The Influence of Academic Self-Efficacy on Academic Performance: A Systematic Review

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Highlights

- Academic self-efficacy moderately correlated with academic performance
- Mediating and moderating factors were identified (effort regulation, deep processing strategies and goal orientations)
- Causality between academic self-efficacy and performance remains to be established
- Future research should focus on longitudinal intervention-based studies

Abstract

This review integrates 12 years of research on the relationship between academic self-efficacy and university student's academic performance, and known cognitive and motivational variables that explain this relationship. Previous reviews report moderate correlations between these variables, but few discuss mediating and moderating factors that impact this relationship. Systematic searches were conducted in April 2015 of psychological, educational, and relevant online databases for studies investigating academic self-efficacy and performance in university populations published between September 2003 and April 2015. Fifty-nine papers were eligible. Academic self-efficacy moderately correlated with academic performance. Several mediating and moderating factors were identified, including effort regulation, deep processing strategies and goal orientations. Given the paucity of longitudinal studies identified in this review, further research into how these variables relate over time is necessary in order to establish causality and uncover the complex interaction between academic self-efficacy, performance, and motivational and cognitive variables that impact it.

Keywords: Academic Self-Efficacy, Academic performance, University, Student, Systematic Review.

The Influence of Academic Self-Efficacy on Academic Performance: A Systematic Review

Among the various theories that attempt to explain the processes that drive and regulate behaviour, Social Cognitive Theory (Bandura, 1977) is undoubtedly one of the most prominent. Social Cognitive Theory posits that a combination of external social systems and internal self-influence factors motivate and regulate behaviour (Bandura, 2012; Schunk & Parajes, 2002). Of these self-influence factors, self-efficacy (SE) is a major component and refers to an individual's judgment of their capabilities to organize and execute courses of action required to achieve desired performances (Bandura, 1997). The influence of self-efficacy has been studied across a range of psychological disciplines, in areas such as smoking cessation, dietary behaviour change, addiction relapse (Conner & Norman, 1995; Povey, Conner, Sparks, James, & Shepherd, 2000), work-related behaviour (Stajkovic & Luthans, 1998), sporting skill and performance (Owen & Froman, 1988), and academic performance (Pintrich & DeGroot, 1990; Robbins, Lauver, Le, David, & Langley, 2004).

Within an academic context, SE is frequently described in terms of Academic Self-Efficacy (ASE), which defines learner judgments about one's ability to successfully attain educational goals (Elias & MacDonald, 2007). A wealth of literature exists that highlights the importance of ASE for learning and subsequent academic performance. This relationship has been studied in a range of learning environments, including early years (Joët, Usher, & Bressoux, 2011), high school (Alivernini & Lucidi, 2011), and university populations (Robbins et al., 2004). Additionally, research has investigated the influence of ASE on academic performance across varying degrees of specificity, such as self-efficacy for successfully completing subject-specific tasks like algebra or geometry problems (Zimmerman & Martinz-Pons, 1990), self-efficacy for successful performance and attainment of a specific grade in a subject (Neuville, Frenay, & Bourgeois, 2007), and self-efficacy for

general success within a university course (Cassidy & Eachus, 2002; Pintrich & DeGroot, 1990). Despite the educational setting in which it is measured, ASE has consistently been shown to positively correlate with academic performance, with meta-analytic studies reporting moderate effect sizes (Richardson, Bond, & Abraham, 2012; Robbins et al., 2004). Findings from the meta-analysis conducted by Richardson et al. (2012) suggest that ASE beliefs account for up to 9% of the variance in the overall Grade Point Average (GPA) of university students, however, significant heterogeneity in effect size was also reported across studies (I^2 = 90.94%). In light of these and similar findings, research has focused on investigating those factors that may mediate the relationship between ASE and performance, and uncover moderator variables that may account for the range of variability across studies.

In addition to existing as a central mechanism to explain the self-monitoring processes explained by Social Cognitive Theory, self-efficacy appears as a key motivational variable within an applied framework for self-regulated learning. The Self-Regulated Learning (SRL) framework (Pintrich, 2004) explains how the interaction of social, contextual, motivational, and cognitive variables influence academic performance outcomes such as Grade Point Average (GPA), examination results, or final course grades. The interaction between ASE and the range of variables within the SRL framework for predicting academic performance in university settings has been extensively studied using a variety of complex data modeling and mediation techniques (Coutinho & Neuman, 2008; Di Benedetto & Bembenutty, 2011; Diseth, 2011; Ferla, Valcke, & Schuyten, 2010; Lindner & Harris, 1992; Mega, Ronconi, & De Beni, 2013; Pintrich, 2004). Findings from these integrative studies have uncovered complex relationships, suggesting the mechanism for which ASE influences academic performance is moderated and mediated various factors, such as personality, past performance, and self-regulatory learning strategies.

The extant literature provides overwhelming support for the relationship between ASE and academic performance. However, the literature that discusses the interactions and pathways by which this relationship exists is more complex. This is attributed in part to the lack of parsimony in the models that have been tested, the different combinations of variables that have been used in model development and the exploratory, non-causal nature in which much of this research has taken place. Despite the existence of relevant reviews on the relationship between ASE and performance (Richardson et al., 2012; Robbins et al., 2004; Usher & Pajares, 2008), no review of available research exists that has investigated the influence of ASE on academic performance, while including the mediating and moderating factors thought to impact on this relationship in a university population. Additionally, while the most recent review (Richardson et al., 2012) is only 5 years old (search was completed in 2010), it did not take into account academic outcome measures beyond GPA that have been studied alongside measures of ASE. While GPA is a widely used outcome measure among university samples that study the relationship between ASE and academic achievement, it is important to consider the impact that other outcome measures (i.e., subject grades) may have on this relationship. Additionally, recent relevant literature has not considered research findings outside of Europe or Northern America (Richardson et al., 2012), which may introduce bias in the presentation of findings, particularly given the difference in tertiary structures that exists outside of these regions. Given the abundance of available research, and the emphasis that ASE has received in educational research investigating academic achievement, this is necessary to clearly identify trends in research findings and provide recommendations for future research.

The aim of the current review was to extend on the work of previous reviews of ASE and academic achievement by integrating recent empirical findings investigating the role of ASE on a range of university student academic performance outcomes. Additionally, this

review aims to summarise the range of factors within the SRL framework that appear to mediate or moderate this relationship.

1.1 Objectives

Specifically, this review sought to address the following:

1) Using meta-analytic techniques, what do the results of recently reported research findings suggest about the strength of the relationship between academic self-efficacy and academic performance?
2) What mediating and moderating factors have been investigated to explain the relationship between academic self-efficacy and academic performance of university students and what do they report?
3) What does longitudinal evidence suggest about the nature of the relationship between academic self-efficacy and academic performance?

This review was based on PRISMA guidelines set for systematic reviews (Moher, Liberati, Tetzlaff, & Altman, 2009).

Methods

2.1 Eligibility Criteria and Selection

Papers for inclusion in the review were limited to published, peer-reviewed journal articles and unpublished theses/dissertations in the English language between September 2003 and March 2015. Such a time frame was imposed because of the lapse in time in which other similar reviews were conducted (namely Robbins et al., 2004; search conducted September, 2003) and to extend more recent reviews (i.e. Richardson et al., 2012). Such a date considers more recent research that has been conducted in educational research on ASE and identifies common research trends in current literature. Furthermore, this systematic review attempts to expand on findings from reviews conducted by Richardson et al. (2012) by investigating the relationship between ASE and a range of academic achievement

measures beyond the primary outcome measure (GPA) explored by Richardson et al. (2012), such as subject grade, examination grade, and course grade. Methodology was limited to quantitative studies, with no other methodological restrictions applied. Participants were limited to a university student sample, and no age or gender factors were considered for exclusion. Where studies included several predictor and outcome variables, only those that measured academic performance as an outcome and ASE as a predictor variable were included.

Studies were selected for the review if they specifically examined influences of ASE on academic performance or if ASE was used as part of a mediating, or path analytic model investigating academic performance in university students. One author (TH) independently screened titles and abstracts of studies for eligibility. All authors (TH & JB) then examined remaining full texts of studies to determine eligibility for inclusion in the review. Disagreements between reviewers were resolved through discussion of the degree to which articles met exclusion criteria.

2.2 Search Strategy

Studies were identified through systematically reviewing electronic databases for research articles, theses, and dissertations and hand searching of reference lists of relevant articles. Search terms were applied to PsycINFO, MEDLINE complete, and ERIC databases, which utilized Ebsco platforms. Original search terms were also applied to a systematic search in Scopus and Web of Science with adaptions made for searches using Trove and Proquest theses and dissertations. The last search was conducted on April 9, 2015. An example of a full strategy is shown in Figure 1.

2.3 Data Abstraction

A data extraction table was developed to enable collection and tabulation of information relevant to the review. All data were collated and synthesised manually.

Information was extracted from each included study on country where research was conducted, sample characteristics (including sample size, mean age and gender), predictor measures, including measure of ASE used, outcome measure, study design, and relevant findings.

2.4 Plan of analysis, Summary Measures and Synthesis of Results

To address the first objective within this review, a meta-analysis will be conducted to determine the strength of the relationship between ASE and academic achievement, with meta-regression analysis used to investigate any heterogeneity that may exist between studies. A qualitative synthesis of relevant literature will also be conducted, as part of the second objective to investigate the mediating and moderating relationships that may exist to explain this relationship.

As self-efficacy is being measured in the context of academic success, it will be referred to as Academic Self-Efficacy. However, it should be noted that a wide range of measures have been used to measure ASE in the studies included within the review and, as such, meta-regression will consider the impact of these measures on the effect of the relationship between ASE and performance.

Meta-analysis was undertaken using the *Metafor* meta-analysis package for R (Viechtbauer, 2010). Given the intent to generalize beyond the identified studies, and the expectation of heterogeneity in results across studies due to methodological differences as well as sampling fluctuations, effect sizes across studies were submitted to a random effects model for meta-analysis. Within this model, Fisher's Z transformed correlations were used to reduce bias and forest plots that show the direction and magnitude of each study's correlation relative to the overall correlation effect in the meta-analysis were used to illustrate the effect for each of the included studies. Funnel plots were also generated to further assess the likelihood of publication bias. Meta-regression analyses, considering study design

differences, self-report, ASE measures and measures of academic performance, were conducted to explain potential heterogeneity in the ASE-performance relationship. Additional substantive variables, including those from the SLR framework were also flagged as potential moderators. However, the lack of studies that examined these variables meant quantitative testing was not practical. Hence, a qualitative approach was taken to summarise these findings (see section 3.1.4).

2.5 Risk of Bias

The present review included unpublished studies, particularly theses and dissertations were also included. This inclusion strategy sought to reduce publication bias and inflation of effects due to significant findings being more likely to be published (Fanelli, 2010).

Results

3.1 Study Selection

A total of 59 studies were identified for inclusion in the review. The search strategy through PsycINFO, ERIC, MEDLINE complete, Scopus, Web of Science, and Proquest dissertations and theses yielded 1,758 results. Following removal of duplicates, 1203 studies remained, with which 1090 were excluded through reviewing the titles and abstracts, as these studies did not meet inclusion criteria. The full text of the remaining 113 studies was examined and 59 were considered relevant. A full list of excluded studies and their reasons for exclusion can be found in Supplementary File 1. Figure 2 outlines the flow diagram of studies included in the review. Thirty-three studies were conducted in the USA, five in the United Kingdom (UK), four in Belgium, three in the Netherlands, two in Turkey and Australia, and one in each of Bangladesh, Canada, Egypt, Iran, Nigeria, Norway, Philippines, Spain, Taiwan and the United Arab Emirates.

