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Socio-economic status and academic performance in higher education: A systematic review☆

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ABSTRACT

Previous educational research has extensively investigated the relationship between socio-economic status (SES) and academic performance. In higher education, however, this relationship still deserves a comprehensive examination given both practical and conceptual reasons. To attend to this need, a mixed-methods systematic literature review of 42 studies has been carried out. In the first part, a summative content analysis examines how SES and academic performance are measured. In the second part, a meta-analysis estimates the effect size of the relationship between SES and academic performance in higher education. Findings suggest that SES is measured through education, occupation, income, household resources, and neighborhood resources, while academic performance in higher education is measured through achievement, competencies, and persistence. Furthermore, the meta-analysis reveals a positive yet weak relationship between SES and academic performance in higher education. Prior academic achievement, university experience, and working status are more strongly related to academic performance than SES.

1. Introduction

Over the past years, the student population applying to and entering university has become more diverse in terms of social, cultural and economic capital, age, nationality (Morlaix & Suchaut, 2014), prior education, and academic achievement (Anderton, Evans, & Chivers, 2016). Moreover, in many countries, social changes have also contributed to changes in higher education systems; thus, although there is still a long way to go, participation from students from low social and economic backgrounds in higher education is increasing (Hansen & Mastekaasa, 2006). In order to achieve a better understanding of these changes in higher education systems, several researchers have explored the relationship between socio-economic status (SES) and academic performance, finding a weak to moderate relationship (e.g., Richardson, Abraham, & Bond, 2012; Sackett et al., 2012; Westrick, Le, Robbins, Radunzel, & Schmidt, 2015).

Given the increasing participation of students from low SES backgrounds and the weak to moderate relation between SES and academic performance, one could wonder whether we still need to study the relationship between SES and academic performance in

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higher education. However, both practical and conceptual reasons exist that warrant continued attention. Firstly, the common trend in the literature has been to use SES as a covariate instead of establishing, in a more comprehensive way, its influence on students' experiences and outcomes (McKenzie & Schweitzer, 2001; Walpole, 2003). By doing the latter, the higher education sector can gain a deeper understanding on how SES and academic performance are related, which might be necessary in order to deal appropriately with the increased diversity in the student population. Secondly, recent meta-analyses in higher education (Richardson et al., 2012; Schneider & Preckel, 2017; Westrick et al., 2015) have focused primarily on calculating the effect size of the relationship between SES and academic performance, possibly ignoring the influence of several other students' and institutional characteristics on this relationship. Thirdly, based on analytic schemes such as the Astin's input-environment-output model (Astin, 1993), it could be argued that the relationship between SES and academic performance in higher education changes when additional variables are taken into account. As such, it seems inadequate to explore students' academic performance as a single-factor phenomenon (De Clercq, Galand, Dupont, & Frenay, 2013).

Although studies reviewing the relationship between SES and academic performance in primary and secondary schools are available (e.g., Sirin, 2005), it cannot be assumed that these results are generalizable to the context of higher education. By carrying out a mixed-methods systematic literature review, this study seeks to fill the gap that exists in the extensive literature devoted to examining the relationship between SES and academic performance in higher education. This article begins by presenting several issues pertaining to the definition of SES and academic performance, and then describes previous research in the literature regarding their relationship. Next, the methodology of this study is outlined in detail, explaining how both summative content analysis and meta-analysis are carried out. Subsequently, the answers to the research questions addressed in this research are presented. The article concludes with the discussion and implications of the key findings of this systematic literature review.

2. Theoretical framework

2.1. Conceptualizing and measuring socio-economic status (SES)

The understanding of students' socio-economic conditions became a major concern for educational researchers when low academic performance at school was observed in students whose parents had low income, low levels of education, and were employed at low-status jobs (Cowan et al., 2012). Although SES can be considered as one of the most commonly used variables in educational research (Sirin, 2005), it has been conceptualized in different ways in the literature. For instance, Chapin (as cited in White, 1982) defined SES in 1928 as: "the position that an individual or family occupies with reference to the prevailing average of standards of cultural possessions, effective income, material possessions, and participation in group activity in the community" (p. 99). Mueller and Parcel (1981) defined SES as the position of an individual, family, or group on a hierarchy based on economic, power, and prestige dimensions. More recently, SES has been defined as the amount of economic, social, and cultural resources available to one student (Cowan et al., 2012; De Clercq, Galand, & Frenay, 2017).

