .90    |
| Control Beliefs                         | 75      | 21,888  | .35     | .87     | .645 | .635 | .661 | .68    |
| Self-Efficacy for Learning              | 199     | 69,177  | .48     | .96     | .879 | .878 | .883 | .93    |
| Test Anxiety                            | 80      | 27,884  | .56     | .91     | .759 | .754 | .767 | .80    |
| **Learning strategies section**         |         |         |         |         |      |      |      |        |
| Rehearsal                               | 75      | 30,089  | .24     | .83     | .668 | .660 | .680 | .69    |
| Elaboration                             | 91      | 35,517  | .41     | .87     | .745 | .739 | .753 | .76    |
| Organization                            | 69      | 30,293  | .24     | .84     | .679 | .671 | .691 | .64    |
| Critical Thinking                       | 76      | 27,619  | .44     | .90     | .778 | .773 | .786 | .80    |
| Metacognitive Self-Regulation           | 149     | 55,175  | .50     | .96     | .754 | .750 | .762 | .79    |
| Time and Study Environment              | 68      | 23,183  | .50     | .85     | .724 | .718 | .734 | .76    |
| Effort Regulation                       | 85      | 28,495  | .32     | .85     | .660 | .652 | .674 | .69    |
| Peer Learning                           | 46      | 15,154  | .41     | .78     | .628 | .614 | .646 | .76    |
| Help Seeking                            | 57      | 16,804  | .35     | .86     | .608 | .596 | .625 | .52    |

Note. m coeff = number of alpha coefficients synthesized; total N = overall sample size across studies; M = unweighted mean estimate of alpha coefficients; LL and UL = lower and upper limits of 95% confidence interval; Manual = alpha coefficient estimates published in the MSLQ manual (Pintrich, Smith, Garcia, & McKeachie, 1991). MSLQ = Motivated Strategies for Learning Questionnaire.

### Table 4. Summary of Predictor (Moderator) Variable Coding and Missing Data.

| Scale                      | m coeff | Coding | 7-point scale | Original wording | English | Postsecondary | North America | Percent male |
|----------------------------|---------|--------|---------------|------------------|--------|---------------|---------------|--------------|
| Intrinsic                  | 112     | % yes  | 77.7          | 49.1             | 70.5   | 81.3          | 58.0          | 50.0         |
|                            |         | % yes  | 3.6           | 0.0              | 2.7    | 0.0           | 0.0           | 17.0         |
| Extrinsic                  | 82      | % yes  | 76.8          | 48.8             | 64.6   | 85.4          | 47.6          | 50.0         |
|                            |         | % yes  | 3.7           | 0.0              | 3.7    | 0.0           | 0.0           | 20.7         |
| Task Value                 | 105     | % yes  | 70.5          | 41.0             | 63.8   | 78.1          | 45.7          | 50.0         |
|                            |         | % yes  | 2.9           | 0.0              | 4.8    | 1.0           | 0.0           | 15.2         |
| Control of Learning Beliefs| 75      | % yes  | 76.0          | 44.0             | 62.7   | 81.3          | 45.3          | 50.0         |
|                            |         | % yes  | 4.0           | 0.0              | 8.0    | 1.3           | 0.0           | 20.0         |
| Self-Efficacy              | 199     | % yes  | 66.3          | 36.7             | 64.3   | 75.4          | 49.2          | 50.0         |
|                            |         | % yes  | 4.0           | 0.0              | 5.0    | 0.5           | 0.5           | 12.1         |
| Test Anxiety               | 80      | % yes  | 70.0          | 43.8             | 62.5   | 75.0          | 40.0          | 50.0         |
|                            |         | % yes  | 2.5           | 0.0              | 3.8    | 1.3           | 0.0           | 21.3         |
| Rehearsal                  | 75      | % yes  | 70.7          | 40.0             | 57.3   | 80.0          | 49.3          | 50.0         |
|                            |         | % yes  | 5.3           | 0.0              | 1.3    | 0.0           | 0.0           | 9.3          |
| Elaboration                | 91      | % yes  | 70.3          | 37.4             | 60.4   | 83.5          | 53.8          | 50.0         |
|                            |         | % yes  | 4.4           | 0.0              | 1.1    | 0.0           | 0.0           | 7.7          |
| Organization               | 69      | % yes  | 68.1          | 33.3             | 55.1   | 76.8          | 44.9          | 50.0         |
|                            |         | % yes  | 1.4           | 0.0              | 0.0    | 0.0           | 0.0           | 10.1         |
| Critical Thinking          | 76      | % yes  | 72.4          | 46.1             | 60.5   | 85.5          | 52.6          | 50.0         |
|                            |         | % yes  | 3.9           | 0.0              | 2.6    | 0.0           | 0.0           | 5.3          |
| Metacognition              | 149     | % yes  | 67.1          | 34.9             | 61.7   | 75.2          | 52.3          | 50.0         |
|                            |         | % yes  | 2.7           | 0.0              | 2.0    | 0.7           | 0.0           | 6.0          |
| Time Management            | 68      | % yes  | 67.6          | 36.8             | 52.9   | 85.3          | 52.3          | 50.0         |
|                            |         | % yes  | 5.9           | 0.0              | 1.5    | 0.0           | 0.0           | 8.8          |
| Effort Regulation          | 85      | % yes  | 67.1          | 37.6             | 60.0   | 70.6          | 51.8          | 50.0         |
|                            |         | % yes  | 2.4           | 0.0              | 3.5    | 0.0           | 0.0           | 5.9          |
| Peer Learning              | 46      | % yes  | 78.3          | 54.3             | 58.7   | 89.1          | 50.0          | 50.0         |
|                            |         | % yes  | 6.5           | 0.0              | 4.3    | 0.0           | 0.0           | 8.7          |
| Help Seeking               | 57      | % yes  | 77.2          | 50.9             | 59.6   | 89.5          | 50.9          | 50.0         |
|                            |         | % yes  | 5.3           | 0.0              | 5.3    | 0.0           | 0.0           | 8.8          |

Note. m coeff = number of alpha coefficients gleaned from journal articles; % yes = percentage of coefficients with matching samples coded as yes (1) for the predictor variable; % missing = percentage of coefficients with missing data for the coded variable. Only missing data percentages are presented for percent male.
Table 5. Results of OLS Regression of Moderator Variables for MSLQ Subscales.

| Moderator                      | Intrinsic (m = 87) |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |
|--------------------------------|--------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
|                                | b                  | SE       | exp(b)   | B        | SE       | exp(b)   | B        | SE       | exp(b)   |
| Intercept                      | −1.622             | 0.074    | 0.197    | −1.282   | 0.100    | 0.277    | −1.467   | 0.067    | 0.231    |
| 7-point response scale         | 0.012              | 0.035    | 1.012    | 0.000    | 0.045    | 1.000    | 0.070    | 0.039    | 1.072    |
| Original item wording          | 0.067              | 0.040    | 1.069    | −0.043   | 0.046    | 0.958    | 0.002    | 0.001    | 1.000    |
| Percent male                   | 0.002              | 0.001    | 1.002    | 0.001    | 0.001    | 1.001    | 0.002    | 0.001    | 1.002    |
| English                        | −0.240             | 0.077    | 0.787    | −0.001   | 0.070    | 0.999    | −0.263   | 0.050    | 0.769    |
| Postsecondary                  | 0.498              | 0.053    | 1.646    | 0.099    | 0.075    | 1.104    | −0.099   | 0.051    | 0.906    |
| North America                  | −0.080             | 0.072    | 0.923    | −0.030   | 0.060    | 0.970    | −0.295   | 0.045    | 0.744    |
| Control of Learning Beliefs    | −0.752             | 0.108    | 0.471    | −1.885   | 0.040    | 0.152    | −1.309   | 0.076    | 0.270    |
| Self-Efficacy                  | −0.098             | 0.052    | 0.907    | −0.163   | 0.023    | 0.849    | 0.017    | 0.037    | 1.017    |
| Test Anxiety                   | −0.258             | 0.062    | 0.773    | −0.278   | 0.026    | 0.757    | 0.219    | 0.045    | 1.245    |
| Original item wording          | −0.004             | 0.001    | 0.996    | −0.001   | 0.001    | 0.999    | 0.002    | 0.001    | 1.002    |
| Percent male                   | −0.190             | 0.104    | 0.827    | 0.043    | 0.029    | 1.044    | −0.503   | 0.057    | 0.605    |
| English                        | 0.017              | 0.076    | 1.017    | −0.062   | 0.031    | 0.940    | −0.098   | 0.042    | 0.907    |
| Postsecondary                  | 0.222              | 0.092    | 1.249    | −0.187   | 0.028    | 0.829    | −0.114   | 0.048    | 0.892    |
| North America                  | −1.118             | 0.060    | 0.327    | −1.321   | 0.047    | 0.267    | −1.420   | 0.061    | 0.242    |
| Rehearsal                      | −0.019             | 0.034    | 0.981    | −0.070   | 0.027    | 0.933    | 0.065    | 0.033    | 1.067    |
| Elaboration                    | −0.066             | 0.048    | 0.936    | 0.097    | 0.037    | 1.102    | 0.029    | 0.047    | 1.030    |
| Organization                   | 0.002              | 0.001    | 1.002    | −0.002   | 0.001    | 0.998    | 0.001    | 0.001    | 1.001    |
| Effort Regulation              | −0.015             | 0.097    | 0.985    | 0.102    | 0.089    | 1.108    | 0.181    | 0.089    | 1.199    |
| Critical Thinking              | −0.108             | 0.047    | 0.898    | 0.059    | 0.040    | 1.061    | 0.088    | 0.043    | 1.092    |
| Metacognition                  | 0.048              | 0.097    | 1.049    | −0.190   | 0.091    | 0.827    | −0.050   | 0.087    | 0.951    |
| Time Management                | −1.262             | 0.058    | 0.283    | −1.072   | 0.037    | 0.342    | −1.274   | 0.063    | 0.280    |
| Original item wording          | −0.156             | 0.032    | 0.855    | −0.051   | 0.021    | 0.950    | 0.048    | 0.034    | 1.049    |
| Percent male                   | −0.001             | 0.011    | 0.999    | −0.006   | 0.001    | 0.994    | 0.003    | 0.001    | 1.003    |
| English                        | −0.009             | 0.095    | 0.991    | −0.341   | 0.041    | 0.711    | −0.387   | 0.088    | 0.679    |
| Postsecondary                  | −0.069             | 0.049    | 0.933    | −0.145   | 0.029    | 0.865    | −0.077   | 0.048    | 0.926    |
| North America                  | −0.133             | 0.092    | 0.876    | 0.376    | 0.040    | 1.456    | 0.086    | 0.091    | 1.089    |
| Effort Regulation              | −1.243             | 0.062    | 0.289    | −0.696   | 0.129    | 0.499    | −1.047   | 0.089    | 0.351    |
| Peer Learning                  | 0.110              | 0.033    | 1.117    | −0.039   | 0.060    | 0.962    | 0.126    | 0.054    | 1.135    |
| Help Seeking                   | 0.060              | 0.053    | 1.062    | 0.012    | 0.078    | 1.012    | 0.290    | 0.088    | 1.337    |
| North America                  | −0.139             | 0.072    | 0.870    | −0.236   | 0.157    | 0.790    | −0.386   | 0.134    | 0.680    |
| Open Learning                  | 0.111              | 0.044    | 1.118    | −0.239   | 0.089    | 0.788    | 0.024    | 0.073    | 1.024    |
| North America                  | 0.036              | 0.073    | 1.036    | −0.134   | 0.141    | 0.874    | −0.005   | 0.106    | 0.995    |

Note. All variables except percent male are dichotomous categorical and coded 1 if study characteristics matched the descriptor and 0 if not. For example, if the study was conducted in North America, the article was coded 1, and coded 0 if not in North America. Outcome variable is bias-adjusted log-complement transformation of study alpha coefficient. Underlined values of b represent coefficients statistically significantly different from 0 at α = .05. b = estimate of regression coefficient; SE = standard error of b × 102; p = significance of t test for b; exp(b) = back-transformation of b; m = number of studies. OLS = ordinary least squares; MSLQ = Motivated Strategies for Learning Questionnaire.
alpha across the subscales. Although the English variable most consistently positively affected reliability, there was much more variability among the other moderators, which showed positive relationships with reliability for some subscales, but negative relationships for others. North America was denied credit in the model for four constructs in the OLS analysis; however, this variable was a significant moderator in the commonality analysis. Table 7 contains a summary of moderator effects for both OLS and commonality analyses.