3.2 Study Characteristics

All 59 studies selected for the review utilised self-report scales to measure ASE. The most commonly utilised research design was cross-sectional, accounting for forty-three of the included studies (Table 1). Eleven studies employed a longitudinal design (Cassidy, 2012; Cheng & Chiou, 2010; De Feyter, Caers, Vigna, & Berings, 2012; Gaylon, Blondin, Yaw, Nalls, & Williams, 2012; Gore, 2006; Jung, 2013; Lane, Hall & Jane, 2004; Lawson, Banks, & Logvin, 2007; Obrentz, 2012; Phan, 2009; Putwain, Sander, & Larkin, 2013). An additional five studies each utilized an ex-post facto (Adeyemo, 2007), an intervention (Breso, Schaufeli, & Salanova, 2001), a randomised control trial (Bouffard, Bouchard, Goulet, Denoncourt, & Couture, 2005), prospective (De Clercq, Galand, Dupont, & Frenay, 2013), and controlled trial design (Ouweneel, Schaufeli, & Le Blanc, 2013). For further details of study characteristics, see Table 1.

3.3 Academic Self-Efficacy Measures

In all studies, the primary predictor variable was ASE or any form of self-efficacy that was correlated with academic performance. Of the 59 studies reviewed, the most commonly reported measure of ASE was the Motivated Strategies for Learning Questionnaire (MSLQ; n=21), the Patterns of Adaptive Learning Survey (PALS; n = 5), the College Self-Efficacy Inventory (CSEI; n=4), and the College Academic Self-Efficacy Survey (CASES; n = 4). The remaining 25 studies used a range of scales adapted from a variety of sources. The reliability of these measures ranged from $\alpha = .67$ (Balkis, 2011) to $\alpha = .98$ (Crippen et al, 2009). It is interesting to note that the accuracy of scale measurement differed based on the level of specificity of ASE, whereby higher levels of reliability were found in specific scales of ASE (α ranged from .75 to .98) compared to global measures (α ranged from .67 to .92).

Where studies contained more than one sample within the study, the reported correlational data based on measures of ASE from these studies were treated as a separate correlation for the purposes of conducting the meta-analysis. Additionally, those correlations

most closely taken to measures of academic achievement, reported as part of a longitudinal study, were the correlations selected for inclusion in the meta-analysis. This is based on findings that correlations between ASE and achievement are most reliable and valid the closer in time with which they are measured (Gore, 2006). Each measure of ASE was also coded as either a global or specific measure of the construct. This was based on available data on the origin of the scales either found within the included studies or from its creator. Global measures were considered to assess ASE across academic behaviours, including achievement in general, whereas specific ASE measures assessed participant perceptions against a particular aspect of their academic endeavours. Of the 59 studies, 22 used measures classified as global, and 34 used measures that were specific. Two studies (Davis, 2009; Feldman & Kubota, 2015) used scale items from different measures of ASE, resulting in a measure combining both global and specific content. The final study (Bouffard et al, 2005) did not provide sufficient detail of the scales used to measure ASE and as such, was not categorised. For full details see Table 1.

3.4 Outcome Measures

In all studies, the primary outcome variable was academic performance. Of the 59 studies reviewed, the most commonly reported outcome variables was GPA (n = 13) official subject grade, course grades or final grade (n = 10), and self-reported GPA (n = 7). The remaining 29 studies measured academic performance over a range of operationalized measures, some measuring examination results (Adeyemo, 2007), whilst others measured proportion of obtained subject credits to those attempted (De Feyter et al, 2012). For fuller detailing of these measures see Table 1.

3.5 Synthesis of Results

In order to address the first objective of this review, meta-analysis was conducted to determine the strength of the relationship between ASE and academic performance. Several

different moderator and mediator variables were implicated for inclusion in the meta-analysis, however, for every mediator / moderator variable there were insufficient numbers of studies to meaningfully undertake quantitative analysis. Hence, qualitative discussion of these mediators and moderators was undertaken instead, and still provides insight into the value these variables add to understanding of the relationship between ASE and academic performance (see Sections 3.1.3 – 3.3.4).

3.1.1 Correlational findings. Of the 59 studies included in the review, 53 were included in the meta-analysis, comprising 14,755 participants. The remaining studies were excluded because they did not provide the required correlational data or descriptive statistics, which may yield correlational information (Bouffard et al., 2005; Kassab, Al-Shafei, Salem, & Otoom, 2015; Lane, Hall, & Jane, 2004; Ouweneel & Schaufeli, 2013; Phan, 2009; Zajacova et al., 2005). These studies were still included within the qualitative synthesis of this review because of the contribution these findings made to mediation and moderation analyses. The strength of the reported relationship between ASE and academic achievement was moderate ($r^+ = .33$, 95% CI [.28, .37], $p < .0001$). See Figure 3 for a forest plot.

It is important to note that significant heterogeneity in effect size was found across studies included in the meta-analysis ($I^2 = 87.71\%$; $H^2 = 8.14$). Therefore, several moderator analyses were conducted to explore the source of this heterogeneity, including the outcome measure used to measure academic achievement, the use of self-reported outcome measures versus those obtained through official university records, study design, and the measure of ASE used. Such variables were selected based on findings from existing literature, which highlights their impact on correlations between ASE and academic achievement (Bandura, 1997; Richardson et al., 2012).

Outcome measure. Measures of academic achievement accounted for 27.08% of the heterogeneity in the studies included for meta-analysis. These measures were entered under

several major categories (official college GPA, official subject grade, official subject examination grade, and self-reported GPA) and were based on data extracted from the included studies. It should be noted here, that in addition to these major categories, several studies operationalized the outcome variable differently from these major categories. To avoid dichotomising the results of this moderator analysis, and to understand the degree to which this variability explained heterogeneity within the meta-analysis, these were included as separate outcome measures. See Table 1 for details of these variables. This was a significant moderator of the ASE and academic performance relationship ($QM_{(df = 12)} = 27.89$, $p = 0.005$). Such a finding indicates the importance of the outcome measure used to correlate ASE and academic achievement. Issues associated with this will be fully evaluated when providing a synthesis of results and limitations to the current review (see Sections 4.0 & 5.0), however, it is noted here that this measure is of particular importance when considering the measure of ASE used, and the level of commensurability between them.

Self-report vs. official grades. Findings from Dobbins, Farh, and Werbel (1993) suggest that up to 25% of indicators of academic achievement provided through self-report may be inaccurate. Given the prominent use of self-report within the included studies, this variable was tested as a moderator to investigate heterogeneity. However, the method of report for academic performance, whether it be self-report by participants or by accessing official university records, was non-significant ($QM_{(df = 3)} = 2.23$, $p = 0.52$). This suggests that the method of collection for the outcome measure does not account for the significant heterogeneity between studies, and that the reporting of academic performance by self-report or official grades does not significantly impact on the relationship between ASE and academic performance.

Measure of academic self-efficacy. Measures of ASE were found to significantly moderate the ASE and academic performance relationship ($QM_{(df = 25)} = 60.73$, $p < .0001$),

accounting for 46.1% of the heterogeneity in the studies included for meta-analysis. This is not surprising given the diversity of scales that have been developed to assess measures of ASE. These measures were grouped based on the scales used in each included study, with 34 of the 59 included studies grouped among 4 different measures (MSLQ, n = 21; PALS, n = 5; CSEI, n = 4; and CASES, n = 4) with the remaining measures either adapted from other scales or developed specifically for that study. Issues associated with this will also be evaluated when discussing limitations to the current review, but it should be noted here that differences in global versus specific measures of ASE and respective commensurability with the measure of academic achievement used within the included studies could significantly impact on the nature of the relationship between these variables.

Given this, additional meta-regression analysis was conducted which measured the degree to which global or specific measures of ASE predicted academic performance. The results of this were non-significant ($QM_{(df = 1)} = 1.19$, $p = .27$), indicating that ASE levels, either global or specific, do not differ in predicting academic performance. However, subgroup analyses revealed significant heterogeneity when both global ($r^+ = 0.32$; $I^2 = 81.73\%$; $H^2 = 5.47$) and specific measures ($r^+ = 0.35$; $I^2 = 89.4\%$; $H^2 = 9.43$) of ASE were examined separately. This is a finding that is largely discordant with existing literature reported within this review

In addition to the meta-analytic findings, several findings are noted from qualitative analysis of correlational studies included within the review that bring to light an understanding of the ASE and academic performance relationship. This is particularly relevant to the specificity of measures of ASE and academic performance. In elaborating on the nature of the SE and performance relationship, Choi (2005) found the specificity level in which SE is measured impacts on the strength of this relationship. In this study, ASE ($r = .22$, $p < .01$) and specific SE (belief to achieve or complete tasks specific to a course) were the

only significant positive predictors of term course grades (r=.32, p< .01), with general SE (a generalised belief in a person's efficacy) failing to significantly correlate (r=.14, p> .05). These findings are supported by further research that found math SE (Davis, 2009), SE for learning (Fenning & May, 2013) and ASE (Feldman & Kubota, 2015) was more significantly correlated to academic performance than general SE.

Study design. Variation in the study designs between studies within the current meta-analysis was included as a source of potential heterogeneity based on significant findings of the influence of study design reported by Richardson et al (2012). Information about each included study's research design is found in Table 1. Despite these previously reported significant findings, the current study did not find support for the impact of study design on the heterogeneity found in meta-analytic findings, accounting for none of the variance ($QM_{(df = 4)} = 0.35$, $p = 0.99$).

3.1.2 Longitudinal studies. Eleven studies (Cassidy, 2012; Cheng & Chiou, 2010; De Feyter et al., 2012; Gaylon et al., 2012; Gore, 2006; Jung, 2013; Lane et al., 2004; Lawson et al., 2007; Obrentz, 2012; Phan, 2009; Putwain et al., 2013) collected longitudinal data to examine the relationship between ASE and academic performance. Findings from Cassidy (2012) and Obrentz (2012) demonstrate the capacity for ASE to change over time. In these studies, ASE increased significantly from the first year of a university course to the final year (Cassidy 2012) and was shown to decrease over time in average and low performance groups, with no change to ASE levels in high performance groups, across three time-points (week 5, 10 & 15) in the university semester (Obrentz, 2012). This suggests that consistently high levels of ASE lead to greater academic performance. Cheng and Chiou (2010) also reported changes in SE when measuring accounting SE at one week, four months, and six months from the commencement of the university year, however, these differences were not tested for significance.

Findings from Gaylon et al. (2012), Gore (2006), Lawson et al. (2007), and Obrentz (2012) suggest the time-point in which ASE and performance is measured influences the strength of its relationship. Gaylon et al. (2012) found ASE positively correlated with performance from the mid-point of a subject onward, with no significant relationship found when measured in earlier stages of a subject. This confirms Gore (2006), who reported ASE measured at the end of college semester correlated better to semester 1 and 2 performance than ASE measured at the beginning of semester, and Obrentz (2012) who found SE became a more important predictor of performance at the 10 and 15 week mark of semester than at week 5. Additionally, Lane et al. (2004) and Lawson et al. (2007) reported ASE did not correlate with achievement at week 2, but did when measured at the end of the academic semester. In testing for a mediating influence of ASE on academic self-discipline (level of effort and persistent in study) and performance, Jung (2013) measured ASE and performance 1-year apart and found no significant correlation between these variables, failing to support a mediating hypothesis. This indicates the time frame when ASE and performance are measured is limited, and a high level of ASE at one time-point does not translate to ongoing, long-term academic success. Krumrei-Mancuso et al. (2013) provide insight into potential lengths of time in which this relationship may exist with findings that ASE measured at one time-point significantly predicted semester 1 and 2 performance, after controlling for previous semester performance. Given the traditional academic year does not span a full calendar year, ASE may be limited to predicting academic performance within a similar time frame.

Finally, Putwain et al. (2012) provided support for a temporal influence of ASE on academic performance and positive learning emotions. In this study, initial levels of ASE were found to positively relate to semester one course grade. This in turn influenced the

adoption of positive learning-related emotions that, in conjunction with semester 1 academic success resulted in greater semester 2 academic success.