The different dimensions of SES have been operationalized using either single indicators, multiple indicators analyzed separately, or several indicators combined in a composite score (Australian Bureau of Statistics, 2011; Cowan et al., 2012; Shavers, 2007). Moreover, the indicators of SES can be observed at several levels, namely, the individual, family, or area levels (Australian Bureau of Statistics, 2011; Krieger, Williams, & Moss, 1997). At the individual level, education, occupation, and income have been used as indicators for SES in previous educational research (Cowan et al., 2012; Sackett, Kuncel, Arneson, Cooper, & Waters, 2009; Van Ewijk & Sleegers, 2010). Education, occupation, and income can consistently capture students' socio-economic conditions regardless of the time in which they are observed (Erola, Jalonen, & Lehti, 2016). In addition, these measurements are easy to interpret and communicate (Cowan et al., 2012). At the family level, household resources have been suggested as the fourth indicator for SES (Sirin, 2005). Household resources refer to possessions such as cars, books, computers, and musical instruments (De Clercq et al., 2017; Pedrosa, Dachs, Maia, Andrade, & Carvalho, 2007). Finally, at the area level, neighborhood resources have been reported as the fifth indicator for SES (Australian Bureau of Statistics, 2011; Cowan et al., 2012; Shavers, 2007). Interestingly, financial and social resources that do not come exclusively from the family can also be related to students' academic performance (Cowan et al., 2012). Such is the case, for example, with neighborhood characteristics and resources like the degree of urbanization (Hansen & Mastekaasa, 2006), and the number of parks and libraries in the area where students live (Cowan et al., 2012).

How education, occupation, income, and household resources interact in the measurement of SES, however, is rather complex. In particular, education has been the most commonly used indicator to assess SES (Australian Bureau of Statistics, 2011; Shavers, 2007) because of its relationship with other aspects of socio-economic status (Erola et al., 2016; Galobardes, Shaw, Lawlor, Lynch, & Smith, 2006). In fact, higher levels of education are related to the subsequent benefits they offer for a person's life and wellbeing, such as a better job, working conditions, and higher-income (Shavers, 2007). Similarly, occupation is also commonly used as an indicator of SES mainly due to its relationship with education and income (Erola et al., 2016; Ganzeboom, De Graaf, & Treiman, 1992). In this case, income represents the amount of social and economic resources a student can have (Australian Bureau of Statistics, 2011; Galobardes et al., 2006; Sirin, 2005), whereas household resources, therefore, can also indicate whether a student's home situation is adequate for learning (Van Ewijk & Sleegers, 2010).

In summary, SES is a broad concept that encompasses two primary dimensions: prestige and resources (Krieger et al., 1997). The first dimension determines the hierarchical position of an individual in a society (Mueller & Parcel, 1981), while the second dimension determines the economic, social, and cultural resources which an individual has access to (Cowan et al., 2012; De Clercq et al., 2017). In addition, education, occupation, income, and household resources have been widely used as measurements to assess SES.

2.2. Measuring academic performance in higher education

When searching for the definition of students' academic performance in higher education, the lack of consensus in the educational literature is evident. Terms such as performance, achievement, and success are used interchangeably among educational researchers without any specific reason (e.g., Casillas et al., 2012; Rochford, Connolly, & Drennan, 2009; Tracey, Allen, & Robbins, 2012). Also, an operationalization (e.g., Grade Point Average) rather than a conceptual definition is mostly reported when defining academic performance in higher education. Despite this lack of consensus, academic achievement, competencies, and persistence have been used as separate, although interrelated, measurements to assess students' academic performance in higher education. Simply looking at academic achievement does not necessarily encompass or represent students' acquisition of competencies nor their persistence (York, Gibson, & Rankin, 2015).