Seven-point response scales. Positive and negative \( b \) estimates of regression coefficients indicate that, for some subscales,
7-point response scales positively influenced reliability, but in other subscales negatively influenced reliability (Table 5). For Task Value, Self-Efficacy, Elaboration, Critical Thinking, and Metacognitive Self-Regulation, 7-point response scales resulted in higher reliabilities than those with other point values. However, for Effort Regulation and Help Seeking, 7-point response scales resulted in lower reliabilities. Original item wording. As seen in Table 5, original item wording was a statistically significant predictor of reliability scores for five subscales. However, commonality analysis results indicate original wording was also a predictor of reliability scores for Peer Learning and Time Management, and to a lesser extent for Organization and Critical Thinking. Regression coefficients, together with commonality analysis results, indicated that retaining the original wording tended to result in higher reliability coefficients for Self-Efficacy, Control of Learning Beliefs, Organization, and Critical Thinking.

Postsecondary and percent male. Postsecondary was a statistically significant predictor of reliability scores for Self-Efficacy, Test Anxiety, Rehearsal, Metacognition, and Peer Learning subscales. The positive regression coefficients suggest that when the sample consisted of postsecondary students, the reliability coefficients were lower for Intrinsic, Organization, and Effort Regulation. Although percent male was a statistically significant predictor of reliability scores for six factors, the regression coefficients were relatively close to zero on all those factors. The reason for such low $b$ values for this predictor is that variable values range from 0 to 100, whereas all other predictors are categorical and coded as either 0 or 1, which are on a similar scale as the criterion variable, transformed coefficient alpha. The negative regression coefficients indicated that when the sample consisted of more males, reliability scores were higher for Control of Learning Beliefs, Metacognition, and Elaboration.

English and North America. Commonality analysis results indicated that reviewing both unique and common contributions is important. Otherwise, the importance of North America would have been overlooked in three of the OLS results. North America was denied explanatory credit for Time Management and Help Seeking and to a lesser extent for Critical Thinking, although serving as suppressor effects for Metacognitive Self-Regulation. As seen in Table 7, of the 10 subscales in which North America served as a moderator, four demonstrated higher reliabilities when the study used North American participants. However, commonality analysis results also suggest three more scales would result in higher reliabilities using North American participants. Of the seven subscales in which English served as a moderator, six demonstrated higher reliabilities when the study was administered in English.

Discussion

One study conducted on one sample may provide information about a hypothesis, but improvements to a given field require comparisons of multiple studies with different study designs on various samples, and the ability to build on existing studies. Pintrich et al. (1991, 1993) understood that improvements to research on student motivation and learning would require the development of an instrument that was widely accessible to researchers. Thus, they developed the MSLQ. The result has been an instrument that has allowed
researchers to investigate motivation and learning across a variety of samples for many years. Methodologists have noted that score reliability varies across samples and does not relate to the reliability of tests (Thompson, 2003). In fact, researchers, editorial boards, and national educational and psychological associations have long recognized the importance of reporting reliability for the data in hand (Thompson, 1994; Wilkinson & APA Task Force on Statistical Inference, 1999). Determining how reliability estimates vary across administrations and samples can help future researchers as they plan their studies (Nimon et al., 2012). Therefore, we conducted an RG study to determine predictors of reliability scores for the MSLQ.

**RG of MSLQ Subscales**

If reliability of scores for a test is generalizable across studies, one would expect subsequent reliability estimates to remain consistent with those obtained during the development of instruments and published in original psychometric studies and test manuals. Vacha-Haase (1998) developed RG as a method to determine whether score reliability might be appropriately generalized across study populations with varying characteristics. For the present RG study, population estimates of alpha reliability for the 15 subscales of the MSLQ were generated using a newly applied VC technique (Bonett, 2010). Based on the disparity between estimates of mean reliability from the current study and reliabilities published in the MSLQ manual (Pintrich et al., 1991), and the presence of moderator variables that appear to influence reliability across studies, alpha reliabilities of the subscales of the MSLQ do not appear to generalize to various study populations.

The results indicate the extent to which variables predicted reliability scores varied across subscales. Original item wording was important for some subscales, but not others. Postsecondary samples tended to result in higher reliability for five subscales, lower reliabilities for three others, and did not serve as a predictor for the remaining subscales. The predictors in our model served as better moderators for Metacognitive Self-Regulation reliabilities than any other subscale.

**CIs for Mean Reliability Estimates**

CIs for mean reliability estimates in the current study for all 15 subscales did not encompass estimates reported in the MSLQ manual (Pintrich et al., 1991). The three lowest reliability estimates reported in the manual were below the lower bound of the CIs reported in Table 3. Therefore, a plausible range of score reliability for those factors (i.e., Extrinsic Goal Orientation, Organization, and Help Seeking) might be higher than the manual indicates, and Extrinsic Goal Orientation may fall within an acceptable range. However, for the remaining 12 subscales, reliability estimates for scores in future studies might actually be lower than those reported in the Pintrich et al. (1991) manual, although the plausible ranges often contain levels of reliability above .70.

Table 3 indicates that eight subscales have mean reliability CIs with a lower bound greater than .70, which is considered an acceptable level of score reliability, and one additional interval contains the value .70. CIs for mean reliability scores suggest Peer Learning might be lower than the .76 reported by Pintrich et al. (1991) and not at an acceptable level, but the larger standard error suggests that these reliabilities might vary more across samples than many of the other constructs. Organization, Rehearsal, and Control Beliefs have upper bounds close to an acceptable range, and the remaining subscales have reliability scores that are acceptable across a variety of samples. Although it is important to keep in mind the varying number of items in each of these subscales (see Table 1), no clear patterns or explanations are discernable from our data.

**Moderator Variables**

Of the 90 regression coefficients generated through OLS analysis, 39 were statistically significant at $\alpha = .05$, and for seven of the subscales, three or more of the six coefficients were statistically significant. Across all subscales in the study, variables that most commonly appeared to moderate reliability were postsecondary (eight subscales), 7-point scale (seven subscales), and English (seven subscales). Interestingly, none of the predictor variables appeared to moderate the Extrinsic Goal Orientation subscale, which may be an indication that reliability may generalize across a range of study factors for this scale.

Due to the log-complement transformation of study reliability in the regression analysis, estimates of $b$ are difficult to interpret. However, $\exp(b)$ may be interpreted as the percentage change in the nonreliability (i.e., $1 - \alpha$) for every 1-point change in the predictor variable (Bonett, 2010). A value of $\exp(b)$ greater than one represents a decrease in reliability. Interpretation of values of $\exp(b)$ for postsecondary suggests that studies utilizing the MSLQ with college students produce scores with significantly higher levels of reliability than younger students for the Self-Efficacy, Test Anxiety, Rehearsal, Metacognitive Self-Regulation, and Peer Learning subscales. However, significantly lower score reliability was indicated for postsecondary for the Intrinsic Goal Orientation, Organization, and Effort Regulation subscales (Table 5).

**Commonality Analysis**

Inspection of effect sizes presented in Table 6 indicates that the amount of variance of the reliability scores explained by the six predictor variables was noteworthy for Peer Learning ($R^2 = .4841$), Intrinsic ($R^2 = .3887$), Test Anxiety ($R^2 = .3581$), Time Management ($R^2 = .3591$), and Task Value ($R^2$...
Unique and common contributions. The largest unique contributions were for postsecondary for the Intrinsic, English for Test Anxiety, and English for Time Management subscales. When multicollinearity exists, predictors might be denied explanatory credit, particularly if variables do not make a unique contribution but share variance with other predictor variables. Original item wording and North America were denied predictive credit in OLS regressions for both Time Management and Peer Learning. Denial of credit was due to minimal unique contributions these variables made to the models despite relatively high levels of shared variance with other predictors. Thus, if statistical significance of OLS regression coefficients was used as the sole criterion for making a contribution to the model, original item wording and North America would have been denied predictive credit. For this reason, it is recommended that use of multiple regression models to detect potential moderators in RG studies are followed with commonality analysis to identify cases where credit may be denied due to shared variance among the predictors.

Possible suppressor effects. English and North America possibly serve as suppressor effects for Metacognitive Self-Regulation. In addition, original item wording possibly serves as a suppressor for Help Seeking. Suppressor effects have indirect predictive power but improve the overall model (Burdenski, 2000; Courville & Thompson, 2001; Pedhazur, 1997; Thompson, 2006). In the suppressor case, the bivariate correlation between the suppressor variable and the dependent variable is close to zero, the beta weight is not close to zero, and inclusion of the suppressor in the model increases the effect size, \( R^2 \). Thus, researchers need to look beyond bivariate correlations when considering variables to include in future studies, otherwise important suppressor variables might be overlooked.

Study Limitations

As with any meta-analysis, the current study is limited by the quality and transparency of reporting in the included primary studies. We found that only 51% of studies reporting use of the MSLQ included reliability estimates for the data collected. The omission of studies may represent a publication bias, whereby authors may not report low score reliabilities, which potentially influences estimates of average reliability and the impact of moderator variables. Additional bias may also have been introduced by excluding dissertations, theses, and other gray literature, as authors of this research may be more likely to report unacceptably low reliability estimates than in peer-reviewed journals. In addition, the lack of reporting of key sample and study characteristics in primary studies served to limit both the sample size and the potential moderator variables available for analysis, which may result in underpowered moderator analyses (Hedges & Pigott, 2004) and model misspecification (Vacha-Haase & Thompson, 2011).

An additional limitation of the study is that the measure of reliability assessed was coefficient alpha, as that was the predominant internal consistency estimate reported. Although coefficient alpha assumes tau equivalence of factor loadings (Graham, 2006), a scant number of studies reporting on MSLQ data reported testing the assumption of tau equivalence. Uniquely, Berger and Karabenick (2011) reported using Raykov’s rho in lieu of coefficient alpha, because rho does not assume tau equivalence (Raykov, 1997).

Implications

The wide variability of alpha reported for MSLQ subscales suggests that researchers should not assume that future use will result in reliabilities similar to those reported in the test manual (Pintrich et al., 1991), especially when applying the instrument to populations and study conditions vastly different than the original norming study. Translations of the MSLQ typically resulted in decreased reliability estimates; thus, it is recommended that researchers requiring use of the MSLQ in languages other than English utilize established cross-cultural adaptation procedures, including back translation, cross-validation, and factor analysis (Sousa & Rojjanasrirat, 2011), or apply a previously validated adaptation (e.g., Lee, Yin, & Zhang, 2010). Researchers may also consider performing a small-scale RG on a carefully selected group of existing studies with characteristics similar to those in a planned future study to estimate expected reliabilities (Bonett, 2010). In addition, researchers reporting coefficient alpha should test for the assumption of tau equivalence or report a measure of reliability that does not assume invariant factor loadings. Potentially, a study could be conducted to determine whether measurement parameters are equal across groups reflected in the moderator variables to inspect item performance differences (cf. Vassar & Bradley, 2010).