These findings may also provide a basis for investigating the potential reciprocal nature of the relationship between ASE and academic performance, particularly the predictive nature of academic performance on levels of ASE. It is probable that such a relationship exists, as higher academic performances provide feedback to students on their academic competence and skills, which will inform future efficacy judgments. The aforementioned findings from longitudinal research conducted by Jung (2013) provide support for this hypothesis, given reported findings that academic performance at one time point predicted subsequent ASE. However, such a finding was only reported from one time point of performance to subsequent measures of ASE, and not a cyclic, feedback loop as was hypothesised. Findings reported by Obrentz (2012) in which those with high levels of academic performance were shown to have consistently high levels of ASE compared to those with average and low academic performance (who had markedly lower levels of ASE), also provides preliminary support for such a hypothesis.

Taken together, these findings suggest that ASE is a highly malleable construct that is influenced by the learning environment, can influence both academic performance and positive learning emotions associated with academic success, correlates more strongly with performance after a time lapse from the beginning of the learning experience and may not accurately correlate with performance when measured at long time-points apart. This summation is not surprising given students are likely to gain more information about their academic capabilities, which can be used when judging ASE, as the learning experience proceeds.

3.1.3 Mediating relationships. Ten included studies investigated mediating relationships (Balkis, 2011; Cheng and Chiou, 2010; Crippen, Biesinger, Muis, & Orgill,

2009; Fenollar et al., 2007; Jung, 2013; Kassab et al., 2015; Komarraju & Nadler, 2013; Krumrei-Mancuso et al., 2013; Tabak et al., 2009; Weiser & Riggio, 2010). Cheng and Chiou (2010) found that conscious and deliberate goal setting prior to learning mediated the relationship between ASE and academic performance. Cognitive variables such as effort regulation (Kassab et al., 2015; Komarraju & Nadler, 2013), metacognition (Kassab et al., 2015), academic procrastination (Balkis, 2011), academic self-discipline (Jung, 2013), and deep processing (Fenollar et al., 2007) have also been found to mediate between ASE and academic performance. In three separate studies, effort regulation, defined as persistence and effort when faced with challenging academic situations (Kassab et al., 2015; Komarraju & Nadler, 2013) and academic self-discipline, which describes the level of effort and persistence undertaken in study (Jung, 2013), were respectively found to partially mediate and fully mediate the relationship between ASE and academic performance. This provides support for a partial mediation of ASE on the negative correlation between academic procrastination and performance reported by Balkis (2011), despite discrepancy in the directionality of the mediating relationship found between these studies. Finally, deep processing was found to fully mediate the ASE and performance relationship (Fenollar et al., 2007). Collectively, these findings suggest that self-efficacious students perform academically because of the use of cognitive processing strategies and high levels of effort that lead to deep understanding during the learning experience, which results in academic success.

Several studies have also investigated the influence that goal orientation (underlying purpose for engaging in learning related tasks) has on the ASE and academic performance relationship. (Ferla et al., 2010; Phan, 2009; Phan 2010). Phan (2010) reported that ASE influenced the type of goal orientation adopted for achieving academic success. When ASE influenced the adoption of mastery goals, academic success was more likely to result.

Despite reporting correlations between these variables, mediating relationships were not tested by Phan (2010) because of the non-significant relationship found between ASE and academic performance. Such mediating relationships were tested in a study conducted by Hsieh et al. (2012) whose findings suggested the relationship between ASE and academic performance was mediated through mastery goal orientation and self-regulatory learning strategies. In contrast to the above findings that suggest goal orientation mediates the relationship between ASE and academic performance, Crippen et al. (2009) and Coutinho and Neuman (2008) found mastery approach goals predicted ASE, which then predicted academic performance, suggesting that ASE acts as a mediator between goal orientations and performance. This highlights inconsistencies in the literature as to whether ASE or goal orientation acts as the mediating variable on academic performance. Perhaps the most pertinent research finding relevant to this relationship is from longitudinal research conducted by Phan (2009). Findings from this study, conducted prior to the aforementioned research, reported a temporal influence of mastery goals influencing ASE at time point 1, which influenced mastery goal adoption at time point 2, which subsequently influenced ASE judgments at time point 2. This strongly suggests a bi-directional relationship exists between these two motivational variables.

In addition to the cognitive variables previously mentioned, other non-cognitive variables such as parental involvement (Weiser & Riggio, 2010) and the personality factor conscientiousness (Tabak et al., 2009) were found to relate to academic performance through the mediating influence of ASE. Finally, in a longitudinal study investigating ASE and GPA, Krumrei-Mancuso et al. (2013) found first semester GPA partially mediated the relationship between ASE and end of year GPA.

3.1.4 Moderating relationships. Six studies (Adeyemo, 2007; Balkis, 2011; Davis, 2009; De Feyter, 2012; Tabak et al., 2009; Villavicencio & Bernardo, 2013) used moderating

techniques to investigate the relationship between ASE and academic performance. Four studies found that the relationship between ASE and performance was moderated by emotional intelligence (Adeyemo, 2007), neuroticism (De Feyter, 2012), time on task (Tabak et al., 2009), and negative emotions (Villavicencio & Bernardo, 2013). When the amount of time spent studying was high or average, the relationship between SE and performance increased (Tabak et al., 2009), demonstrating a positive moderating effect. Furthermore, low levels of negative emotions (anxiety, shame, anger, and hopelessness) did not influence the relationship between ASE and performance unlike high levels of negative emotions, which negatively impacted on this relationship (Villavicencio & Bernardo, 2013) demonstrating a negative moderating effect.

De Feyter (2012) assumed the relationship between ASE and performance to be non-linear in a study that investigated the moderating influence of the personality trait neuroticism on ASE and performance. Findings show that individuals with high levels of neuroticism and either high or low levels of ASE were found to have lower academic performance. However, those individuals with low levels of neuroticism and either high or low levels of ASE were found to have higher academic performance. This suggests that those who are highly neurotic with low levels of ASE perform less successfully as a result of the characteristic emotions associated with neuroticism, such as depressed mood and anxiety, which could impact on performance. This could also be said for those who are highly neurotic with high ASE levels. Thus, high levels of neuroticism may be deleterious to high levels of ASE, which result in compromised academic performance.

The remaining studies found that ASE moderated the relationship between procrastination and performance (Balkis, 2011) and final exam score on overall GPA (Davis, 2009). High levels of ASE were found to reduce academic procrastination, resulting in greater academic performance, demonstrating a negative moderating influence of ASE

(Balkis, 2011). Academic self-efficacy was also shown to negatively moderate the relationship between final examination grade and overall GPA (Davis, 2009). In this study, as levels of SE increased, the relationship between final examination grade and overall GPA decreased. This is surprising and indicates the effect that overconfidence as a result of high levels of SE may have on specific task performance, such as completing examinations that may not influence overall course performance, as measured my GPA.

Discussion

4.1 Summary of evidence

This review investigated the direct, mediated and moderated relationship between ASE and academic performance in 59 recent studies. Overall, meta-analytic findings suggest that a moderate positive relationship exists between ASE and academic performance, but there is significant heterogeneity across studies, which are accounted for by inter-study differences in operationalization of ASE and academic performance. Additionally, it appears that the mechanism in which ASE relates to and influences academic performance is mediated through such variables as effort regulation, academic procrastination, deep processing strategies, parental involvement and goal orientations. A summary of the evidence relevant to each objective within the review is presented below.

4.2 Using meta-analytic techniques, what do the results of recently reported research findings suggest about the strength of the relationship between academic self-efficacy and academic performance?

This objective sought to replicate the findings from previous reviews (Richardson et al., 2012; Robbins et al., 2004) and extend such findings to recent literature that measures the impact of ASE on various academic performance outcomes. The findings from studies included in this review provide overwhelming support for a moderate positive relationship between academic self-efficacy and academic performance. This is based on meta-analytic

findings from 51 studies that reported correlations within this review. This relationship indicates that higher levels of ASE are more likely to result in higher levels of academic performance. Seemingly, this is because students who hold stronger beliefs about their ability to perform academically are more likely to do so than students who do not hold strong beliefs in their academic ability. Additional literature also suggests that those with higher levels of ASE, when compared to those with low levels, are likely to select challenging tasks, persist during difficult tasks and adapt learning strategies to more effective ones when faced with failure (Mega et al., 2013), further promoting academic success. Knowledge of the influence that ASE has on academic success can assist teaching staff in structuring curriculum and developing learning programs that promote a student's ASE for academic performance.

The six studies with non-significant findings for the relationship between ASE and performance (Cho, 2013; Crippen et al., 2009; Gebka, 2014; Khan, 2013; Neuville et al., 2007; Phan, 2010) differed in study design characteristics, and hence a single explanation for their non-significance cannot be readily identified. Gebka's (2014) study found an effect size ($r = .29$) marginally smaller than the overall effect in the present meta-analysis ($r = .33$), and likely reflects small sample size. In contrast, the findings of Khan (2013) and Neuville et al. (2007) may seemingly be explained on the basis of using global rather than specific measures of ASE, although present meta-regression results suggest differences due to operationalization of ASE may be highly variable. Timing of measurement may also have dampened effects. Phan (2010) and Neuville et al. (2007) measured ASE in the early stages of the university semester, which may have impacted on the ability to accurately measure the relationship between ASE and performance. This is justified given findings previously discussed within this review by Gaylon et al. (2012) in which ASE was found to better correlate to academic performance from the mid-point of a course, with non-significant

correlations found when measured in early stages.

It is noted in the present review, as in relevant past reviews (Chesnut & Burley, 2015; Usher & Pajares, 2008), that measures of ASE vary markedly across studies, with scales having considerably different standards of construct validity and internal consistency. In the present review, we found 26 different measures used, which could be broadly categorized into global measures (n = 22 studies) and specific measures of ASE (n = 34 studies). Although there is some indication from prior studies and reviews that the relationship between ASE and academic performance is stronger when specific measures of ASE are used (e.g., Chesnut & Burley, 2015), the more striking finding in the present review was that there was considerable heterogeneity in effect size even after separating into studies using specific vs global measures. This within-group heterogeneity implies that a range of factors, apart from operationalization of ASE, may determine effect size, and suggests that these factors may be competing to determine the size of the effect. This could include differences in characteristics such as the type of study being undertaken, reliability of measures for a given study, and the timing of measurement of ASE and performance. Indeed, Chesnut and Burley (2015) showed that specificity, conceptual accuracy, and reliability of constructs jointly influenced strength of association between ASE and academic performance.

4.3 What mediating and moderating factors have been investigated to explain the relationship between Academic Self-efficacy and academic performance of University students and what do they report?

Of the specific mediation pathways tested, effort regulation and academic procrastination appear to at least partially mediate the relationship between ASE and academic performance. This suggests that a student's ability to regulate the amount of effort dedicated to learning tasks, in the face of boredom or other distractions, partially facilitates and explains the relationship between ASE and performance. It appears the higher a

student's level of ASE, the more likely effort will be expended on a learning task, which is likely to result in greater levels of academic performance. This is a logical conclusion and is supported by previous research findings (Mega et al., 2013). Weiser and Riggio (2010) reported ASE positively mediated the relationship between parental involvement and achievement, suggesting that parental support and involvement in the learning process can also influence student levels of ASE and subsequent academic success.

Academic self-efficacy is also implicated in several moderating relationships with academic performance, with ASE interacting with several cognitive and non-cognitive variables to influence performance. Academic self-efficacy appears to be positively moderated by non-cognitive variables such as time on task (Tabak et al., 2009) and cognitive factors such as emotional intelligence (Adeyemo, 2007), with negative emotions negatively moderating the ASE and academic performance relationship (Villavicencio & Bernardo, 2013). The personality trait neuroticism also appears to moderate the relationship between ASE and performance, with high levels of neuroticism negatively impacting on academic performance at high and low levels of ASE only (De Feyter, 2012).

Academic self-efficacy has also shown to act as a negative moderator on several variables that correlate with academic performance. This includes academic procrastination and academic performance (Balkis, 2011), whereby high levels of ASE result in lower levels of academic procrastination and higher subsequent achievement. Finally, ASE negatively moderated the relationship between final examination grade and overall GPA (Davis, 2009), with higher levels of ASE decreasing the strength of the relationship between final examination grade and overall GPA. This suggests that high ASE may result in overconfidence and, in turn, reduced preparedness for final examinations and lower results. Consequently, the relationship between the examination score achieved in this subject examination and overall course average (GPA) would be affected.

Overall, current findings identify multiple, potential mediating factors between ASE and academic performance, particularly through the motivational variable effort regulation. However, it was also observed in this review that many of these mediation effects have yet to be replicated or tested in competition with other putative mediation pathways in a more comprehensive model. Moreover, the over-reliance on cross-sectional designs, and occasional reversal of roles of variables in these models (such that goal orientation was a mediator in one context and the independent variable in another; Coutinho & Newman, 2008; Hsieh et al., 2012), means that the direction and causal nature of these mediation pathways remain unclear. As several authors have contended (e.g., Phan, 2009), it is also plausible that bi-directional relationships exist between these two motivational variables, which influence each other, and academic performance through regulatory feedback loops.

4.4 What are the implications for future research based on the research to date?

More research is needed to further investigate the mediating relationships that exist between ASE and academic performance in light of the findings from this review. Of particular interest is the nature of the relationship between ASE and other motivational and cognitive variables within the SRL framework, including goal orientation. This is warranted given the variability in research findings with regard to the directionality of this relationship. Given findings from many of the reviewed studies reported moderate correlations between the aforementioned variables, in addition to support for their predictive utility found in regression studies, the existence of a prominent interaction among these, which impacts on academic performance, is feasible. Future research should also focus on the potential bi-directionality between theses variables through recursive models.

The time point in which ASE and academic performance are measured is also worthy of further investigation. This is justified given findings from Gaylon et al. (2012) and Gore (2006) which report ASE is a weak predictor of academic performance in the early stages of

the academic semester and shows greater predictive utility from the mid-point in the semester. Given the significant influence that mastery through experience and verbal persuasion and feedback from credible sources has on the development of ASE (Usher & Pajares, 2008; Zimmerman, 2000), the inability to find significant relationships between ASE and performance in early stages of university education is reasonable. Students lacking experience within university environments have limited exposure in which to experience mastery in learning within such environments and have not been afforded the opportunity to develop efficacious beliefs of performance abilities. Research will provide greater insight into the development of ASE and promote the implementation of early intervention programs that enhance ASE and result in the best educational outcomes for university students.

Given there is no single valid scale of ASE, with scales being derived based on the domain specificity being studied, future research must consider the degree to which selected measures of ASE correspond to the academic performance domain measured. Clear and consistently operationalized variables for global and specific measures of ASE and academic performance need to be adopted in future research to enable more meaningful and accurate reviews of the literature. This will assist in providing confirmatory support to what has long been a theoretical discussion throughout educational research into ASE and academic performance, and may help to explain the heterogeneity that exists between correlational findings reported within this review.

Finally, longitudinal studies with intervention-based methods are required in order for causal explanations between these variables to be tested. Despite evaluation of the research findings from longitudinal studies within the current review, limited longitudinal intervention based research exists involving university populations. Given the greater emphasis for the use of self-regulated learning skills within a university context over various pre-tertiary education environments (Oolbekkink-Marchand, Van Driel, & Verloop, 2006) such research

is warranted. This will promote a greater understanding of the temporal influence of ASE on academic performance and will give insight into the malleability of ASE, factors that are necessary to enhance ASE, and the long-term effectiveness of intervention programs on ASE levels. Such research will also extend the practical understanding of the literature by providing insight in the influence that academic performance has on ASE, a relationship that has not been sufficiently examined within the studies of the current review.

5.0 Limitations

Although there have been a greater variety of studies from regions other than Europe and North America since Richardson et al.'s (2012) review, there are still too few studies to meaningfully compare results by region. In light of potential differences in cultural importance placed on academic achievement (Yamamoto & Holloway, 2010) and in the formal structures provided to facilitate effective learning (Cho, 2013; Crippen et al., 2009), cross-cultural comparisons of the role of ASE in academic performance remain an important, and largely under-explored, avenue for future research. Similarly, the present review noted an absence of replication of observed mediation and moderation effects found in earlier studies. Replication is necessary in order to provide a stronger evidence base for the role of these motivational and cognitive factors in the relationship between ASE and performance, and serve to enhance understanding of drivers of academic performance.

Finally, given the significance of the measure of academic performance used to explain the heterogeneity of findings within the current meta-analysis, attention should be given to the way that academic performance is operationalized and the level in which academic performance is measured and correlated with ASE within research. The original context in which these beliefs should be measured, according to Bandura (1997), is in situations no greater than at a domain-specific level. Despite this clear recommendation, the interpretation of this within the context of research is inconsistent, with some research

considering a domain specific level to be subject specific (Cassidy, 2011; Diseth, 2011) and others considering it to be course or college specific (Ferla et al., 2010). Given this, the use of scales which measure ASE and academic performance need to be evaluated for their appropriate applicability to the research question being addressed in order to avoid false generalisation and misinterpretation of research findings. For example, measures of ASE using the MSLQ were utilised by Coutinho & Neuman (2008), Diseth (2011), and Phan (2010). In each of these studies a different measure of academic performance was used, each at a different level, to correlate the relationship between these variables. This highlights the issue of scale application and can question the validity of the findings, given the MSLQ was intended to measure ASE at the course level (Duncan & McKeachie, 2005).

6.0 Conclusion

In conclusion, considering the importance of academic performance within higher education, an understanding of the factors that influence this it vital. In addition to confirming the important role of high levels of ASE in influencing increased levels of academic performance, the current review brings to light additional variables that act to moderate or mediate this relationship. Additionally, a range of factors, including operationalization of studied variables, may account for the significant heterogeneity found between research findings. Further research is required that specifically investigates academic performance and variables that significantly correlate with ASE such as goal orientation subtypes and cognitive factors like effort regulation in isolation of complex models to gain deeper insight into this relationship. Finally, longitudinal studies that focus on interventions designed to manipulate and improve ASE and performance are required in order to establish causality and understand temporal patterns among these variables.

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Databases: PsycINFO, ERIC, MEDLINE complete, Scopus & Web of Science

Search 1:

"self-efficacy" OR "academic self-efficacy" OR "performance self-efficacy"

AND "university" OR "college" OR "higher education" OR "undergraduate" OR "tertiary"

AND "GPA" OR "academic performance" OR "academic achievement" OR "academic outcome"