Conclusion

Our findings provide further evidence of the importance of reporting score reliabilities rather than inducting reliability from other publications. Varying characteristics of the sample population, such as being in North America, can affect score reliability of nearly all subscales of the MSLQ. Similarly, modifying the MSLQ instrument, such as changing the 7-point scale to a 5-point scale or translating the instrument from English into another language, might positively or negatively affect subscale reliability.
When designing a quantitative study, forethought is important to administering tests that will result in reliability coefficients that are sufficient to produce unattenuated effect sizes (Pedhazur, 1997; Thompson, 2003; Yetkiner & Thompson, 2010). Reliability estimates obtained for an instrument will vary between applications if the score variability, sample composition, and administration conditions fluctuate (Crocker & Algina, 1986). Vacha-Haase and Thompson (2011) stated that random variations in data, including the random variations associated with measurement error, attenuate the relationships among measured variables. Such attenuation occurs because correlation coefficients are sensitive to systematic covariances among measured variables replicated over study participants and not random fluctuations. (p. 159)

However, in certain circumstances, the attenuation of effect sizes due to low score reliability may not always occur (Nimon et al., 2012). Therefore, it is considered good practice to account for sample reliability in studies requiring statistical analysis and interpretation of data generated through the use of an instrument, such as in establishing test norms, assessing individuals and groups, performing validity studies, and evaluating sensitivity of measures. A failure to do so might have negative consequences for study outcomes and for individuals. For example, in clinical settings, use of inaccurate reliability estimates may result in misdiagnosis or underassessment, and in research settings, “insufficient reliability reporting practices influence the interpretation and application of research results and contribute to development and use of faulty measures” (Green et al., 2011, p. 658). Despite these efforts, reliability reporting practices appreciably have not improved over the past three decades (Green et al., 2011; Hogan, Benjamin, & Brezinski, 2000; Vacha-Haase & Thompson, 2011), an observation that is supported by findings from the current study.

Future researchers should benefit from the results of the current study as they allow for the estimation of reliability based on anticipated sample characteristics and study designs. In other words, researchers can better anticipate how their study design characteristics will affect the reliability of their results and make informed decisions about whether or not a particular modification (e.g., modification of item wording or use of a Likert-type scale with a different number of choices) is appropriate in light of the potential influence on score reliability. With these data in mind, researchers can make empirically based decisions to strengthen their research, and ultimately, the quality of scientific knowledge obtained using this measurement tool.

Regardless of the negative implications of poor reliability reporting, it is common for researchers either to fail to report reliability estimates for data collected or to report only previously published reliability coefficients for the instrument, a practice that has been characterized as reliability induction (Vacha-Haase, Kogan, & Thompson, 2000). Such practice likely arises from a misunderstanding that reliability is a property of the scores generated by administration of a test to a particular sample under specific conditions, rather than a property of the instrument itself (Thompson & Vacha-Haase, 2000).

To encourage better practice in reliability reporting, journal editors (e.g., Thompson, 1994) and professional organizations (e.g., American Educational Research Association, 2006; APA, 2001; Wilkinson & APA Task Force on Statistical Inference, 1999) have consistently advocated that authors provide reliability estimates for the data in hand because “it is poor practice and potentially harmful to tested subgroups for researchers to assume that reliability evidence obtained with one sample (e.g., adult men) can generalize to other samples and/or populations (e.g., women, children, adolescents)” (Green et al., 2011, p. 658). Despite these efforts, reliability reporting practices appreciably have not improved over the past three decades (Green et al., 2011; Hogan, Benjamin, & Brezinski, 2000; Vacha-Haase & Thompson, 2011), an observation that is supported by findings from the current study.

Conceptually, reliability estimates the degree to which an individual’s scores remain relatively constant or free from measurement error over repeated administrations of the same test or of alternate forms of a test (Crocker & Algina, 1986; Rudner, 1994). Thus, to make a validity judgment about how well scores from an instrument measure a construct, researchers must consider score reliability. In this way, reliability is considered to be a necessary, but not sufficient condition for the establishment of score validity (Pedhazur & Schmelkin, 1991).
Appendix A

SPSS Code to Perform Ordinary Least Squares (OLS) Regression Moderator Analysis Using the Bonett Method

***** Read data matrices from active dataset ***** .

** X is an m x t matrix of predictors (m = studies, t = predictors) ** .

** The first matrix column should contain ones (Xones) ** .
get X
   / variables = Xones to Xt
   / names = Xnames .

** P is an m x 1 vector of log-complement, bias-adjusted alpha estimates ** .
get P
   / variables = P .

** V is an m x 1 vector of study sampling errors ** .
get V
   / variables = V .

***** calculate b hat ***** .
compute Xtrans = T(X) .
compute XtransX = Xtrans * X .
compute invXX = inv(XtransX) .
compute bhat = invXX * Xtrans * P .

print bhat
   / title = “b Hat”
   / rnames = Xnames .

***** calculate cov(bhat) ***** .
compute Vdiag = mdiag(V) .
compute XtransV = Xtrans * Vdiag .
compute XtransVX = XtransV * X .
compute covb = invXX * XtransV * invXX .
compute varb = diag(covb) .

print varb
   / title = “b Variance”
   / rnames = Xnames .

end matrix .
Appendix B

Studies Included in the Reliability Generalization Meta-Analysis

Abar, B., Carter, K. L., & Winsler, A. (2009). The effects of maternal parenting style and religious commitment on self-regulation, academic achievement, and risk behavior among African-American parochial college students. *Journal of Adolescence, 32*, 259-273. doi:10.1016/j.adolescence.2008.03.008

Abdullah, M. N. L. Y., & Evans, T. (2012). The relationships between postgraduate research students’ psychological attributes and their supervisors’ supervision training. *Procedia: Social and Behavioral Sciences, 31*, 788-793. doi:10.1016/j.sbspro.2011.12.142

Acce, T. W., & Weinstein, C. E. (2010). Effects of a value-reappraisal intervention on statistics students’ motivation and performance. *Journal of Experimental Education, 78*, 487-512. doi:10.1080/00220970903352753

Ackerman, P. L., & Kanfer, R. (2009). Test length and cognitive fatigue: An empirical examination of effects on performance and test-taker reactions. *Journal of Experimental Psychology: Applied, 15*, 163-181. doi:10.1037/a0015719

Ackerman, P. L., Kanfer, R., & Beier, M. E. (2013). Trait complex, cognitive ability, and domain knowledge predictors of baccalaureate success, STEM persistence, and gender differences. *Journal of Educational Psychology, 105*, 911-927. doi:10.1037/a0032338

Ackerman, P. L., & Wolman, S. D. (2007). Determinants and validity of self-estimates of abilities and self-concept measures. *Journal of Experimental Psychology: Applied, 13*, 57-58. doi:10.1037/1076-898X.13.2.57

Adcroft, A. (2010). The motivations to study of undergraduate students in management: The impact of degree programme and level of study. *International Journal of Management Education, 9*, 11-20. doi:10.1080/0309877X.2011.590581

Adcroft, A. (2011). The motivations to study and expectations of studying of undergraduate students in business and management. *Journal of Further and Higher Education, 35*, 521-543. doi:10.1080/0309877X.2011.590581

Akin, A. (2008). Self-efficacy, achievement goals and depression, anxiety, and stress: A structural equation modeling. *World Applied Sciences Journal, 3*, 725-732. Retrieved from http://idosi.org/wasj/online.htm

Akin, A., & Kurbanoglu, I. N. (2011). The relationships between math anxiety, math attitudes, and self-efficacy: A structural equation model. *Studia Psychologica, 53*, 263-273. Available from http://www.studiapsychologica.com

Akyol, G., Sungur, S., & Tekkaya, C. (2010). The contribution of cognitive and metacognitive strategy use to students’ science achievement. *Educational Research and Evaluation, 16*, 1-21. doi:10.1080/13803611003672348

Al-Harthi, A. S. (2010). Learner self-regulation in distance education: A cross cultural study. *American Journal of Distance Education, 24*, 135-150. doi:10.1080/08993467.2010.498232

Alkharusi, H. (2013). Canonical correlational models of students’ perceptions of assessment tasks, motivational orientations, and learning strategies. *International Journal of Instruction, 6*, 21-38. Available from http://www.e-iji.net

Alkharusi, H., Aldhafri, S., Alnabhani, H., & Alkalbani, M. (2013). The impact of students’ perceptions of assessment tasks on self-efficacy and perception of task value: A path analysis. *Social Behavior and Personality: An International Journal, 41*, 1681-1602. doi:10.2224/sbp.2013.41.10.1681

Alkharusi, H., Aldhafri, S., Alnabhani, H., & Alkalbani, M. (2014). Classroom assessment: Teacher practices, student perceptions, and academic self-efficacy beliefs. *Social Behavior and Personality: An International Journal, 42*, 835-855. doi:10.2224/sbp.2014.42.5.835

Alkharusi, H., Neisler, O., Al-Barwani, T., David, C., Al-Sulaimani, H., Khan, M., ... Al-Kalbani, M. (2012). Psychometric properties of the Motivated Strategies for Learning Questionnaire for Sultan Qaboos university students. *College Student Journal, 46*, 567-580.

Alt, D. (2014). The construction and validation of a new scale for measuring features of constructivist learning environments in higher education. *Frontline Learning Research, 2*(3). doi:10.4786/flr.v2i26.8

Alt, D., & Geiger, B. (2012). Goal orientations and tendency to neutralize academic cheating: An ecological perspective. *Psychological Studies, 57*, 404-416. doi:10.1007/s12646-012-0161-y

Anderson, R., Velez, J., & Anderson, S. (2014). Using the Health Belief Model to comparatively examine the welding safety beliefs of postsecondary agricultural education students and their non-agricultural education peers. *Career and Technical Education Research, 39*, 9-22. doi:10.5328/cter.39.19

Andreou, E., & Metallidou, P. (2004). The relationship of academic and social cognition to behaviour in bullying situations among Greek primary school children. *Educational Psychology, 24*, 27-41. doi:10.1080/0144341032000146421

Andrew, S., & Vialle, W. (1998). Nursing students’ self-efficacy, self-regulated learning and academic performance in science teaching. *Nursing Times, 76*, 422-476.