Limiters: All in English, September 2003- March 2015 & Journal articles

1,758 articles found
114 selected

Figure 1: Example of a full search strategy

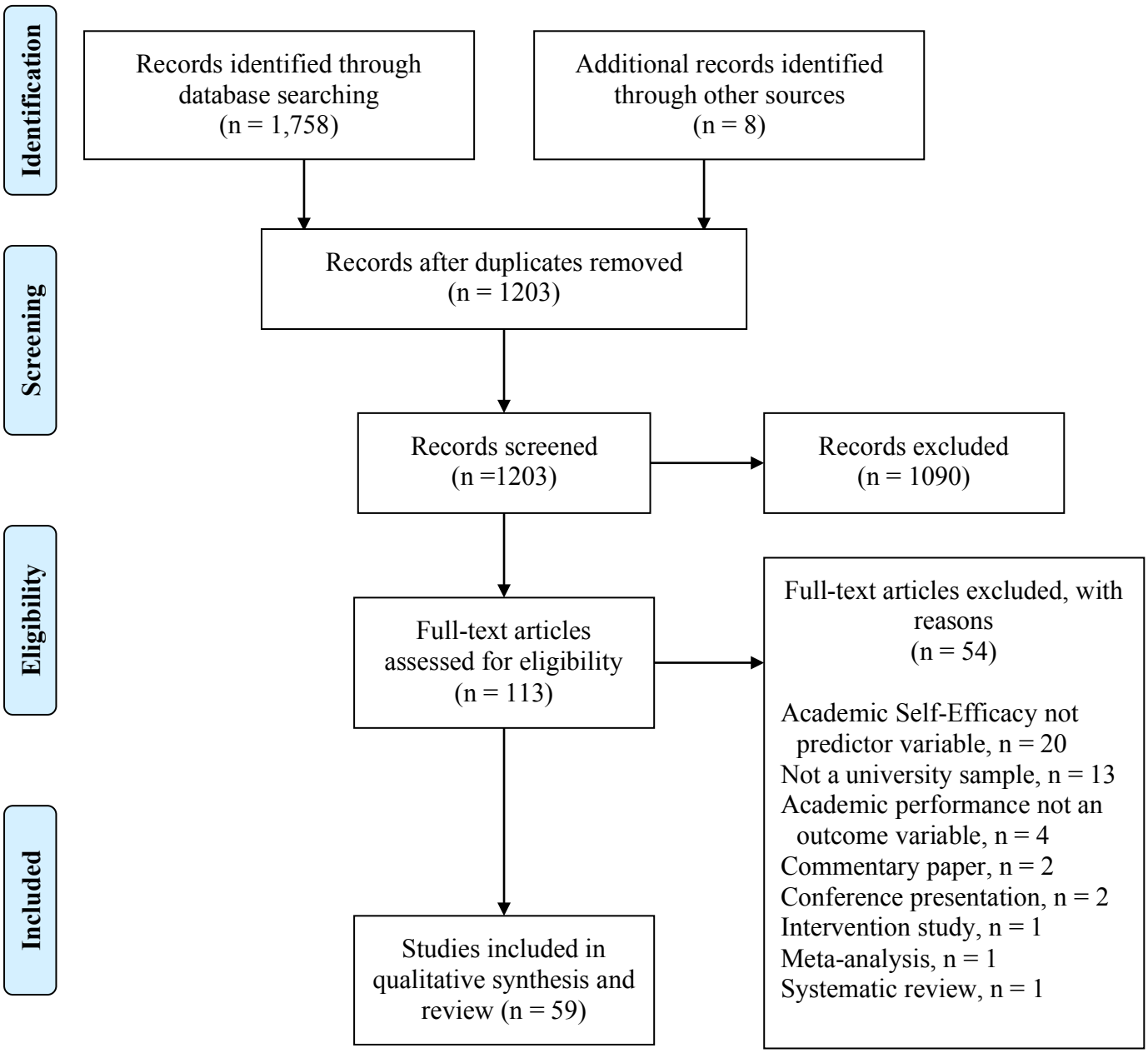

Figure 2: Flow diagram of studies included in review

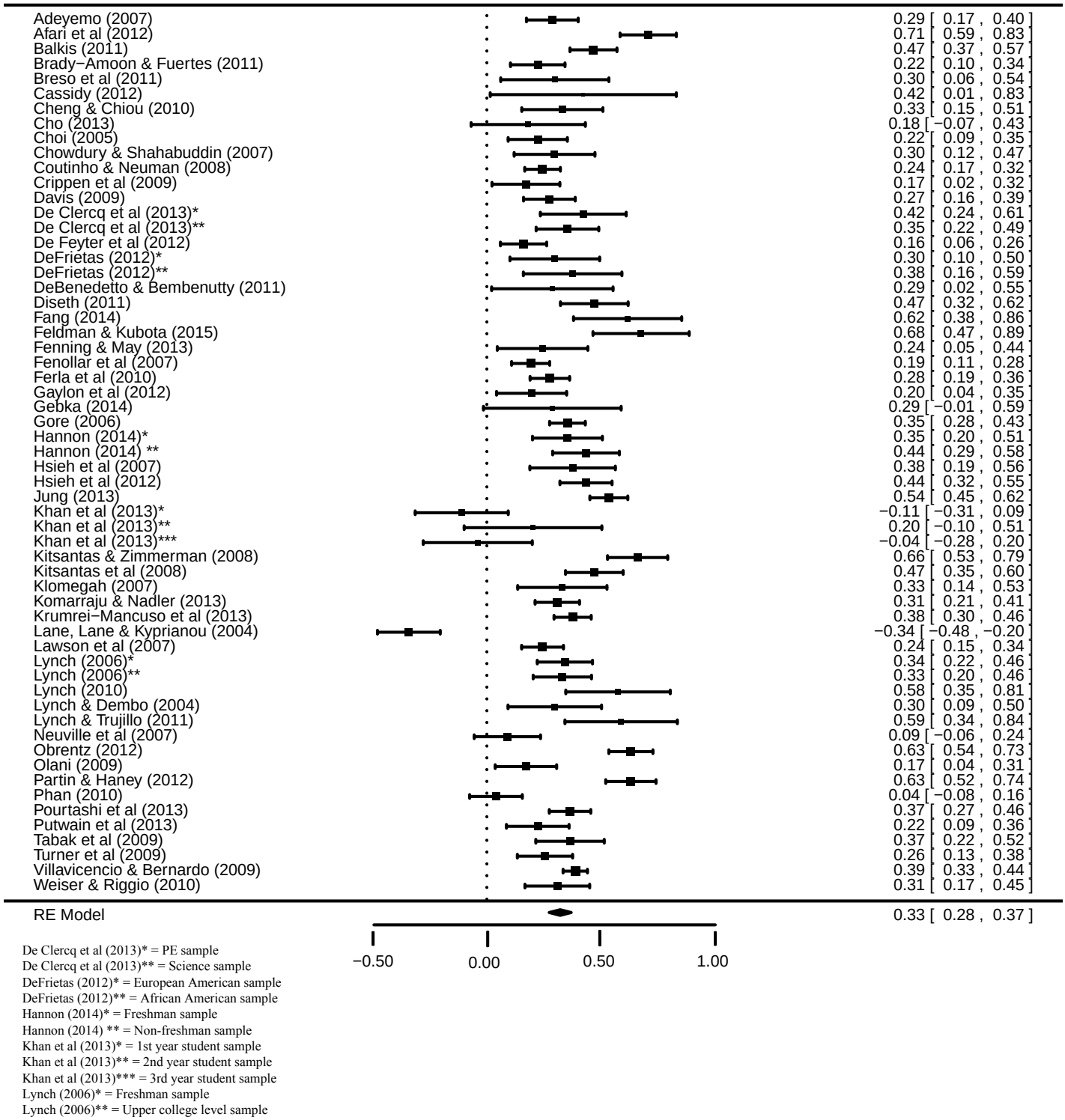

Figure 3 – A forest plot of the meta-analysis (Fisher's Z transformed correlation coefficient)

Table 1
Summary of Included Studies within the Systematic Review in Alphabetical Order

Author	Country of origin and Sample characteristics	Study design, Predictor measure and Outcome measures	Findings
Adeyemo (2007)	*Country:* Nigeria *n* = 300 - 140 M, 160 F Mean age = 19.4 years	*Design:* Ex-post facto research type *Predictor:* Academic confidence scale (Sander and Sander, 2003) – Global measure of ASE *Outcome:* Examination results (official or self-report not disclosed)	1. ASE and academic performance were significantly correlated (r = .28, p<.01) 2. ASE positively and significant predicted on academic performance (β = 0.26, p<.01). 3. There was a significant interaction between emotional intelligence and ASE on the relationship between ASE and performance (β = .53, p<.01)
Afari et al (2012)	*Country:* The United Arab Emirates *n* = 255 - 181 M, 74 F Mean age = 18.5 years	*Design:* Cross-sectional *Predictor:* Academic self-efficacy based on Jinks and Morgan student efficacy scale (Jinks & Morgan, 1999) – Global measure of ASE *Outcome:* Students average grade for the mid semester and final semester (official or self-report not disclosed)	1. Academic performance was associated with having high ASE (r = .61, p<.001)
Balkis (2011)	*Country:* Turkey *n* = 364 -145 M, 219 F Mean age = 21.15 years (SD = 1.76)	*Design:* Cross-sectional *Predictor:* 1) Academic efficacy measured by an academic efficacy subscale of the Maslach Burnout – Global measure of ASE 2) Inventory Student Survey (Schaufeli et al. 2002) *Outcome:* No conclusive measure of performance provided.	1. ASE was significantly correlated with academic performance (r = .437, p<.01) 2. ASE partially mediated the relationship between academic procrastination and academic performance. 3. ASE also moderated the relationship between academic procrastination and reported academic performance by increasing academic performance and reducing academic procrastination at high levels of ASE
Bouffard et al (2005)	*Country:* Canada *n* = 140 - 55M, 85 F Mean age = 17.8 years (SD = 8.6 months)	*Design:* Randomised Control Trial *Predictor:* Induced Self-efficacy through exposure to learning or performance approach goal conditions *Outcome:* Actual performance assessed using two criteria; the number of corrects responses and number of rejections of their own correct responses	1. Self-efficacy had a significant effect on actual performance F(2,135) = 13.43, p<.001. 2. A significant difference was found between high and low self-efficacy induced groups, with those in the high SE group rejecting correct responses less often and answering more questions correctly (F (1,36) = 23.61, p < .001) than those in the low SE group (F (1, 36) = 9.31, p<.005). 3. Those in performance-approach goal condition with either high or low SE didn't differ on performance. Those in mastery-approach goal condition did differ, those with high SE performed better than those with low SE.
Brady-Amoon & Fuertes (2011)	*Country*: USA *n* = 271 - 103 M, 68 F Mean age = 21.26 years (SD = 5.02 years)	*Design:* Cross-sectional *Predictor:* College Self-Efficacy Inventory (CSEI; Solberg et al., 1993) – Global measure of ASE *Outcome:* Official cumulative GPA	1. SE positively correlated with performance (r = .22, p<.01) 2. SE and self-rated abilities significantly predicted academic performance, F (2,228) = 9.61, p < .01, R^2 = .08, R^2 = .07. However on an individual bases neither self-rated abilities nor self-efficacy were significant predictors of academic performance.

Breso et al (2011)	*Country:* The Netherlands *n* = 71 – 30 M, 41 F Mean age = 21.6years (SD = 1.69)	*Design:* Intervention *Predictor:* Patterns of Adaptive Learning Scale (PALS; Midgley et al., 2000) – Specific measure of ASE *Outcome:* Ratio of number of exams passed to number of exams taken	1. SE positively correlated with semester 1 performance (*r* = .29, p<.05) but not with semester 2 performance (*r* = .23, p>,05) 2. Levels of SE were significantly higher for those in the intervention group (F = 23.89, *df* = 40, p<.001) compared to those in the control group (p>.05) following CBT.
Cassidy (2012)	*Country:* UK Time 1 – n = 97 (20 M, 77 F). Time 2 – *n* = 26 (due to attrition, no gender information provided) Mean age - 23.5 years	*Design:* Longitudinal *Predictor:* 1)General Academic Self-Efficacy Scale (Cassidy & Eachus, 2002) - Specific measure of ASE 2) Prior academic achievement (prior research methods subject mark) *Outcome:* Official GPA	1 Dissertation (*r*=0.29*) and final degree mark (*r*=0.40*) positively correlated with ASE (*p<.01) 2 ASE accounted for 6.2% of variance in final degree mark (p<.01) 3 Prior academic achievement (β = .539, p<.001) was a stronger predictor of final degree mark than ASE (β = .263, p<.01 4 Significant increase in levels of ASE from first year to final year (*d*=.46)
Cheng & Chiou (2010)	*Country:* Taiwan *n* = 124 - 57 M, 67 F Mean age = 18.3 years (SD = 1.1 years)	*Design:* Longitudinal *Predictor:* 1) Accounting self-efficacy; adapted from the Motivation Strategies for Learning Questionnaire (MSLQ; Pintrich & De Groot, 1990) 2) Patterns of Adaptive Learning Survey (Roeser et al., 1996) – Both specific measures of ASE *Outcome:* Official Accounting test performance	1. Accounting SE significantly correlated with performance at 3 time points (*r* = .32; *r* = .40; *r* = .38, p < .01) 2. Accounting SE significantly predicted performance (β = .24, p<.05) 3. Mediation analysis shows that accounting SE (β = .24, p < .01) predicted test performance, and this was mediated through goal setting (β = .20, p < .01; R = .84, R2 = .71, adjusted R^2 = .70)
Cho (2013)	*Country:* USA *n* = 64 – 6 M, 58 F Mean age = 27.47 years (SD = 9.03)	*Design:* Cross-sectional *Predictor:* Academic Self-efficacy, measured by the MSLQ (Pintrich & De Groot, 1990) - Specific measure of ASE *Outcome:* Total points accumulated in course	1. ASE did not significantly correlate with performance (*r* = .18, p>.05) 2. ASE had an indirect effect on effort regulation through the actions of metacognitive regulation (β = .24). Metacognitive regulation then indirectly impacted performance through effort regulation (β = .61)
Choi (2005)	*Country:* USA *n* = 230 -101 M, 129 F Mean age = 20.5 years (SD = 4.1 years)	*Design:* Cross-sectional *Predictor:* 1) Global self-efficacy measured by the general self-efficacy subscale of the Self-Efficacy Scale (SES; Sherer et al., 1982). 2) Academic self-efficacy measured by the College Academic Self-Efficacy Scale (CASES; Owen & Froman, 1988) 3)Specific self-efficacy measured by 7-items modified from Wood and Locke (1987) *Outcome:* Official course grades	1 ASE and Specific SE positively correlated with performance (*r* = .22; *r* = .32, p<.01). General SE did not significantly correlate. 2 General, Academic and Specific SE predicted 9% variance in performance (Adjusted r^2 = .09). Specific SE was the only significant unique predictor

Chowdury & Shahabuddin (2007)	*Country:* Bangladesh *n* = 125. No other details provided	*Design:* Cross-sectional *Predictor:* Self-Efficacy measured by 6-items adapted from MSLQ (Pintrich & DeGroot, 1990) – Specific measure of ASE *Outcome:* End of year final course grade (official or self-report not disclosed)	1 Self-efficacy was significantly correlated with performance (r = .289, p < .01) 2 Regression analysis shows self-efficacy did not significantly predict grades (p = .111)
Coutinho & Neuman (2008)	*Country:* USA *n* = 629 - 316 M, 310 F Mean age = 19.22 years	*Design:* Cross-sectional *Predictor:* 1) Self-Efficacy subscale from MSLQ (Pintrich et al, 2003) - Specific measure of ASE 2) Achievement goal questionnaire (Elliot & McGregor, 2001) *Outcome:* Self-reported GPA	1 ASE positively correlated with performance (r = .24, p<.01) 2 Mastery goals (r=0.36*) and performance approach goals (r=0.43*) positively correlated with ASE (*p<.001) 3 ASE was the strongest predictor of performance in a path analysis model (β = 0.36) 4 ASE related to deep processing (β = .21) which negatively related to performance (β = -.12)
Crippen et al (2009)	*Country:* USA *n* = 176 No other data provided	*Design:* Cross-sectional *Predictor:* 1) Self-efficacy for chemistry content (Crippen et al., 2009) – Specific measure of ASE 2) Achievement Goal Questionnaire (AGQ; Elliot & Church, 1997) *Outcome:* Overall course score	1. Self-efficacy did not significantly correlate with performance (r = .17, p>.05) 2. Structural equation model did not support the mediating influence of self-efficacy on the relationship between mastery goal orientations and achievement
Davis (2009)	*Country:* USA *n* = 301 - 160 M, 141 F Age range = 18 - over 45 yrs (90% under 32 yrs)	*Design:* Cross-sectional *Predictor:* 1) General self-efficacy scale (GSES; Jerusalem & Schwarzer, 1992) – Global measure of ASE 2) Mathematics self-efficacy – Specific measure of ASE *Outcome:* Official subject examination grade	1. Mathematics SE (r = .268, p<.001) and General SE (r = .126, p<.05) positively correlated with final exam score 2 Mathematics SE significantly predicted performance (β = .224, p<.05). General SE did not significantly predict performance (β = .004, p>.05) 3. Mathematics self-efficacy negatively moderated the relationship between final exam score and overall GPA. As Mathematics SE increased the relationship between overall GPA and final exam score decreased.
De Clercq et al (2013)	*Country:* Belgium *n* = 317; 111 from from PE faculty, aged 18-22 years (M = 19) 44% M 56% F; 206 from Science faculty, aged 17-21 years (M=18), 55% M, 45% F	*Design:* Prospective *Predictor:* Self-efficacy measured using five items adapted from Galand (2001) – Global measure of ASE *Outcome:* Official GPA	1 ASE correlated positively with performance in PE (r = .4, p<.001) and Science (r = .34, p<.001) 2 ASE was the strongest predictor of achievement in the PE class (β = .35, p < .001) and intention to persist was strongest predictor in science class (β = .31, p < .05). ASE was the second strongest predictor of performance in science class.