Ang, R. P., Klassen, R. M., Chong, W. H., Huan, V. S., Wong, I. Y. F., Yeo, L. S., & Krawchuk, L. L. (2009). Cross-cultural invariance of the academic expectations stress inventory: Adolescent samples from Canada and Singapore. *Journal of Adolescence, 32*, 1225-1237. doi:10.1016/j.adolescence.2009.01.009

Arend, B. D. (2007). Course assessment practices and student learning strategies in online courses. *Journal of Asynchronous Learning Networks, 11*(4), 3-13. Retrieved from https://onlinelearningconsortium.org/read/online-learning-journal/

Artino, A. R., Jr. (2009). Think, feel, act: Motivational and emotional influences on military students’ online academic success. *Journal of Computing in Higher Education, 21*, 146-166. doi:10.1007/s12528-009-9020-9

Artino, A. R., Jr., Dong, T., DeZee, K. J., Gilliland, W. R., Waechter, D. M., Cruess, D., & Durning, S. J. (2012). Achievement goal structures and self-regulated learning: Relationships and changes in medical school. *Academic Medicine, 87*, 1375-1381. doi:10.1097/ACM.0b013e3182676b55

Artino, A. R., Jr., Hemmer, P. A., & Durning, S. J. (2011). Using self-regulated learning theory to understand the beliefs, emotions, and behaviors of struggling medical students. *Academic Medicine, 86*(10), S35-S38. doi:10.1097/ACM.0b013e31822a603d
Artino, A. R., Jr., & Jones, K. D. (2012). Exploring the complex relations between achievement emotions and self-regulated learning behaviors in online learning. The Internet and Higher Education, 15, 170-175. doi:10.1016/j.iheduc.2012.01.006

Artino, A. R., Jr., & McCoach, D. B. (2008). Development and initial validation of the online learning value and self-efficacy scale. Journal of Educational Computing Research, 38, 279-303. doi:10.2190/EC.38.3.c

Artino, A. R., Jr., & Stephens, J. M. (2006). Motivating students. Higher Education Research & Development, 31, 449-463. doi:10.1080/07294360.2011.634384

Auld, D. P., Blumberg, F. C., & Clayton, K. (2010). Linkages between motivation, self-efficacy, self-regulated learning and preferences for traditional learning environments or those with an online component. Digital Culture & Education, 2, 128-143. doi:10.4105/2395-2296.186521

Aydin, Y. C., Uzuntiryaki, E., & Demirdöğen, B. (2011). Interplay of motivational and cognitive strategies in predicting self-efficacy and anxiety. Educational Psychology: An International Journal of Experimental Educational Psychology, 31, 55-66. doi:10.1080/01443410.2010.518561

Barker, J., & Olson, J. (1997). Medical students’ learning strategies: Evaluation of first year changes. Journal of the Mississippi Academy of Sciences, 42(2). Retrieved from http://www.msacad.org/journal/cjou2.html

Bartels, J. M., Magun-Jackson, S., & Kemp, A. D. (2009). Volitional regulation and self-regulated learning: An examination of individual differences in approach-avoidance achievement motivation. Electronic Journal of Research in Educational Psychology, 7, 605-626. Retrieved from http://www.investigacion-psicopedagogica.org/revista/new/english/index.php

Bartels, J. M., Magun-Jackson, S., & Ryan, J. J. (2011). Achievement goals, volitional regulation and help-seeking among college students: A multiple goal analysis. Individual Differences Research, 9, 41-51.

Bassili, J. N. (2008). Motivation and cognitive strategies in the choice to attend lectures or watch them online. International Journal of E-Learning & Distance Education, 22, 129-148. Retrieved from http://ijede.ca/index.php/jde

Bembunuty, H., & Karabenick, S. A. (1998). Academic delay of gratification. Learning and Individual Differences, 10, 329-346. doi:10.1016/S1041-6080(99)00826-5

Ben-Eliyahu, A., & Linnenbrink-Garcia, L. (2015). Integrating the regulation of affect, behavior, and cognition into self-regulated learning paradigms among secondary and post-secondary students. Metacognition and Learning, 10, 15-42. doi:10.1007/s11409-014-9129-8

Bergin, S., & Reilly, R. (2006). Predicting introductory programming performance: A multi-institutional multivariate study. Computer Science Education, 16, 303-323. doi:10.1080/08993400600997096

Birenbaum, M. (1997). Assessment preferences and their relationship to learning strategies and orientations. Higher Education, 33, 71-84. doi:10.1023/A:100295613176

Bolkas, S. (2015). Intellectually stimulating students’ intrinsic motivation: The mediating influence of affective learning and student engagement. Communication Reports, 28, 80-91. doi:10.1080/08934215.2014.962752

Bolkan, S., Goodboy, A. K., & Griffin, D. J. (2011). Teacher leadership and intellectual stimulation: Improving students’ approaches to studying through intrinsic motivation. Communication Research Reports, 28, 337-346. doi:10.1080/08824096.2011.615958

Bong, M., Cho, C., Ahn, H. S., & Kim, H. J. (2012). Comparison of self-beliefs for predicting student motivation and achievement. The Journal of Educational Research, 105, 336-352. doi:10.1080/00220671.2011.627401

Boyce, L. A., LaVoie, N., Streeter, L. A., Lochbaum, K. E., & Psotka, J. (2008). Technology as a tool for leadership development: Effectiveness of automated web-based systems in facilitating tacit knowledge acquisition. Military Psychology, 20, 271-288. doi:10.1080/08995600802345220

Brackney, B. E., & Karabenick, S. A. (1995). Psychopathology and academic performance: The role of motivation and learning strategies. Journal of Counseling Psychology, 42, 456-465. doi:10.1037/0022-0167.42.4.456

Brady, M., Seli, H., & Rosenthal, J. (2013). “Clickers” and metacognition: A quasi-experimental comparative study about metacognitive self-regulation and use of electronic feedback devices. Computers & Education, 65, 56-63. doi:10.1016/j.compedu.2013.02.001

Bråten, I., & Olausen, B. S. (2007). The motivational development of Norwegian nursing students over the college years. Learning in Health and Social Care, 6, 27-43. doi:10.1111/j.1473-6861.2007.00144.x

Bråten, I., Samuelstuen, M. S., & Stromso, H. I. (2004). Do students’ self-efficacy beliefs moderate the effects of performance goals on self-regulatory strategy use? Educational Psychology, 24, 231-247. doi:10.1080/0144341032000160164

Bye, D., Pushkar, D., & Conway, M. (2007). Motivation, interest, and positive affect in traditional and nontraditional undergraduate students. Adult Education Quarterly, 57, 141-158. doi:10.1177/0741713606294235

Campbell, M. M. (2007). Motivational systems theory and the academic performance of college students. Journal of College Teaching & Learning, 4, 11-24. doi:10.19030/tlc.v4i7.1561

Cavero, M. A. B. (2011) Voluntad para estudiar, regulación del aprendizaje e índice de efectividad. Revista de Investigación Educativa, 29, 171-195. Retrieved from http://revistas.um.es/rie/article/view/110731

Chang, M.-M. (2005). Applying self-regulated learning strategies in a web-based instruction: An investigation of motivation perception. Computer Assisted Language Learning, 18, 217-230. doi:10.1080/09588220500178939

Chang, M.-M., & Ho, C.-M. (2009). Effects of locus of control and learner-control on web-based language learning. Computer Assisted Language Learning, 22, 189-206. doi:10.1080/09588220902920094

Chen, C.-H., Wang, K.-C., & Lin, Y.-H. (2015). The comparison of solitary and collaborative modes of game-based learning on students’ science learning and motivation. Journal of Educational Technology & Society, 18, 237-248. Retrieved from http://www.jstori.org/stable/jedutechsoci.18.2.237
Chen, G., Gully, S. M., & Eden, D. (2004). General self-efficacy and self-esteem: Toward theoretical and empirical distinction between correlated self-evaluations. *Journal of Organizational Behavior, 25*, 375-395. doi:10.1002/job.251

Cheng, G., & Chau, J. (2013). Exploring the relationship between students’ self-regulated learning ability and their ePortfolio achievement. *The Internet and Higher Education, 17*, 9-15. doi:10.1016/j.iheduc.2012.09.005

Cheung, C.-K., Roskams, T., & Fisher, D. (2006). *Exploring the relationship between motivation, learning strategies and choice of environment whether traditional or including an online component*. British Journal of Educational Technology, 37, 349-364. doi:10.1111/j.1467-8532.2005.00099.x

Chyung, S. Y., Moll, A. J., & Berg, S. A. (2010). The role of intrinsic goal orientation, self-efficacy, and e-learning practice in engineering education. *The Journal of Effective Education, 10*, 22-37. Retrieved from ERIC database. (EJ1092160)

Cho, M.-H., & Heron, M. L. (2015). Self-regulated learning: The role of motivation, emotion, and use of learning strategies in students’ learning experiences in a self-paced online mathematics course. *Distance Education, 36*, 80-99. doi:10.1080/01587919.2015.1019963

Clayton, K., Blumberg, F., & Auld, D. P. (2010). The relationship between motivation, learning strategies and choice of environment whether traditional or including an online component. *British Journal of Educational Technology, 41*, 349-364. doi:10.1111/j.1467-8535.2009.00993.x

Coffin, R. J., & MacIntyre, P. D. (1999). Motivational influences on computer-related affective states. *Computers in Human Behavior, 15*, 549-569. doi:10.1016/S0747-5632(99)00036-9

Cole, J. S., Cole, S. T., & Ferguson, A. P. (2006). Students’ motivation to learn: A comparison between undergraduate students majoring in parks, recreation, and tourism and those in other majors. *Journal of Teaching in Travel & Tourism, 6*, 61-70. doi:10.1300/J172v06n02_05

Cole, J. S., & Denzine, G. M. (2004). “I’m not doing as well in this class as I’d like to”: Exploring achievement motivation and personality. *Journal of College Reading and Learning, 34*, 29-44. doi:10.1080/10790195.2004.10850160

Corkin, D. M., Yu, S. L., Wolters, C. A., & Wiesner, M. (2014). The role of the college classroom climate on academic procrastination. *Learning and Individual Differences, 32*, 294-303. doi:10.1016/j.lindif.2014.4.001

Cornillie, F., Clarebout, G., & Desmet, P. (2012). Between learning and playing? Exploring learners’ perceptions of corrective feedback in an immersive game for English pragmatics. *ReCALL, 24*, 257-278. doi:10.1017/S0958344120000146

Coutinho, S. A., & Neuman, G. (2008). A model of metacognition, achievement goal orientation, learning style and self-efficacy. *Learning Environments Research, 11*, 131-151. doi:10.1007/s10984-008-9042-7

Creasey, G., Jarvis, P., & Gadke, D. (2009). Student attachment stances, instructor immediacy, and student-instructor relationships as predictors of achievement expectancies in college students. *Journal of College Student Development, 50*, 353-372. doi:10.1353/csd.0.0082

Daniels, L. M., Stupnisky, R. H., Pekrun, R., Haynes, T. L., Perry, R. P., & Newall, N. E. (2009). A longitudinal analysis of achievement goals: From affective antecedents to emotional effects and achievement outcomes. *Journal of Educational Psychology, 101*, 948-963. doi:10.1037/a0016096

Davis, K. D., Wilsner, A., & Middleton, M. (2006). Students’ perceptions of rewards for academic performance by parents and teachers: Relations with achievement and motivation in college. *The Journal of Genetic Psychology: Research and Theory on Human Development, 167*, 211-220. doi:10.3200/GNTP.167.2.211-220

Dawson, D. L., Meadows, K. N., & Haffie, T. (2010). The effect of performance feedback on study help-seeking and learning strategy use: Do clickers make a difference? *The Canadian Journal for the Scholarship of Teaching and Learning, 1*(1). doi:10.5206/cjsot-rcaea.2010.1.6

de Fátima Goulão, M. (2014). The relationship between self-efficacy and academic achievement in adults’ learners. *Athens Journal of Education, 1*, 237-246. Retrieved from https://www.athensjournals.gr/aje

Duijnhouwer, H., Prins, F. J., & Stokking, K. M. (2010). Progress feedback effects on students’ writing mastery goal, self-efficacy beliefs, and performance. *Educational Research and Evaluation, 16*, 53-74. doi:10.1080/13803611003711393

Dunn, K. E. (2014). Why wait? The influence of academic self-regulation, intrinsic motivation, and statistics anxiety on procrastination in online statistics. *Innovative Higher Education, 39*, 33-44. doi:10.1007/s10755-013-9256-1

Dunn, K. E., Rakes, G. C., & Rakes, T. A. (2014). Influence of academic self-regulation, critical thinking, and age on online graduate students’ academic help-seeking. *Distance Education, 35*, 75-89. doi:10.1080/01587919.2014.891426

Edens, D. (2011). Predictors of culinary students’ satisfaction with learning. *Journal of Hospitality & Tourism Education, 23*(3), 5-15. doi:10.1080/10963758.2011.10697008

Ee, J., Wang, C. K. J., Koh, C., Tan, O. S., & Liu, W. C. (2009). Goal orientations and metacognitive skills of normal technical and normal academic students on project work. *Asia Pacific Education Review, 10*, 337-344. doi:10.1007/s12564-009-9033-0