De Feyter et al (2012)	*Country: Belgium* *n* = 375 - 60% M, 40% F Age range = 18 to 22 years	*Design:* Longitudinal *Predictor:* Modified version of Lane et al (2004) – Global measure of ASE Outcome: Proportion of obtained credits to attempted	1. SE was significantly correlated with academic performance (r = .16, p < .01) 2. Self-efficacy and academic performance was significantly moderated by neuroticism. Positive indirect effect of neuroticism on academic performance at high levels of self-efficacy and a positive direct effect of neuroticism on academic performance at low levels of self-efficacy 3. Self-efficacy did not mediate conscientiousness and performance
DeFreitas (2012)	*Country:* USA *n* = 187 (102 European American, 85 African American)	*Design: Cross-sectional* *Predictor:* Self-Regulated Learning Scale of the Multidimension Scales of Perceived Self-Efficacy (Bandura, 1990). – Global measure of ASE *Outcome:* End of semester grade	1. Self-efficacy positively correlated to Spring GPA for European Americans (r = .29, p < .01) and African Americans (r = .36, p < .01) 2. Regression analyses showed that self-efficacy (β = .29, p <.05) and ethnicity (β = .38, p <.05) were predictive of GPA
DeBenedetto & Bembenutty (2011)	*Country:* USA n = 57 - 24 M, 33 F No age details provided	*Design:* Cross-sectional *Predictor:* Self efficacy was measured using a 4 item scale, students rated their beliefs about their capability to perform in the science course – Specific measure of ASE *Outcome:* Final exam grade	1. ASE positively correlated with performance (r = .28, p<.05) 2. When other variables were controlled, self-efficacy was a significant predictor of final course grade (β = .28, p =.03), accounting for 8% of the variance. This reduced to non-significance once delay of gratification was entered into the model
Diseth (2011)	*Country:* Norway *n* = 177 - 26 M, 141 F Mean age = 21.21 years	*Design:* Cross-sectional *Predictor:* 1) Self-Efficacy subscale from MSLQ (Pintrich & DeGroot, 1990) – Specific measure of ASE 2) Nine items with highest factor loadings from the goal orientation inventory (Elliot & Church, 1997) *Outcome:* Examination grade (self-report or official not disclosed)	1 Exam grade positively correlated with self-efficacy (r=0.44*), mastery approach (r=0.21*), performance approach goals (r=0 .39*) and High School GPA (r = .46*), *p<.01 2 Prior GPA had positive direct relationship with performance (β = .39) and was also positively mediated by ASE (p<.01) 3 Performance approach goals mediated the relationship between ASE and exam grade (p<.01)
Fang (2014)	*Country:* USA *n* = 71 – 62 M, 9 F No mean details provided	*Design:* Cross-sectional *Predictor:* Academic self-efficacy from the MSLQ (Pintrich & DeGroot, 1990) – Specific measure of ASE *Outcome:* Average examination score across kinematics subject	1. SE positively correlated with performance (r = .55, p<.01)
Feldman & Kubota (2015)	*Country:* USA *n* = 89 – 27 M, 62 F Mean age = 19.35 (SD = 2.25)	*Design:* Cross-sectional *Predictor:* 1) GSES (Jerusalem & Schwarzer, 1992) – Global measure of ASE 2) Academic self-efficacy measured by academic self-efficacy scale (ASES; Chemers et al., 2001) – Specific measure of ASE *Outcome:* Self-reported GPA	1. Academic self-efficacy was more positively correlated to performance (r = .59, p<.01) than general self-efficacy (r = .31, p<.01) 2. Academic self-efficacy was directly related to GPA (β = .23, p = .02). General self-efficacy failed to significantly predict performance in this model.

Fenning & May (2013)	*Country:* USA *n* = 100 - 29 M, 71 F Mean age = 19.6 years (SD = 2.1 years)	*Design:* Cross-sectional *Predictor: 1)* The SES (Sherer et al., 1982) 2) Self-efficacy for learning form (SELF; Zimmerman & Kitsantas, 2007) – Both global measures of ASE *Outcome:* Self-reported GPA	1. SE for learning significantly correlated with current GPA (*r* = .24, p < .05). General self-efficacy did not correlate with GPA (*r* = .16, p > .05).
Fenollar et al (2007)	*Country:* Spain *n* = 553 - 221 M, 332 F Mean age = 21 years	*Design:* Cross-sectional *Predictor:* Academic self-efficacy was measured with an 8 item scale (Greene & Miller, 1996) – Specific measure of ASE *Outcome:* Official subject grade	1 SE positively correlated with academic performance (*r* = .19, p<.001) 2 The indirect relationship between self-efficacy and academic performance through deep processing was significant (t = 2.20)
Ferla et al (2010)	*Country: Belgium* *n* = 512 - 71 M, 441 F No mean age reported	*Design:* Cross-sectional *Predictor:* Self-Efficacy for Self Regulated Learning questionnaire (Zimmerman et al, 1992) – Global measure of ASE *Outcome:* Official GPA	1 ASE positively correlated with GPA (*r* = .27) 2 ASE explained 7.4% unique variance in performance (p<.001)
Gaylon et al (2012)	*Country:* USA *n* = 165 - 37 M, 128 F No mean age reported	*Design:* Longitudinal *Predictor:* CASES, as cited in Choi (2005) – Global measure of ASE *Outcome:* Official subject examination grade	1 ASE positively related to exam performance from the mid-point in the course (unit C, *r* = 0.234, p<.01, unit D, *r* = .243, p<.01, unit E, *r* = .194, p<.05) whereas no significant relationship between ASE and performance was found when measured at the beginning of a course (Unit A, *r* = .045, unit B, *r* = .115, p>.05)
Gebka (2014)	*Country:* UK *n = 45* No other details provided	*Design:* Cross-sectional *Predictor:* Self-efficacy subscale of MSLQ (Pintrich et al., 1993) – Specific measure of ASE *Outcome:* Official mid-year and end of year subject examination grade	1. Self-efficacy did not significantly correlate with mid-year examination grade (*r* = .28, p>.05) or end of year examination grade (*r* = .23, p>.05) 2. Statistically significant path found for *self-esteem→ self-efficacy→ mastery→ effort→ performance* NOTE: This study attempts to replicate findings from Phan (2010)
Gore (2006)	*Country:* USA *n* = 629 - 335 M, 294 F Mean age = 18.1 years	*Design:* Longitudinal *Predictor:* 1) CSEI (Solberg et al., 1993) 2) Academic self-confidence as a measure of academic self-efficacy. Subscale of the Student Readiness Inventory (Le et al., 2005). – Global measures of ASE *Outcome:* Official end of semester GPA	1. Course SE significantly predicted semester 1 (*r* = .11) and 2 (*r* = .13) GPA; there was a stronger correlation between end of semester course SE and semester 1 (*r* = .34) and 2 (*r* = .35) GPA than baseline course SE and GPA. 2. Course SE scores obtained at the beginning of students first semester in college failed to predict GPA. However, course SE scores obtained at the end of the first semester significantly predicted first (β = .4, p<.05) and second semester (β = .385, p<.05) GPA

Hannon (2014)	*Country:* USA *n* = 348 (166 freshman, 182 non-freshman) No gender provided Mean age = 19.46 (SD = 1.72)	*Design:* Cross-sectional *Predictor:* Academic self-efficacy measured by 10 item subscale from McIlroy et al (2000) – Global measure of ASE *Outcome:* Official GPA	1. SE positively correlated with freshman performance (*r* = .34, p<.05) 2. SE positively correlated with non-freshman performance (*r* = .41, p<.05)
Hsieh et al (2007)	*Country:* USA *n* = 112 - 57 M, 55 F Age - 18-23 years (72%), 24-29 years (13%), over 30 years(13%)	*Design:* Cross-sectional *Predictor:* 1) PALS (Midgley et al., 1993) – General measure of ASE 2) Achievement Goal Orientation Inventory (Elliot & Church, 1997 *Outcome:* Self-reported GPA	1 GPA positively related to ASE (*r*=.36*) and mastery goal orientation (*r*=.40*). *p<.01 2 ASE alone accounted for 12% variance in GPA (p<.001). When mastery goal was included it was a more important predictor (β = .38, p<.001) than ASE (β = .18, p>.05) 3 High levels of ASE showed higher adoption of mastery goals than low levels of ASE (p<.001)
Hsieh et al (2012)	*Country:* USA *n* = 297 - 157 M, 140 F Aged 18-23 years	*Design:* Cross-sectional *Predictor:* PALS (Midgley et al., 1993) – Specific measure of ASE *Outcome:* Official midterm exam and overall course grade	1 SE was one of the strongest bivariate predictors of course grades (*r* = .41, p < .001) 2 SE related to self-regulation through mastery goal orientation. This then related to academic performance.
Jung (2013)	*Country:* USA <u>*Longitudinal analysis*</u> Time 1 (2008) – *n* = 560 (136 M, 424 F) Mean age - 19.89 years Time 2 (2009) – *n* = 332 (no gender information) Time 3 (2010) – *n* = 129 (no gender information) <u>*Cross-sectional analysis*</u> Time 1 (2008) –*n* = 12,714 Time 2 (2009) –*n* = 12,567 Time 3 (2010) –*n* = 13,176	*Design:* Longitudinal and cross-sectional *Predictor:* 1) PALS (Midgley et al., 1993) – Specific measure of ASE 2) Academic Self-discipline measured by International Personality Item Pool (Goldberg et al., 2006 *Outcome:* Official semester GPA	<u>*Longitudinal*</u> 1. ASE positively correlated to GPA across all time points 2. A mediation effect of academic self-discipline on the relationship between ASE and performance was not supported <u>*Cross-sectional*</u> 1. Academic self-discipline fully mediated the relationship between ASE and academic performance when measured in all time points

Kassab et al (2015)	*Country:* Egypt *n = 171* No other data provided	*Design:* Cross-sectional *Predictor:* Academic Self-efficacy subscale of the MSLQ (Pintrich et al., 1993) – Specific measure of ASE *Outcome:* Examination scores (official or self-report unknown)	1. Path analysis showed a statistically significant relationship as follows: *self-efficacy→ metacognition→ effort regulation →academic performance*
Khan (2013)	*Country:* Turkey *n* = 300 - 151 M, 149 F No other data provided	*Design:* Cross-sectional *Predictor:* Turkish adaptation of the general perceived self-efficacy scale (Yesila et al. 2012, as cited in Khan et al., 2013) – Insufficient detail of measure of ASE to classify *Outcome:* Average scores on committee examinations	1 There was no significant correlations found between mean examination scores and self-efficacy mean scores in first year (r = -.11, p = .276), second year (r = .20, p = .18) and third year (r = -.04, p = .75) of medical training
Kitsantas & Zimmerman (2009)	*Country:* USA *n* = 223 – 56 M, 167 F Mean age – 21.92	*Design:* Cross-sectional *Predictor:* SELF – Global measure of ASE *Outcome:* Official subject grade	1. SE positively correlated with grades (r = .58, p<.01) 2. Path analysis showed a direct effect of SE on grades ((β = .26, p<.05)
Kitsantas, Winsler & Huie (2008)	*Country:* USA *n* = 243 – 88 M, 155 F Mean age – 18	*Design:* Cross-sectional *Predictor:* Self-efficacy subscales from the MSLQ (Pintrich et al., 1993) – Specific measure of ASE *Outcome:* Official college GPA	1. SE positively correlated with second semester (r = .44, p<.001) and fifth semester GPA (r = .37, p<.01)
Klomegah (2007)	*Country:* USA *n* = 103 No other data provided	*Design:* Cross-sectional *Predictor:* 1) MSLQ and Self-efficacy for Self-Regulated Learning Scale used in Carroll & Gravalia (2004) – Specific measure of ASE *Outcome:* Course grades (official or self-report not disclosed)	1 Self-efficacy strongly correlated with academic performance (r = .32, p < .001) 2 Multivariate regression showed that self-efficacy measures explained 40% variance in academic performance. Self-efficacy was the second strongest contributor (β = .37, p < .01) after high school GPA (β = .50, p < .001)
Komarraju & Nadler (2013)	*Country:* USA *n* = 407 - 196 M, 211 F Mean age - 20.48 years	*Design:* Cross-sectional *Predictor:* MSLQ (Pintrich, Smith, Garcia & McKeachie, 1993) – Specific measure of ASE *Outcome:* Self-reported GPA	1 ASE showed a positive correlation with GPA (r=.30, p<.01) 2 Mean split used to create high and low ASE groups. High ASE group scored higher on mastery goal setting than low ASE group (partial η^2 = .12, p<.001 3 ASE only motivational variable from the MSLQ that significantly predicted positive correlation with GPA (R^2 = .09, p<.001) 4 Effort regulation showed a positive partial mediated relationship between ASE and GPA (p<.001)

Krumrei-Mancuso et al (2013)	*Country:* USA *n* = 579 - 205 M, 374 F Mean age = 18.24 years	*Design:* Cross-sectional *Predictor:* Academic self-efficacy, a scale from the College Learning Effectiveness Inventory (CLEI; Newton et al., 2008) – Global measure of ASE *Outcome:* Official first semester and end of year College GPA	1. Academic self-efficacy was strongly correlated with first semester GPA (r = .36) and end of year GPA (*r* = .34) 2. First semester GPA acted as a positive partial mediator between academic self-efficacy and end of year GPA (50% of the effect was mediated).
Lane, Hall & Jane (2004)	*Country:* UK *n* = 65 Mean age = 20.23 years (SD = 4.21)	*Design:* Longitudinal *Predictor:* Self-efficacy toward statistics questionnaire (STSQ; Lane et al., 2002) - Specific measure of ASE *Outcome:* Assignment grade from statistics module	1. SE did not significantly relate to module performance in week 2 of the academic semester but did positively relate to module performance when measured in week 7 of the academic semester (R^2 = .17, p<.05)
Lane, Lane & Kyprianou (2004)	*Country:* UK *n* = 205 – 82 M, 123 F Mean age = 27.5 years (SD = 5.6)	*Design:* Cross-sectional *Predictor:* Self-efficacy to gain a pass in assessments as measured by confidence scale from Bandura (1997) – Specific measure of ASE *Outcome:* Mean mark of assessed modules completed in academic semester	1. SE to gain a pass was negatively correlated with mean module marks (*r* = -.33, p<.05)
Lawson, Banks & Logvin (2007)	*Country:* USA *n* = 459 – 159 M, 300 F No age data provided	*Design:* Longitudinal *Predictor:* Self-efficacy measured by 16-item questionnaire by author – Specific measure of ASE *Outcome:* Final course grade	1. Self-efficacy measured at week 2 of the semester did not significantly correlate with course grade (*r = -.09)* 2. Self-efficacy measured at end of semester significantly correlated with course grade (*r* = .24, p<.01)
Lynch (2006)	*Country:* USA *n* = 501 - 127 M, 137 F No age data provided	*Design:* Cross-sectional *Predictor:* Self-efficacy for learning and performance subscale from the MSLQ (Pintrich et al., 1993) – Specific measure of ASE *Outcome:* Course grades (official or self-report not disclosed	1 Self-efficacy had the strongest correlation with college grades for freshman (*r* = .33, p < .01) and the second strongest correlation for upper level students (*r* = .32, p < .01) following effort regulation 2 Freshman students grades were predicted by self-efficacy and extrinsic goal orientation (R = .405, F (3, 246) = 16.066, p < .000) and Upper level students grades were predicted with effort and self-efficacy (R = .434, F (2, 169) = 19.637, p < .000)
Lynch (2010)	*Country:* USA *n* = 76 - 27 M, 49 F No other data provided	*Design:* Cross-sectional *Predictor:* Self-efficacy for learning and performance subscale from the MSLQ (Pintrich et al., 1993) – Specific measure of ASE *Outcome:* Official semester grade	1. Final grade was strongly associated with self-efficacy (*r* = .52, p < .01). 2. Self-efficacy had a stronger correlation with male's (*r* = .71, p < .01) than females (*r* = .42, p < .01) semester grade, despite no statistically significant gender difference in semester grades

Lynch & Dembo (2004)	*Country:* USA *n* = 94 – 47 M, 47 F Mean age = 20.6 years	*Design:* Cross-sectional *Predictor:* Self-efficacy subscale of the MSLQ (Pintrich et al., 1993) – Specific measure of ASE *Outcome:* Final grades as percentages	1. SE positively correlated with final grades (*r* = .29, p<.01)
Lynch & Trujillo (2011)	*Country:* USA *n* = 66 No other data provided	*Design:* Cross-sectional *Predictor:* Self-efficacy for learning and performance subscale from the MSLQ (Pintrich et al., 1993) – Specific measure of ASE *Outcome:* Semester grade (official or self-report not disclosed)	1. Student self-efficacy was highly correlated with academic performance (*r* = .53, p < .001)
Neuville et al (2007)	*Country:* Belgium *n* = 184 - 30 M, 154 F Mean age - 18.3 years	*Design:* Cross-sectional *Predictor:* 1) Self-Efficacy questions (Galand, 2001) – General measure of ASE 2) Learning strategies 20 item questionnaire from Bourgeois et al (2003) *Outcome:* Official subject grade	1 ASE did not directly correlate with performance (*r* = .09, p>.05). 2 ASE significantly predicted deep processing strategies which in turn influenced achievement (p<.01)
Obrentz (2012)	*Country:* USA *n* = 413 – 145 M, 268 F No age related data provided	*Design:* Longitudinal *Predictor:* 1) MSLQ – Specific measure of ASE 2) 30 item chemistry motivation questionnaire *Outcome:* Final course grades (official or self-reported not disclosed)	1 Self-Efficacy positively correlated with performance at time 2 (*r* =.54, p<.01) and time 3 (*r* =.56, p<.01). Medium correlations found at time 1 (*r* = .4, p<. 01) 2 Self-efficacy significantly predicted performance at time 1 (β = .19, p<.001), time 2 (β = .37, p<.001) and time 3 (β = .34, p<.001). The relative importance of self-efficacy as a predictor increased from time 1 to time 2 and remained stable from time 2 to time 3.
Olani (2009)	*Country:* Netherlands (Ethiopian sample) *n* = 214 - 171 M, 43 F Mean age = 19.5 years (SD = 1.31 years)	*Design:* Cross-sectional *Predictor:* CASES (Owen & Froman, 1988) – Global measure of ASE *Outcome:* Official GPA	1. Self-efficacy was positively correlated with GPA (*r* = .17, p < .05) 2. Achievement motivation and SE explained 4% variance in students university GPA (R^2 = .04, F(2,212) = 4.38, p < .05). However, SE did not uniquely predict performance when included in a model considering past performance factors. 3. ASE positively predicted first semester GPA (R^2 = .04, p < .05).
Ouweneel & Schaufeli (2013)	*Country:* Netherlands *n* = 335 - 51 M, 284 F Mean age 20.7 years (SD = 2.0 years)	*Design:* Controlled trial *Predictor:* PALS (Midgley, Maeher & Urdan, 1993) – Specific measure of ASE *Outcome:* Official GPA	1 Changes (Increase/decrease) in self-efficacy in an experimental setting was significantly related to corresponding change (increases/decreases) in academic performance over time (Wilks Lambda = .84, F(6, 660) = 9.70, p < .001) 2. No significant changes to SE found in a naturalistic setting over time
Partin & Haney (2012)	*Country:* USA *n* = 318 No other data provided	*Design:* Cross-sectional *Predictor:* Self-efficacy for learning and performance subscale from the MSLQ (Pintrich et al. 1993) – Specific measure of ASE	1. ASE positively correlated to performance (*r* = .56, p<.05) 2. Self-efficacy mediated the relationship between attitudes toward biology and course performance 3. Self-efficacy significantly predicted course performance (Adjusted R^2 = .30, F (1,

		Outcome: Official final course grade	302) = 131.526, p < .001) and accounted for 30.3% variance in course performance.
Phan (2009)	*Country:* Australia *n* = 264 – 145 M, 119 F No other data provided	*Design:* Longitudinal *Predictor:* Self-Efficacy subscale from MSLQ (Pintrich et al., 1993) – Specific measure of ASE *Outcome:* Official subject grade	Time 1 – Cross sectional 1. Path analysis showed a statistically significant relationship as follows: *mastery goals→ self-efficacy → deep processing → academic performance* (p<.05) Longitudinal results 1. Path analysis showed a statistically significant relationship as follows: *mastery goals at T1→ self-efficacy at T1 → mastery goals at T2 → self-efficacy goals at T2* (p<.05)
Phan (2010)	*Country:* Australia *n* = 290 - 112 M, 178 F Mean age – 19 years	*Design:* Cross-sectional *Predictor:* 1) Self-Efficacy subscale from MSLQ (Pintrich et al,. 1993) 2) 5 item scale from PALS (Midgley et al., 1993) – Both specific measures of ASE *Outcome:* Official subject grade	1 ASE not significantly correlated with performance (*r*=.04) 2 Self-esteem is predictive of ASE (p<.01) Structural paths 1 Self-esteem - ASE - performance approach goals - surface processing - academic performance (p<.01) 2 ASE - mastery goals - academic performance (p<.05) 3 ASE - deep processing - academic performance (p<.01)
Pourtashi et al (2013)	*Country:* Iran *n* = 466 - 214 M, 252 F Mean age = 21.36 years	*Design:* Cross-sectional *Predictor:* Self-efficacy beliefs scale adapted from the MSLQ (Pintrich et al., 1993) – Specific measures of ASE *Outcome:* Official GPA	1. Self-efficacy beliefs were significantly related to academic performance (*r* = .35, p < .01) 2. Path analysis showed that self-efficacy beliefs were predictive of academic performance directly (β = .460) and indirectly through motivation to achieve success.
Putwain et al (2013)	*Country:* UK *n* = 206 - No gender data Mean age - 21.7 years	*Design:* Longitudinal *Predictor:* 1) Academic Confidence scale (Sander & Sander, 2003) – Global measure of ASE 2) Achievement Emotions Questionnaire (Pekrun et al., 2011) *Outcome:* Official subject grade	1 ASE for studying measured at the beginning of semester 1 correlated positively with semester 1 (*r*=.22, p<.001) and 2 (*r*=.21, p<.01) performance (p<.01) 2 Positive relationship between initial levels of ASE and pleasant learning related emotions at the beginning of semester 2 (p<.001) and semester 1 performance (p<.01). 3. SE indirectly influenced semester 2 performance through semester 1 performance and pleasant learning related emotions at the beginning of semester 2
Tabak et al (2009)	*Country:* USA *n* = 173 - 95 M, 78 F Mean age = 22 years	*Design:* Cross-sectional *Predictor:* Self-efficacy measured by 1 item question asking students how confident they were of attaining a course letter grade – Specific measures of ASE *Outcome:* Final course grades (official or self-report not disclosed)	1. Self-efficacy was significantly correlated with course performance (*r* =.35, p < .01) 2. Self-efficacy partially mediates the relationship between conscientiousness and performance; However, this effect is moderated by time spent on the task (β = 0321, p < .05) and the indirect effect is not significant at low levels of time on task but is significant at higher levels of time on task