Fadlalmula, F., Cakiroglu, E., & Sungur, S. (2015). Developing a structural model on the relationship among motivational beliefs, self-regulated learning strategies, and achievement in mathematics. *International Journal of Science and Mathematics Education, 13*, 1355-1375. doi:10.1007/s11665-013-9499-4

Fall, L. T., Kelly, S., & Christen, S. (2011). Revisiting the impact of instructional immediacy: A differentiation between military and civilians. *Quarterly Review of Distance Education, 12*, 199-206. Retrieved from http://www.infoagepub.com/quarterly-review-of-distance-education

Fantz, T. D., Siller, T. J., & Demiranda, M. A. (2011). Pre-collegiate factors influencing the self-efficacy of engineering students. *Journal of Engineering Education, 100*, 604-623. doi:10.1002/j.2168-9830.2011.tb00028.x

Fernandez, R., Salamonson, Y., & Griffiths, R. (2012). Emotional intelligence as a predictor of academic performance in first-year accelerated graduate entry nursing students. *Journal of Clinical Nursing, 21*, 3485-3492. doi:10.1111/j.1365-2702.2012.04199.x
Freeman, T. M., Anderman, L. H., & Jensen, J. M. (2007). Sense of belonging in college freshmen at the classroom and campus levels. *The Journal of Experimental Education, 75*, 203-220. doi:10.3200/JEXE.75.3.203-220

Furlan, L. A., Rosas, J. S., Heredia, D., Illbele, A., & Martinez, M. (2012). Estrategias de aprendizaje y afrontamiento en estudiantes con elevada ansiedad frente a los exámenes. [Learning and coping strategies in students with high anxiety about exams]. *Anuario de Investigaciones de la Facultad de Psicología, 1*, 130-141. Retrieved from https://revistas.unc.edu.ar/index.php/aifp/article/view/2903

Gaeta, M. L., Teruel, M. P., & Orejudo, S. (2012). Motivational, volitional and metacognitive aspects of self-regulated learning. *Electronic Journal of Research in Educational Psychology, 10*, 73-94. Retrieved from http://www.investigacion-psicopedagogica.org/revista/new/english/index.php

Garcia, T., McCann, E. J., Turner, J. E., & Roska, L. (1998). Modeling the mediating role of volition in the learning process. *Contemporary Educational Psychology, 23*, 392-418. doi:10.1006/ceps.1998.0982

Garcia-Ros, R., & Pérez-González, F. (2011). Validez predictiva e incremental de las habilidades de autorregulación sobre el éxito académico en la Universidad. [Predictive and incremental validity of self-regulation skills on academic success in the university]. *Revista de Psicodidáctica, 16*, 231-250. Retrieved from http://www.ehu.eus/ojs/index.php/psicodidactica

Garcia-Ros, R., & Pérez-González, F. (2012). Spanish version of the time management behavior questionnaire for university students. *The Spanish Journal of Psychology, 15*, 1485-1494. doi:10.5209/rev_SJOP.2012.v15.n3.39432

Garnier, J. K. (2009). Conceptualizing the relations between executive functions and self-regulated learning. *The Journal of Psychology: Interdisciplinary and Applied, 143*, 405-426. doi:10.3200/JRLP.143.4.405-426

Gaudreau, P. (2012). Goal self-concordance moderates the relationship between achievement goals and indicators of academic adjustment. *Learning and Individual Differences, 22*, 827-832. doi:10.1016/j.lindif.2012.06.006

Gillet, N., Lafrenière, M. A. K., Huygebaert, T., & Fouquereau, E. (2015). Autonomous and controlled reasons underlying achievement goals: Implications for the 3 x 2 achievement goal model in educational and work settings. *Motivation and Emotion, 39*, 858-875. doi:10.1007/s11031-015-9505-y

Goldman, Z. W., & Martin, M. M. (2014). College students’ academic beliefs and their motives for communicating with their instructor. *Communication Research Reports, 31*, 316-328. doi:10.1080/08824096.2014.924341

Groenendijk, T., Janssen, T., Rijlaarsdam, G., & van den Bergh, H. (2013). Learning to be creative. The effects of observational learning on students’ design products and processes. *Learning and Instruction, 28*, 35-47. doi:10.1016/j.learninstruc.2013.05.001

Hall, N. C. (2008). Self-regulation of primary and secondary control in achievement settings: A process model. *Journal of Social and Clinical Psychology, 27*, 1126-1164. doi:10.1521/jscp.2008.27.10.1126

Hall, N. C., Hladkjy, S., Perry, R. P., & Ruthig, J. C. (2004). The role of attributional retraining and elaborative learning in college students’ academic development. *The Journal of Social Psychology, 144*, 591-612. doi:10.3200/SOCP.144.6.591-612

Hamilton, R. J., & Akhter, S. (2009). Construct validity of the Motivated Strategies for Learning Questionnaire. *Psychological Reports, 104*, 711-722. doi:10.2466/PR0.104.3.711-722

Hamm, J. M., Perry, R. P., Clifton, R. A., Chipperfield, J. G., & Boese, G. D. (2014). Attributional retraining: A motivation treatment with differential psychosocial and performance benefits for failure prone individuals in competitive achievement settings. *Basic and Applied Social Psychology, 36*, 221-237. doi:10.1080/01973533.2014.90623

Hamm, J. M., Stewart, T. L., Perry, R. P., Clifton, R. A., Chipperfield, J. G., & Heckhausen, J. (2013). Sustaining primary control striving for achievement goals during challenging developmental transitions: The role of secondary control strategies. *Basic and Applied Social Psychology, 35*, 286-297. doi:10.1080/01973533.2013.785404

Hamman, D., Berthelot, J., Saia, J., & Crowley, E. (2000). Teachers’ coaching of learning and its relation to students’ strategic learning. *Journal of Educational Psychology, 92*, 342-348. doi:10.1037/0022-0663.92.2.342

Harackiewicz, J. M., Barron, K. E., Tauer, J. M., Carter, S. M., & Elliot, A. J. (2000). Short-term and long-term consequences of achievement goals: Predicting interest and performance over time. *Journal of Educational Psychology, 92*, 316-330. doi:10.1037/0022-0663.92.2.316

Hativa, N., & Birenbaum, M. (2000). Who prefers what? Disciplinary differences in students’ preferred approaches to teaching and learning styles. *Research in Higher Education, 41*, 209-236. doi:10.1023/A:100709

Haynes, T. L., Daniels, L. M., Stupnisky, R. H., Perry, R. P., & Hladkjy, S. (2008). The effect of attributional retraining on mastery and performance motivation among first-year college students. *Basic and Applied Social Psychology, 30*, 198-207. doi:10.1080/01973530802374972

Hensley, L. C. (2014). Reconsidering active procrastination: Relations to motivation and achievement in college anatomy. *Learning and Individual Differences, 36*, 157-164. doi:10.1016/j.lindif.2014.10.012

Hilpert, J. C., Stempien, J., van der Hoeven Kraft, K. J., & Husman, J. (2013). Evidence for the latent factor structure of the MSLQ: A new conceptualization of an established questionnaire. *SAGE Open, 3*(4). doi:10.1177/2158244013510305

Hodges, C. B., & Kim, C. (2010). Email, self-regulation, self-efficacy, and achievement in a college online mathematics course. *Journal of Educational Computing Research, 43*, 207-223. doi:10.2190/EC.43.2.d

Hodges, C. B., Stackpole-Hodges, C. L., & Cox, K. M. (2008). Self-efficacy, self-regulation, and cognitive style as predictors of achievement with podcast instruction. *Journal of Educational Computing Research, 38*, 139-153. doi:10.2190/EC.38.2.b

Hopstock, L. A. (2008). Motivation and adult learning: A survey among hospital personnel attending a CPR course. *Resuscitation, 76*, 425-430. doi:10.1016/j.resuscitation.2007.09.011

Hsieh, P. H., Cho, Y., Liu, M., & Schallert, D. L. (2008). Learning and self-regulation and a fronto-parietal network in knowledge acquisition. *Learning and Instruction, 18*, 316-328. doi:10.1016/j.learninstruc.2007.09.006

Hsieh, P. H., Sullivan, J. R., Sass, D. A., & Guerra, N. S. (2012). Undergraduate engineering students’ beliefs, coping strategies,
and academic performance: An evaluation of theoretical models. *The Journal of Experimental Education, 80*, 196-218. doi: 10.1080/00220973.2011.596853

Huang, S. C. (2008). Assessing motivation and learning strategies using the Motivated Strategies for Learning Questionnaire in a foreign language learning context. *Social Behavior and Personality: An International Journal, 36*, 529-534. doi:10.2224/sbp.2008.36.4.529

Husman, J., Derryberry, W. P., Crowson, H. M, & Lomax, R. (2004). Exceptionalities across the college semester. *Motivation and Emotion, 28*, 191-204. doi:10.1016/j.motem.2003.11.017

Johnson, R. D., Gueutal, H., & Falbe, C. M. (2009). Technology, trainees, metacognitive activity and e-learning effectiveness. *Journal of Managerial Psychology, 24*, 545-566. doi:10.1108/02683940910974125

Jones, M. H., Alexander, J. M., & Estell, D. B. (2010). Homophily among peer groups members’ perceived self-regulated learning. *The Journal of Experimental Education, 78*, 378-394. doi:10.1080/00220970903548020

Kadioglu, C., & Uzuntiryaki-Kondakci, E. (2014). Relationship between learning strategies and goal orientations: A multilevel analysis. *Eurasian Journal of Educational Research, 56*, 1-22. doi:10.14689/ejer.2014.56.6

Kahraman, N., & Sungur, S. (2013). Antecedents and consequences of middle school students’ achievement goals in science. *The Asia-Pacific Education Researcher, 22*, 45-60. doi:10.1007/s40299-012-0024-2

Kanfer, R., Ackerman, P. L., & Heggestad, E. D. (1996). Motivational skills & self-regulation for learning: A trait perspective. *Learning and Individual Differences, 8*, 185-209. doi:10.1016/S1041-6080(96)90014-X

Karabenick, S. A. (2003). Seeking help in large college classes: A person-centered approach. *Contemporary Educational Psychology, 28*, 37-58. doi:10.1016/S0361-476X(02)00012-7

Karabenick, S. A., & Collins-Eaglin, J. (1997). Relation of perceived instructional goals and incentives to college students’ use of learning strategies. *Motivation and Social Processes, 4*, 331-341. doi:10.1080/00220973.1997.10806608

Karabenick, S. A., & Sharma, R. (1994). Perceived teacher support of student questioning in the college classroom: Its relation to student characteristics and role in the classroom questioning process. *Journal of Educational Psychology, 86*, 90-103. doi:10.1037/0022-0663.86.1.90

Kassab, S. E., Al-Shafei, A. I., Salem, A. H., & Otoom, S. (2015). Relationships between the quality of blended learning experience, self-regulated learning, and academic achievement of medical students: A path analysis. *Advances in Medical Education and Practice, 6*, 27-34. doi:10.2147/AMEP.S75830

Kelly, S., Rice, C., Wyatt, B., Ducking, J., & Denton, Z. (2015). Teacher immediacy and decreased student quantitative reasoning anxiety: The mediating effect of perception. *Communication Education, 64*, 171-186. doi:10.1080/03634523.2015.1014383

Kesici, S., Baloglu, M., & Deniz, M. E. (2011). Self-regulated learning strategies in relation with statistics anxiety. *Learning and Individual Differences, 21*, 472-477. doi:10.1016/j.lindif.2011.02.006

Kiliç-Çakmak, E. (2010). Learning strategies and motivational factors predicting information literacy self-efficacy of e-learners. *Australasian Journal of Educational Technology, 26*, doi:10.14742/ajet.1090

Kim, C. M., & Bennekin, K. N. (2013). Design and implementation of volitional control support in mathematics courses. *Educational Technology Research & Development, 61*, 793-817. doi:10.1007/s11423-013-9309-2

Kim, C. M., Park, S. W., Cozart, J., & Lee, H. (2015). From motivation to engagement: The role of effort regulation of virtual high school students in mathematics courses. *Journal of Educational Technology & Society, 18*, 261-272.