Turner et al (2009)	*Country:* USA *n* = 264 - 92 M, 172 F Mean age - 19.27 years	*Design:* Cross-sectional *Predictor:* The Self-Efficacy and Study Skills Questionnaire containing CASES and CSEI (Gredler & Garavalia, 2000) – Both global measures of ASE *Outcome:* Self-reported GPA	1 ASE positively correlated with GPA (*r* = .25, p<.01) 2 ASE found to significantly predict academic performance (p<.001)
Villavicencio & Bernado (2009)	*Country:* Philippines *n* = 1,345 - 906 M, 439 F Mean age = 16.46 years (SD = 1.66 years)	*Design:* Cross-sectional *Predictor:* 1) Self-efficacy beliefs scale derived from the MSLQ (Pintrich et al., 1993) – Specific measure of ASE 2) The Academic Emotions Questionnaire (Pekrun et al., 2005) *Outcome:* Official final grade	1. Self-efficacy was significantly correlated with final grade (*r* = .37, p < .0001) 2. Higher self-efficacy was related to higher grades among students who reported lower levels of negative academic emotions. Self-efficacy had minimal or no effect on grades among students who reported higher levels of negative academic emotions
Weiser & Riggio (2010)	*Country:* USA *n* = 193 - 54 M, 139 F Mean age = 20 years	*Design: Cross-sectional* *Predictor:* The SES (Sherer et al., 1982) – Global measure of ASE *Outcome:* Self-reported GPA	1 ASE positively correlated with GPA (*r* = .30, p<.01) 2 ASE significantly predicted GPA (R^2 = .09, p<.01) 3 ASE found to positively mediate relationship between parental involvement and achievement (p<.001)
Zajacova et al (2005)	*Country:* USA n = 107 - 29 M, 78 F Mean age = 20.7 years	*Design:* Cross-sectional *Predictor:* 1) New 27 item scale of ASE and stress 2) 9 items selected from Academic Milestones Scale (Lent et al., 1986) & CSEI (Solberg et al., 1993) 3) Remaining items derived from survey conducted at the college where research was conducted – Global measures of ASE *Outcome:* Official college GPA	1 ASE had a significant positive effect on GPA (β = .25, p<.001). Stress and background variables did not significantly relate to GPA (β = -.27, p>.05) 2 ASE and background variables included in questionnaire accounted for 32% of variance in GPA (although background variables had very little influence) 3 High school performance (β = .43, p<.05) was a stronger predictor of performance than ASE (β = .25, p<.001)

Supplementary File 1

List of Excluded Studies and Reasons for Exclusion in Alphabetical Order

No	Author	Reason for exclusion
1	Abo Habieb, E. E., El-Shaer, A. M., Shrief, W. I., & Elsayed, N. M. (2013). *Life Science journal, 10(3)*, 2707-2716	Academic Self-efficacy not predictor variable
2	Artino, A. R., La Rochelle, J. S., & Durning, S. J.(2010). *Medical Education, 44 (2),* 1203-1212	Academic Self-efficacy not predictor variable
3	Braten, I., Samuelstuen, M. S., & Stromso, H. I. (2004). *Educational Psychology, 24 (2), 231-247*	Academic performance not an outcome variable
4	Burgoon, J. M., Meece, J. L., & Granger, N. A. (2012). *Anatomical Sciences Education, 5, 249-255*	No correlational data could be obtained
5	Caprara, G. V., Fida, R., Vecchione, M., Del Bove, G., Vecchio, G. M., Barbaranelli, C., & Bandura, A. (2008). *Journal of Educational Psychology, 100 (3), 525-534*	Not a university sample
6	Caprara, G. V., Vecchione, M., Alessandri, G., Gerbino, M., & Barbaranelli, C. (2011). *British Journal of Educational Psychology, 81(1), 78-96*	Not a university sample
7	Cassidy, S. (2011). *Studies in Higher Education, 36(8), 989-1000*	Commentary paper
8	Chamorro-Premuzic, T., Harlaar, N., Greven, C. U., & Plomin, R. (2010). *Intelligence, 38(4), 385-392*	Not a university sample
9	Chang, C., Liu, E. A., Sung, H., Lin, C., Chen, N., & Cheng, S. (2014). *Innovations in Education and Teaching International, 51(4), 366-377.*	No correlational data could be obtained
10	Clark, M. H., Middleton, S. C., Nguyen, D., & Zwick, L. K. (2014). *Learning and Individual Differences, 33, 30-38*	Academic Self-efficacy not predictor variable
11	Clayton, K., Blumberg, F., & Auld, D. P. (2010). *British Journal of Educational Technology, 41(3), 349-364*	Academic performance not an outcome variable
12	Concannon, J. P., & Barrow, L. H. (2012). *Journal of Science Education and Technology, 21(6), 742-753*	Academic performance not an outcome variable
13	Davidson, O. B., Feldman, D. B., & Margalit, M. (2012). *The Journal of Psychology: Interdisciplinary and Applied, 146 (3)*, 333-352	Intervention study
14	DeTure, M. (2004). *American Journal of Distance Education, 18(1), 21-38.*	No correlational data could be obtained
15	Di Gunta, L., Alessandri, G., Gerbino, M., Kanacri, P. L., Zuffiano, A., & Caprara, G. V. (2013). *Learning and Individual Differences, 27, 102-108*	Not a university sample
16	Downing, K. J. (2009). *International Journal of Learning, 16 (4),* 185-200	Academic Self-efficacy not predictor variable
17	Elias, S. M., & MacDonald, S. (2007). *Journal of Applied Social Psychology, 37(11), 2518-2531*	No correlational data could be obtained
18	Garriott, P. O, & Flores, L. Y. (2013). *Education Publishing Foundation, 1(2),* 85-94	Not a university sample
19	Hailikari, T., Nevgi, A., & Komulainen, E. (2008). *Educational Psychology, 28 (1),* 59-71	Academic Self-efficacy not predictor variable
20	Hamaideh, S. H., & Hamdan-Mansour, A. M. (2014). *Nurse Education Today, 34(5), 703-708*	Academic Self-efficacy not predictor variable
21	Hen, M., & Goroshit, M. (2014). *Journal of Learning Disabilities, 47(2), 116-124*	No correlational data could be obtained
22	Henning, M. A., & Shulruf, B. (2011) *Psychologia, 54, 135-144*	Academic Self-efficacy not predictor variable
23	Hii, L. M. T. C. F. (2013). *No reference – was a conference paper*	Conference paper
24	Hodges, C. B., & Kim, C. (2010). *Journal of Educational Computing Research, 43(2), 207-223*	Academic Self-efficacy not predictor variable

25	Hoigaard, R., Kovac, V. B., Overby, N. C., Haugen, T. (2015). *School Psychology Quarterly, 30(1), 64-74*	Not a university sample
26	Huang, C. (2013). *European Journal of Psychology of Education, 28(1)*, 1-35	Meta analysis
27	Ihm, J., & Lee, G., & Kim, K., Jang, K., & Jin, B. (2013). *Journal of Dental Education, 77(12),* 1616-1623	Academic Self-efficacy not predictor variable
28	Jahanian, R., & Mahjoubi, S. (2013). *Middle Eastern Journal of Scientific Research, 15(7), 1021-1027*	No correlational data could be obtained
29	Jurecska, D. E., Chang, K. B. T., Peterson, M. A., Lee-Zorn, C. E., Merrick, J., & Sequeira, E. (2012). *International Journal of Adolescent Medicine and Health, 24(4),* 355-362	Academic Self-efficacy not predictor variable
30	Karimi, F. K (2010). *The international Journal of Learning, 17(8), 63-76.*	No correlational data could be obtained
31	Lavasani, M. G., Ejei, J., & Afshari, M (2009). *Journal of Psychology, 13(3), 289-305*	Not a university sample
32	Lee, S. H., Chen, C. Y., & Sok, K. (2010). *Social Behavior and Personality, 38(7),* 969-978	Academic Self-efficacy not predictor variable
33	Lee, W., Lee, M. J., & Bong, M. (2014). *Contemporary Educational Psychology, 39(2), 86-99.*	Not a university sample
34	Lewis, J. (2009). *No reference - was a dissertation*	Academic Self-efficacy not predictor variable
35	Lindley, L. D. (2006). *Journal of Career Assessment, 14(1),* 143-160	Not a university sample
36	Mahyuddine, R., Elias, H., & Noordin, N. (2009). *International Journal of Interdisciplinary Social Sciences, 4(4),* 95-102	Academic Self-efficacy not predictor variable
37	Majer, J. M. (2009). *Educational Publishing Foundation, 2(4),* 243-250	Academic Self-efficacy not predictor variable
38	Mattern, K. D., & Shaw, E. J. (2010). *Journal of College Student Development, 51(6),* 665-678	Academic Self-efficacy not predictor variable
39	Muis, K. R., & Ranellucci, J., & Franco, G. M., & Crippen, K. J. (2013). *Journal of Experimental Education, 81(4),* 556-578	Academic Self-efficacy not predictor variable
40	Neuville, S., Frenay, M., Schmitz, J., Boudrenghien, G., Noel, B., & Wertz, V. (2007). *Psychologica Belgica, 47(1-2),* 31-50	Academic Self-efficacy not predictor variable
41	Nicolaou, A. A., & Philippou, G. N. (2007). *No reference – was a conference paper*	Conference paper
42	Phan, H (2012). *Educational Psychology, 32(1), 81-105*	Not a university sample
43	Rezaei, A. (2012). *Gender and Education, 24(4),* 393-409	Academic performance not an outcome variable
44	Richardson, M., & Abraham, C., & Bond. (2012). *Psychological Bulletin, 138(2),* 353-387	Systematic review and meta-analysis
45	Thelwell, R. C., Lane, A. M., & Weston, N. J. V. (2007). *Personality and Individual Differences, 42(3),* 573-583	Academic Self-efficacy not predictor variable
46	Thompson, J. G., Oberle, C. D., & Lilley, J. L. (2011). *Journal of College Student Development, 52(6),* 749-753	Academic Self-efficacy not predictor variable
47	Van Westhuizen, S. D., & De Beer, M., & Bekwa, N. (2011). *Journal of Psychology in Africa, 21(3),* 473-478	Academic Self-efficacy not predictor variable
48	Vancouver, J. B, & Kendall, L. N. (2006). *Journal of Applied Psychology, 91(5),* 1146-1153	Academic Self-efficacy not predictor variable
49	Vuong, M., Brown-Welty, S., & Tracz, S. (2010). *Journal of College Student Development, 51*(1), *50-64*	No correlational data could be obtained
50	Weissbeg, N. C., & Owen, D. R. (2005). *Psychological Bulletin, 131(3),* 407-409	Commentary paper
51	Yip, M. C. W. (2012). *Quality in Higher Education, 18(1), 23-34.*	No correlational data could be obtained

52	Zhu, Y. Q., Chen, L. Y., Chen, H. G., & Chern, C. C. (2011). *Computers and Education, 57(4), 2476-2484*	Not a university sample
53	Zimmerman, B. J., & Kitsantas, A. (2005). *Contemporary Educational Psychology, 30(4), 397-417.*	Not a university sample
54	Zuffiano, A., Alessandri, G., Gerbino, M., Luengo Kanacri, B. P., Di Giunta, L., Milioni, M., & Caprara, G V. (2013). *Learning and Individual Differences, 23, 158-162*	Not a university sample