Kim, E., & Seo, E. H. (2013). The relationship of flow and self-regulated learning to active procrastination. *Social Behavior and Personality: An International Journal, 41*, 1099-1114. doi:10.2224/sbp.2013.41.7.1099

Kıngır, S., Tas, Y., Gök, G., & Vural, S. S. (2013). Relationships among constructivist learning environment perceptions, motivational beliefs, self-regulation and science achievement. *Research in Science & Technological Education, 31*, 204-226. doi:10.1080/02635143.2013.825594

Kirian, D., & Sungur, S. (2012). Middle school students’ science self-efficacy and its sources: Examination of gender difference. *Journal of Science Education and Technology, 21*, 619-630. doi:10.1007/s10956-011-9351-y

Kirik, Ö. T., & Boz, Y. (2012). Cooperative learning instruction for conceptual change in the concepts of chemical kinetics. *Chemistry Education Research and Practice, 13*, 221-236. doi:10.1039/C1RP90072B

Klassen, R. M., Ang, R. P., Chong, W. H., Krawchuk, L. L., Huan, V. S., Wong, I. Y. F., & Yeo, L. S. (2010). Academic procrastination of undergraduates: Low self-efficacy to self-regulate predicts higher levels of procrastination. *Applied Psychology, 59*, 361-379. doi:10.1111/j.1464-0597.2009.00394.x

Klassen, R. M., Krawchuk, L. L., Lynch, S. L., & Rajani, S. (2008). Procrastination and motivation of undergraduates with learning disabilities: A mixed-methods inquiry. *Learning Disabilities Research & Practice, 23*, 137-147. doi:10.1111/j.1540-5826.2008.00271.x

Klassen, R. M., Krawchuk, L. L., & Rajani, S. (2008). Academic procrastination of undergraduates: Low self-efficacy to self-regulate predicts higher levels of procrastination. *Contemporary Educational Psychology, 33*, 915-931. doi:10.1016/j.cedpsych.2007.07.001

Klassen, R. M., & Kuzucu, E. (2009). Academic procrastination and motivation of adolescents in Turkey. *Educational Psychology, 29*, 69-81. doi:10.1080/01443410802478622
Peruvian high school students. *Psychologica Belgica*, 47, 51-70. doi:10.5334/ph-47-1-51

Mattern, R. A. (2005). College students’ goal orientations and achievement. *International Journal of Teaching and Learning in Higher Education*, 17, 27-32. Retrieved from http://www.isetl.org/ijthe

McInerney, D. M., & King, R. B. (2001). Harnessing the power of motivational factors for optimizing the educational success of remote indigenous students: A cross-cultural study. *Diversity in Higher Education*, 14, 81-111. doi:10.1108/S1479-3644(2013)0000014004

McManus, T. F. (2000). Individualizing instruction in a web-based hypermedia learning environment: Nonlinearity, advance organizers, and self-regulated learners. *Journal of Interactive Learning*, 11, 219-251. Retrieved from https://www.learn techlib.org/p/8486

McWhaw, K., & Abrami, P. C. (2001). Student goal orientation and interest: Effects on students’ use of self-regulated learning strategies. *Contemporary Educational Psychology*, 26, 311-329. doi:10.1016/ceps.2000.1054

Michou, A., Vansteenkiste, M., Mouratidis, A., & Lens, W. (2014). Enriching the hierarchical model of achievement motivation: Autonomous and controlling reasons underlying achievement goals. *British Journal of Educational Psychology*, 84, 650-666. doi:10.1111/bjep.12055

Mills, J. S., & Blankstein, K. R. (2000). Differences in higher education. *Journal of Personality and Individual Differences*, 29, 1191-1204. doi:10.1016/S0191-8869(00)0003-9

Moos, D. C. (2011). Self-regulated learning and externally generated feedback with hypermedia. *Journal of Educational Computing Research*, 44, 265-297. doi:10.2190/EC.44.3.b

Moos, D. C., & Azevedo, R. (2008). Monitoring, planning, and self-efficacy during learning with hypermedia: The impact of conceptual scaffolds. *Computers in Human Behavior*, 24, 1686-1766. doi:10.1016/j.chb.2007.07.001

Moos, D. C., & Azevedo, R. (2009). Self-efficacy and prior domain knowledge: To what extent does monitoring mediate their relationship with hypermedia learning? *Metacognition and Learning*, 4, 197-216. doi:10.1007/s11409-009-9045-5

Mouratidis, A., Vansteenkiste, M., Lens, W., Michou, A., & Soenens, B. (2013). Within-person configurations and temporal relations of personal and perceived parent-promoted aspirations to school correlates among adolescents. *Journal of Educational Psychology*, 105, 895-910. doi:10.1037/a0032838

Mouratidis, A., Vansteenkiste, M., Michou, A., & Lens, W. (2013). Perceived structure and achievement goals as predictors of students’ self-regulated learning and affect and the mediating role of competence need satisfaction. *Learning and Individual Differences*, 23, 179-186. doi:10.1016/j.lindif.2012.09.001

Muis, K. R., & Duffy, M. C. (2013). Epistemic climate and epistemic change: Instruction designed to change students’ beliefs and learning strategies and improve achievement. *Journal of Educational Psychology*, 105, 213-225. doi:10.1037/a0029690

Muis, K. R., & Franco, G. M. (2010). Epistemic profiles and metacognition: Support for the consistency hypothesis. *Metacognition and Learning*, 5, 27-45. doi:10.1007/s11409-009-9041-9
Papantoniou, G., Moraitou, D., Katsadima, E., & Dinou, M. (2010). Action control and dispositional hope: An examination of their effect on self-regulated learning. *Electronic Journal of Research in Educational Psychology, 8*, 5-32.

Park, S. W., & Sperling, R. A. (2012). Academic procrastinators and their self-regulation. *Psychology, 3*, 12-23. doi:10.4236/psych.2012.31003

Partin, M. L., & Haney, J. J. (2012). The CLEM model: Path analysis of the mediating effects of attitudes and motivational beliefs on the relationship between perceived learning environment and course performance in an undergraduate non-major biology course. *Learning Environments Research, 15*, 103-123. doi:10.1007/s10984-012-9102-x

Partin, M. L., Haney, J. J., Worch, E. A., Underwood, E. M., Nurnberger-Haag, J. A., Scheurmann, A., & Midden, W. R. (2011). Yes I can: The contributions of motivation and attitudes on course performance among biology nonmajors. *Journal of College Science Teaching, 40*, 86-95. Retrieved from http://www.nsta.org/college

Paulsen, M. B., & Feldman, K. A. (2005). The conditional and interaction effects of epistemological beliefs on the self-regulated learning of college students: Motivational strategies. *Research in Higher Education, 46*, 731-768. doi:10.1007/s11162-004-6224-8

Paulsen, M. B., & Feldman, K. A. (2007). The conditional and interaction effects of epistemological beliefs on the self-regulated learning of college students: Cognitive and behavioral strategies. *Research in Higher Education, 48*, 353-401. doi:10.1007/s11162-006-9029-0

Pekrun, R., Goetz, T., Frenzel, A. C., Barchfeld, P., & Perry, R. P. (2011). Measuring emotions in students’ learning and performance: The Achievement Emotions Questionnaire (AEQ). *Contemporary Educational Psychology, 36*, 36-48. doi:10.1016/j.cedpsych.2010.10.002

Pekrun, R., Goetz, T., Perry, R. P., Kramer, K., Hochstadt, M., & Molfenter, S. (2004). Beyond test anxiety: Development and validation of the test emotions questionnaire (TEQ). *Anxiety, Stress & Coping, 17*, 287-316. doi:10.1080/1061800412331303847

Pekrun, R., Hall, N. C., Goetz, T., & Perry, R. P. (2014). Boredom and academic achievement: Testing a model of reciprocal causation. *Journal of Educational Psychology, 106*, 696-710. doi:10.1037/a0036006

Pelaccia, T., Delplanq, H., Triby, E., Bartier, J.-C., Leman, C., & Dupeyron, J.-P. (2009). Impact of training periods in the emergency department on the motivation of health care students to learn. *Medical Education, 43*, 462-469. doi:10.1111/j.1365-2923.2009.03356.x

Pelaccia, T., Delplanq, H., Triby, E., Bartier, J.-C., Leman, C., Hadef, H. . . Dupeyron, J.-P. (2010). Gender stereotypes: An explanation to the underrepresentation of women in emergency medicine. *Academic Emergency Medicine, 17*, 775-779. doi:10.1111/j.1553-2712.2010.00793.x

Perry, R. P., Hladkyj, S., Pekrun, R. H., & Pelletier, S. T. (2001). Academic control and action control in the achievement of college students: A longitudinal field study. *Journal of Educational Psychology, 93*, 776-789. doi:10.1037/0022-0663.93.4.776

Phan, H. P. (2007). An examination of reflective thinking, learning approaches, and self-efficacy beliefs at the University of the South Pacific: A path analysis approach. *Educational Psychology, 2*, 789-806. doi:10.1080/01443410701349809

Phan, H. P. (2008). Multiple regression analysis of epistemological beliefs, learning approaches, and self-regulated learning. *Electronic Journal of Research in Educational Psychology, 6*, 157-184. Retrieved from http://www.investigacion-psicopedia.com/revista/new

Phan, H. P. (2011). Interrelations between self-efficacy and learning approaches: A developmental approach. *Educational Psychology, 31*, 225-246. doi:10.1080/01443410.2010.545050

Phan, H. P. (2014a). Expectancy-value and cognitive process outcomes in mathematics learning: A structural equation analysis. *Higher Education Research & Development, 33*, 325-340. doi:10.1080/07294360.2013.832161

Phan, H. P. (2014b). An integrated framework involving enactive learning experiences, mastery goals, and academic engagement-disengagement. *Europe’s Journal of Psychology, 10*, 41-66. doi:10.5964/ejop.v10i1.680

Phan, H. P. (2014c). Self-efficacy, reflection, and achievement: A short-term longitudinal examination. *The Journal of Educational Research, 107*, 90-102. doi:10.1080/002202671.2012.753860

Phillips, K. T., Phillips, M. M., Lalone, T. L., & Tormohlen, K. N. (2015). Marijuana use, craving, and academic motivation and performance among college students: An in-the-moment study. *Addictive Behaviors, 47*, 42-47. doi:10.1016/j.addbeh.2015.03.020

Phillips, M. M., Phillips, K. T., Lalone, T. L., & Dykema, K. R. (2014). Feasibility of text messaging for ecological momentary assessment of marijuana use in college students. *Psychological Assessment, 26*, 947-957. doi:10.1037/a0036612

Pillay, H., Purdie, N., & Boulton-Lewis, G. (2000). Investigating cross-cultural variation in conceptions of learning and the use of self-regulated strategies. *Education Journal, 28*, 65-83. Retrieved from https://www.fed.cuhk.edu.hk/erieč/ ej

Pizzimenti, M. A., & Axelson, R. D. (2015). Assessing student engagement and self-regulated learning in a medical gross anatomy course. *Anatomical Sciences Education, 8*, 104-110. doi:10.1002/ase.1463

Poellhuber, B., Chomienne, M., & Karsenti, T. (2008). The effect of peer collaboration and collaborative learning on self-efficacy and persistence in a learner-paced continuous intake model. *Journal of Distance Education, 22*, 41-62. Available from http://ijede.ca

Radovan, M. (2011). The relation between distance students’ motivation, their use of learning strategies, and academic success. *TOJET: The Turkish Online Journal of Educational Psychology, 10*, 216-222. Available from http://www.tojet.net

Rakes, G. C., & Dunn, K. E. (2010). The impact of online graduate students’ motivation and self-regulation on academic procrastination. *Journal of Interactive Online Learning, 9*, 78-93. Available from http://www.ncolr.org

Ranellucci, J., Hall, N. C., & Goetz, T. (2015). Achievement goals, emotions, learning, and performance: A process model. *Motivation Science, 1*, 98-120. doi:10.1037/mot0000014

Razon, S., Turner, J., Johnson, T. E., Arsal, G., & Tenenbaum, G. (2012). Effects of a collaborative annotation method on students’ learning and learning-related motivation and affect. *Computers in Human Behavior, 28*, 350-359. doi:10.1016/j.chb.2011.10.004
Richardson, J. T. E. (2007). Motives, attitudes and approaches to studying in distance education. *Higher Education, 54*, 385-416. doi:10.1007/s10734-006-9003-y

Riconcente, M. M. (2014). Effects of perceived teacher practices on Latino high school students’ interest, self-efficacy, and achievement in mathematics. *The Journal of Experimental Education, 82*, 51-73. doi:10.1080/00220973.2013.813358

Ranning, W. M. (2009). Adult, flexible students’ approaches to studying in higher education. *Scandinavian Journal of Educational Research, 53*, 447-460. doi:10.1080/0033839090180737

Ryan, A. M., & Patrick, H. (2001). The classroom social environment and changes in adolescents’ motivation and engagement during middle school. *American Educational Research Journal, 38*, 437-460. doi:10.3102/002831203800243

Saab, N., van Joolingen, W. R., & van Hout-Wolters, B. (2009). Prior knowledge, attitude, and strategy use in an introduction to statistics course. *Journal of Experimental Education, 77*, 49-64. doi:10.11144/Javerianacali.PPSI13-2.mtb

Sakiz, G. (2011). Mastery and performance approach goal orientations in relation to academic self-efficacy beliefs and academic help seeking behaviors of college students in Turkey. *Educational Research, 2*, 771-778. Retrieved from http://www.interesjournals.org/ER

Sakiz, G., Pape, S. J., & Hoy, A. W. (2012). Does perceived teacher affective support matter for middle school students in mathematics classrooms? *Journal of School Psychology, 50*, 235-255. doi:10.1016/j.jsp.2011.10.005

Salamonson, Y., Everett, B., Koch, J., Wilson, I., & Davidson, P. M. (2009). Learning strategies of first year nursing and medical students: A comparative study. *International Journal of Nursing Studies, 46*, 1541-1547. doi:10.1016/j.ijnurstu.2009.05.010

Sánchez Rosas, J., & Perez, E. (2015). Measuring threats, benefits, emotional costs and avoidance of academic help-seeking in Argentinian university students. *Pensamiento Psicológico, 13*, 49-64. doi:10.11144/Javerianacali.PSS2013-2.mb

Schaub, S. K., Hecht, M., Nouns, Z. M., KuhlmeY, A., & Dettmer, S. (2015). The role of environmental and individual characteristics in the development of student achievement: A comparison between a traditional and a problem-based-learning curriculum. *Advances in Health Sciences Education, 20*, 1033-1052. doi:10.1007/s10459-015-9584-2

Schutz, P. A., Drogozis, L. M., White, V. E., & Destefano, C. (1998). Prior knowledge, attitude, and strategy use in an introduction to statistics course. *Learning and Individual Differences, 10*, 291-308. doi:10.1016/S1041-6080(99)80124-1

Schwinger, M., Steinnmayr, R., & Spinath, B. (2012). Not all roads lead to Rome—Comparing different types of motivational regulation profiles. *Learning and Individual Differences, 22*, 269-279. doi:10.1016/j.lindif.2011.12.006

Shawer, S. F. (2010). Self-efficacy levels and student-teacher language teaching skills development. *Journal of Academic Leadership, 8*(3), 1-29.

Sidellinger, R. J. (2010). College student involvement: An examination of student characteristics and perceived instructor communication behaviors in the classroom. *Communication Studies, 61*, 87-103. doi:10.1080/10510970903400311

Sidellinger, R. J., Bolen, D. M., Frisby, B. N., & McMullen, A. L. (2011). When instructors misbehave: An examination of student-to-student connectedness as a mediator in the college classroom. *Communication Education, 60*, 340-361. doi:10.1080/03634523.2011.554991

Sidellinger, R. J., Bolen, D. M., McMullen, A. L., & Nyeste, M. C. (2015). Academic and social integration in the basic communication course: Predictors of students’ out-of-class communication and academic learning. *Communication Studies, 66*, 63-84. doi:10.1080/10510974.2013.856807

Sironic, A., & Reeve, R. A. (2012). More evidence for four perfectionism subgroups. *Personality and Individual Differences, 53*, 437-442. doi:10.1016/j.paid.2012.04.003

Soenens, B., Sierens, E., Vansteenkiste, M., Dochy, F., & Goossens, L. (2012). Psychologically controlling teaching: Examining outcomes, antecedents, and mediators. *Journal of Educational Psychology, 104*, 8-120. doi:10.1037/a0025742

Soríc, I., Penezić, Z., & Burić, I. (2013). Big five personality traits, cognitive appraisals and emotion regulation strategies as predictors of achievement emotions. *Psychological Topics, 22*, 325-349. Retrieved from http://hrcauk.srce.hr/108516

Sproule, J., Martindale, R., Wang, J., Allison, P., Nash, C., & Gray, S. (2013). Investigating the experience of outdoor and adventurous project work in an educational setting using a self-determination framework. *European Physical Education Review, 19*, 315-328. doi:10.1177/1356336X13495629

Stark, R., Kopp, V., & Fischer, M. R. (2011). Case-based learning with worked examples in complex domains: Two experimental studies in undergraduate medical education. *Learning and Instruction, 21*, 22-33. doi:10.1016/j.learninstruc.2009.10.001

Stegers-Jager, K. M., Cohen-Schotanus, J., & Themmen, A. P. N. (2012). Motivation, learning strategies, participation and medical school performance. *Medical Education, 46*, 678-688. doi:10.1111/j.1365-2923.2012.04284.x

Steur, J. M., Jansen, E. P. W. A., & Hofman, W. H. A. (2012). Graduateness: An empirical examination of the formative function of university education, *Higher Education, 64*, 861-874. doi:10.1007/s10734-012-9533-4

Stump, G. S., Hilpert, J. C., Husman, J., Chung, W. T., & Kim, W. (2011). Collaborative learning in engineering students: Gender and achievement. *Journal of Engineering Education, 100*, 475-497. doi:10.1002/j.2168-9830.2011.tb00023.x

Stump, G. S., Husman, J., & Corby, M. (2014). Engineering students’ intelligence beliefs and learning. *Journal of Engineering Education, 103*, 369-387. doi:10.1002/jee.20051

Stupnisky, R. H., Renaud, R. D., Daniels, L. M., Haynes, T. L., & Perry, R. P. (2008). The interrelation of first-year college students’ critical thinking disposition, perceived academic control, and academic achievement. *Research in Higher Education, 49*, 513-530. doi:10.1007/s11162-008-9093-8

Suárez, J. M., & Fernández Suárez, A. P. (2011). A model of how motivational strategies related to the expectative component affect cognitive and metacognitive strategies. *Electronic Journal of Research in Educational Psychology, 9*, 641-658. Retrieved from http://www.investigacion-psicopedagogica.com/revista/new

Suárez Riveiro, J. M., & Fernández Suárez, A. P. (2013). Un modelo sobre cómo las estrategias motivacionales relacionadas con el componente de afectividad inciden sobre las estrategias cognitivas y metacognitivas [A model of how motivational
success in engineering programs. *The Journal of Higher Education, 78*, 337-364. doi:10.1353/jhe.2007.0019

Vrieling, E. M., Bastiaens, T. J., & Stijnen, S. (2012). Effects of increased self-regulated learning opportunities on student teachers’ metacognitive and motivational development. *International Journal of Educational Research, 53*, 251-263. doi:10.1016/j.ijer.2012.03.014

Wang, C.-H., Shannon, D. M., & Ross, M. E. (2013). Students’ characteristics, self-regulated learning, technology self-efficacy, and course outcomes in online learning. *Distance Education, 34*, 302-323. doi:10.1080/01587979.2013.835779

Weber, K. (2003). The relationship of interest to internal and external motivation. *Communication Research Reports, 20*, 376-383. doi:10.1080/08824090309388837

Weber, K., Martin, M. M., & Cayanus, J. L. (2005). Student interest: A two-study re-examination of the concept. *Communication Quarterly, 53*, 71-86. doi:10.1080/014633705000055996

Weber, K., Martin, M. M., & Myers, S. A. (2011). The development and testing of the Instructional Beliefs Model. *Communication Education, 60*, 51-74. doi:10.1080/03634523.2010.491122

Wilson, D., Jones, D., Kim, M. J., Allendoerfer, C., Bates, R., Crawford, J., . . . Veilleux, N. (2014). The link between curricular activities and academic engagement in engineering education. *Journal of Engineering Education, 103*, 625-651. doi:10.1002/jee.20057

Yalcinkaya, E., Boz, Y., & Erdur-Baker, O. (2012). Is case-based learning, and self-regulated learning strategies among students of Arabic language course and intensive Arabic course in Mara University of Technology Malaysia (Uitm). *International Journal of Applied Educational Studies, 8*, 57-67.

Zepeda, C. D., Richey, J. E., Ronevich, P., & Nokes-Malach, T. J. (2015). Direct instruction of metacognition benefits adolescent science learning, transfer, and motivation: An in vivo study. *Journal of Educational Psychology, 107*, 954-970. doi:10.1037/edu0000022

Zhang, Q. (2014). Assessing the effects of instructor enthusiasm on classroom engagement, learning goal orientation, and academic self-efficacy. *Communication Teacher, 1*, 44-56. doi:10.1080/17404622.2013.839047

Zhang, Q., & Zhang, J. (2013). Instructors’ positive emotions: Effects on student engagement and critical thinking in U.S. and Chinese classrooms. *Communication Education, 62*, 395-411. doi:10.1080/03634523.2013.828842

Zhu, C., Valcke, M., & Schellens, T. (2009). A cross-cultural study of online collaborative learning. *Multicultural Education & Technology Journal, 3*, 33-46. doi:10.1108/17504970910951138

Zhu, C., Valcke, M., Schellens, T., & Li, Y. (2009). Chinese students’ perceptions of a collaborative e-learning environment and factors affecting their performance: Implementing a Flemish e-learning course in a Chinese educational context. *Asia Pacific Education Review, 10*, 225-235. doi:10.1007/s12564-009-9021-4

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References

American Educational Research Association. (2006). Standards for reporting on empirical social science research in AERA publications. *Educational Researcher, 35*, 33-40. doi:10.3102/0013189X035006033

American Educational Research Association, American Psychological Association, & National Council on Measurement in Education. (1999). *Standards for educational and psychological testing*. Washington, DC: American Educational Research Association.

American Psychological Association. (2001). *Publication manual of the American Psychological Association* (5th ed.). Washington, DC: Author.
American Psychological Association. (2010). *Publication manual of the American Psychological Association* (6th ed.). Washington, DC: Author.

Andreu, E., & Metalidou, P. (2004). The relationship of academic and social cognition to behaviour in bullying situations among Greek primary school children. *Educational Psychology, 24*, 27-41. doi:10.1080/0144341032000146421

Arend, B. D. (2007). Course assessment practices and student learning strategies in online courses. *Journal of Asynchronous Learning Networks, 11*(4), 3-13. Retrieved from https://online-learningconsortium.org/read/online-learning-journal/

Berger, J.-L., & Karabenick, S. A. (2011). Motivation and students' use of learning strategies: Evidence of unidirectional effects in mathematics classrooms. *Learning and Instruction, 21*, 416-428. doi:10.1016/j.learninstruc.2010.06.002

Bonett, D. G. (2008). Meta-analytic interval estimation for bivariate correlations. *Psychological Methods, 13*, 173-189. doi:10.1037/a0012868

Bonett, D. G. (2010). Varying coefficient meta-analytic methods for alpha reliability. *Psychological Methods, 15*, 368-385. doi:10.1037/a0002014

Burdenski, T. K. (2000, January). *The importance of structure coefficients in multiple regression: A review with examples from published literature*. Paper presented at the Annual Meeting of the Southwest Educational Research Association, Dallas, TX. Retrieved from ERIC database. (ED435704)

Caruso, J. C. (2000). Reliability generalization of the NEO personality scales. *Educational and Psychological Measurement, 60*, 236-254. doi:10.1177/001649140021970484

Courville, T., & Thompson, B. (2001). Use of structure coefficients in published multiple regression articles: β is not enough. *Educational and Psychological Measurement, 61*, 229-248. doi:10.1177/0016491401612006

Credé, M., & Phillips, L. A. (2011). A meta-analytic review of the Motivated Strategies for Learning Questionnaire. *Learning and Individual Differences, 21*, 337-346. doi:10.1016/j.lindif.2011.03.02

Crocker, L., & Algina, J. (1986). *Introduction to classical and modern test theory*. Belmont, CA: Wadsworth.

Cumming, G., & Finch, S. (2001). A primer on the understanding, use and calculation of confidence intervals that are based on central and noncentral distributions. *Educational and Psychological Measurement, 61*, 532-574. doi:10.1177/0016491401614002

Duncan, T. G., & McKeachie, W. J. (2005). The making of the Motivated Strategies for Learning Questionnaire. *Educational Psychologist, 40*, 117-128. doi:10.1207/s15326985ep4002_6

Graham, J. M. (2006). Congeneric and (essentially) tau-equivalent estimates of score reliability: What they are and how to use them. *Educational and Psychological Measurement, 66*, 930-944. doi:10.1177/0016491406288165

Green, C. E., Chen, C. E., Helms, J. E., & Henze, K. T. (2011). Recent reliability reporting practices in psychological assessment: Recognizing the people behind the data. *Psychological Assessment, 23*, 656-669. doi:10.1037/a0023089

Harzing, A. W. (2016). Publish or perish (Version 5) [Computer software]. Retrieved from http://www.harzing.com/pop.htm

Hedges, L. V. (1992). Meta-analysis. *Journal of Educational Statistics, 17*, 279-296.

Hedges, L. V., & Olkin, I. (1985). *Statistical methods for meta-analysis*. Orlando, FL: Academic Press.

Hedges, L. V., & Pigott, T. D. (2004). The power of statistical tests for moderators in meta-analysis. *Psychological Methods, 9*, 426-445. doi:10.1037/1082-989X.9.4.426

Hedges, L. V., & Vevea, J. L. (1998). Fixed and random-effects models in meta-analysis. *Psychological Methods, 3*, 486-504. doi:10.1037/1082-989X.3.4.486

Henson, R. K. (2006). Effect-size measures and meta-analytic thinking in counseling psychology research. *The Counseling Psychologist, 34*, 601-629. doi:10.1177/0011000005283558

Henson, R. K., & Thompson, B. (2002). Characterizing measurement error in scores across studies: Some recommendations for conducting “reliability generalization” studies. *Measurement and Evaluation in Counseling and Development, 35*, 113-127.

Hilpert, J. C., Stempien, J., van der Hoeven Kraft, K. J., & Husman, J. (2013). Evidence for the latent factor structure of the MSLQ: A new conceptualization of an established questionnaire. *SAGE Open, 3*(4). doi:10.1177/2158244013510305

Hodges, C. B., & Kim, C. (2010). Email, self-regulation, self-efficacy, and achievement in a college online mathematics course. *Journal of Educational Computing Research, 43*, 207-223. doi:10.2190/EC.43.2.d

Hogan, T. P., Benjamin, A., & Brezinski, K. L. (2000). Reliability methods: A note on the frequency of use of various types. *Educational and Psychological Measurement, 60*, 523-531. doi:10.1177/00131640021970691

Holland, D. F. (2015). Reliability generalization: A systematic review and evaluation of meta-analytic methodology and reporting practice (Doctoral dissertation). Retrieved from https://digital.library.unt.edu/ark:/67531/metadc822810

Hunter, J. E., & Schmidt, F. L. (2004). *Methods of meta-analysis: Correcting error and bias in research findings* (2nd ed.). Thousand Oaks, CA: Sage.

Husman, J., & Hilpert, J. (2007). The intersection of students’ perceptions of instrumentality, self-efficacy, and goal orientations in an online mathematics course. *Zeitschrift für Pädagogische Psychologie, 21*, 229-239. doi:10.1024/1010-0652.21.3.229

Krizan, Z. (2010). Synthesizer 1.0: A varying-coefficient meta-analytic tool. *Behavior Research Methods, 42*, 863-870. doi:10.3758/BRM.42.3.863

Laird, N. M., & Mosteller, F. (1990). Some statistical methods for combining experimental results. *International Journal of Technology Assessment in Health Care, 6*, 5-30. doi:10.1017/S0266462300008916

Lee, J. C., Yin, H., & Zhang, Z. (2010). Adaptation and analysis of Motivated Strategies for Learning Questionnaire in the Chinese setting. *International Journal of Testing, 10*, 149-165. doi:10.1080/1535050903534670

Leech, N. L., Onwuegbuzie, A. L., & O’Conner, R. (2011). Assessing internal consistency in counseling research. *Counseling Outcome Research and Evaluation, 2*, 115-125. doi:10.1177/2150137811414873

Nielsen, S. G. (2004). Strategies and self-efficacy beliefs in instrumental and vocal individual practice: A study of students in higher music education. *Psychology of Music, 32*, 418-431. doi:10.1177/0305735604046099

Nimon, K., Lewis, M., Kane, R., & Haynes, R. M. (2008). An R package to compute commonality coefficients in the
multiple regression case: An introduction to the package and a practical example. Behavior Research Methods, 40, 457-466. doi:10.3758/BRM.40.2.457

Nimon, K., Zientek, L. R., & Henson, R. K. (2012). The assumption of a reliable instrument and other pitfalls to avoid when considering the reliability of data. Frontiers in Quantitative Psychology and Measurement, 3, 102. doi:10.3389/fpsyg.2012.01012

Nunnally, J. C. (1978). Psychometric theory (2nd ed.). New York, NY: McGraw-Hill.

Pedhazur, E. J. (1997). Multiple regression in behavioral research: Explanation and prediction (3rd ed.). Fort Worth, TX: Harcourt Brace.

Pedhazur, E. J., & Schmelkin, L. P. (1991). Measurement, design, and analysis: An integrated approach. Hillsdale, NJ: Lawrence Erlbaum.

Pintrich, P. R. (2004). A conceptual framework for assessing motivation and self-regulated learning in college students. Educational Psychology Review, 16, 385-407. doi:10.1007/s10649-004-0006-x

Pintrich, P. R., Smith, D. A. F., Garcia, T., & McKeachie, W. J. (1991). A manual for the use of the Motivated Strategies for Learning Questionnaire (MSLQ). Ann Arbor: National Center for Research to Improve Postsecondary Teaching and Learning, University of Michigan.

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

Raykov, T. (1997). Estimation of composite reliability for congeneric measures. Applied Psychological Measurement, 21, 173-184.

Richardson, J. T. E. (2007). Motives, attitudes and approaches to studying in distance education. Higher Education, 54, 385-416. doi:10.1007/s10734-006-9003-y

Rodriguez, M. C., & Maeda, Y. (2006). Meta-analysis of coefficient alpha. Psychological Methods, 11, 306-322. doi:10.1037/1082-989X.11.3.306

Romano, J. L., & Kromrey, J. D. (2009). What are the consequences if the assumption of independent observations is violated in reliability generalization meta-analysis studies? Educational and Psychological Measurement, 69, 404-428. doi:10.1177/0013164408323237

Rudner, L. M. (1994). Questions to ask when evaluating tests. Practical Assessment, Research & Evaluation, 4(2), 1-3. Retrieved from http://pareonline.net/getvn.asp?v=4&n=2

Sánchez-Meca, J., López-López, J. A., & López-Pina, J. A. (2013). Some recommended statistical analytic practices when reliability generalization studies are conducted. British Journal of Mathematical and Statistical Psychology, 66, 402-425. doi:10.1111/j.2044-8317.2012.02057.x

Schmidt, F. L., Oh, I.-S., & Hayes, T. L. (2009). Fixed- versus random-effects models in meta-analysis: Model properties and an empirical comparison of differences in results. British Journal of Mathematical and Statistical Psychology, 62, 97-128. doi:10.1348/000711007X255327

Sousa, V. S., & Rojjanasrirat, W. (2011). Translation, adaptation and validation of instruments or scales for use in cross-cultural health care research: A clear and user-friendly guideline. Journal of Evaluation in Clinical Practice, 17, 268-274. doi:10.1111/j.1365-2753.2010.01434.x

Thompson, B. (1994). Guidelines for authors. Educational and Psychological Measurement, 54, 837-847.

Thompson, B. (2002). What future quantitative social science research could look like: Confidence intervals for effect sizes. Educational Researcher, 31, 25-32. doi:10.3102/0013189X031003025

Thompson, B. (2003). Understanding reliability and coefficient alpha, really. In B. Thompson (Ed.), Score reliability: Contemporary thinking on reliability issues (pp. 3-23). Thousand Oaks, CA: Sage.

Thompson, B. (2006). Foundations of behavioral statistics: An insight based approach. New York, NY: Guilford Press.

Thompson, B., & Vacha-Haase, T. (2000). Psychometrics is datametrics: The test is not reliable. Educational and Psychological Measurement, 60, 174-195. doi:10.1177/0160286600600402

Vacha-Haase, T. (1998). Reliability generalization: Exploring variance in measurement error affecting score reliability across studies. Educational and Psychological Measurement, 58, 6-20. doi:10.1177/0013164498058001002

Vacha-Haase, T., Henson, R. K., & Caruso, J. C. (2002). Reliability generalization: Moving toward improved understanding and use of score reliability. Educational and Psychological Measurement, 62, 562-569. doi:10.1177/0013164420602004002

Vacha-Haase, T., Kogan, L. R., & Thompson, B. (2000). Sample compositions and variabilities in published studies versus those in test manuals: Validity of score reliability inductions. Educational and Psychological Measurement, 60, 509-522. doi:10.1177/0013164402060200070682

Vacha-Haase, T., & Thompson, B. (2011). Score reliability: A retrospective look back at 12 years of reliability generalization studies. Measurement and Evaluation in Counseling and Development, 44, 159-168. doi:10.1177/0748175611409845

Vassar, M., & Bradley, G. (2010). A reliability generalization study of coefficient alpha for the Life Orientation Test. Journal of Personality Assessment, 92, 362-370. doi:10.1080/00223891.2010.482016

Wilkinson, L., & APA Task Force on Statistical Inference. (1999). Statistical methods in psychological journals: Guidelines and explanations. American Psychologist, 54, 594-604. doi:10.1037/0003-066X.54.8.594

Yetkiner, Z. E., & Thompson, B. (2010). Demonstration of how score reliability is integrated into SEM and how reliability affects all statistical analyses. Multiple Linear Regression Viewpoints, 36(2), 1-12.

Zientek, L. R., & Thompson, B. (2006). Commonality analysis: Partitioning variance to facilitate better understanding of data. Journal of Early Intervention, 28, 299-307. doi:10.1177/10538100602800405

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