Academic achievement can be defined as the attainment of either medium- or long-term educational goals (Yusuf, 2002). In this respect, Li, Chen, and Duanmu (2010) have pointed out that prior academic achievement is strongly related to students' academic performance at university. As a matter of fact, a considerable number of studies have reported the explanatory role of prior academic achievement in academic performance at university (e.g. Betts, Elder, Hartley, & Blurton, 2008; Byrne & Flood, 2008; Casillas et al., 2012; McKenzie & Schweitzer, 2001; Pike & Saupe, 2002; Roberts, 2007). Furthermore, a competency is a "performance capacity to do as well as to know which is judged by some level or standard of performance" (Shavelson, 2010, p. 44). In particular, higher education aims at developing both specific and generic competencies (Sadler, 2013). Undoubtedly, a deeper understanding of academic performance in higher education requires the assessment of both generic and specific student competencies (Blömeke, Zlatkin-Troitschanskaia, Kuhn, & Fege, 2013). Consequently, the assessment of competencies has arisen in many countries at different stages of the higher education learning process (Zlatkin-Troitschanskaia, Shavelson, & Kuhn, 2015). Finally, Tinto's (1993) theory of departure indicates that students persist when they are integrated into both the academic and social systems of the university. Persistence can be understood as the students' academic progression towards degree completion regardless of institutional transfers, academic programs, or institutional contexts (York et al., 2015). The dropout rate has usually been suggested as an indicator of persistence in higher education (Hilton, 1982; Tinto, 1975, 1993).

2.3. The relationship between SES and academic performance

One of the most crucial turning points in educational research during the 20th century was the publication of a 1966 report by Coleman and colleagues entitled Equality of Educational Opportunity (EEO). The report suggested that high school characteristics were unrelated to academic performance in the USA, but students' socio-economic conditions were. Consequently, many educational researchers have carried out studies aimed at understanding Coleman's main findings.

On the one hand, several authors have postulated theoretical frameworks, such as Astin's (1984, 1999) student involvement theory or Bourdieu's (1986) social capital theory, which could explain how SES and academic performance are related. Regarding social capital theory (Bourdieu, 1986), Dika and Singh (2002) critically reviewed the literature (published between 1986 and 2001) that relates social capital to educational outcomes and identified several problems with the conceptualization and measurement of social capital as a predictor of academic performance. In particular, sources of social capital are often confused with the resources and opportunities coming from it; thus, there is no clear distinction between possession and activation of social capital (Dika & Singh, 2002). Additionally, the selection of cross-sectional data has made it difficult to determine how social resources and educational outcomes are related (Dika & Singh, 2002). Therefore, it cannot be entirely accepted that social capital explains how SES is related to academic performance (Jæger, 2011; Sullivan, 2001).

On the other hand, several meta-analytic studies have been conducted in different educational settings. Focusing on the elementary and secondary levels, the main objectives of these meta-analyses (e.g., Sirin, 2005; Van Ewijk & Sleegers, 2010; White, 1982) have been: (1) to determine the effect size of the relationship between SES and academic performance; and (2) to identify which factors could moderate the relationship between SES and academic performance. Regarding the first objective, the findings show a positive, albeit moderate, relationship, as indicated by average correlations of .343 (S.D. = .204; White, 1982), .299 (S.D. = .169; Sirin, 2005) and .32 (S.E. = .016; Van Ewijk & Sleegers, 2010). With respect to the second objective, the results suggest that methodological factors such as the unit of analysis (Sirin, 2005; White, 1982), the definition of SES (White, 1982), the source of the SES data, the range of the SES, and the type of SES-performance measure (Sirin, 2005), moderate the relationship between SES and academic performance.

Delving into higher education, one of the objectives of these meta-analyses (e.g., Richardson et al., 2012; Schneider & Preckel, 2017; Westrick et al., 2015) has been to explore the effect size of the relationship between SES and academic performance. Richardson et al. (2012) found a small correlation between SES and academic performance ($r = .11$, 95% CI [.08, .15]). Similarly, Westrick et al. (2015) reported that SES is weakly related to first-year GPA ($r = .24$, 95% CI [.24, .25]) and second-year retention at university ($r = .10$, 95% CI [.09, .11]). Finally, SES was ranked in the 68th place among 105 variables associated with academic performance in higher education (Schneider & Preckel, 2017). A concluding remark of this body of research is that there is a weak to moderate relationship between SES and academic performance in higher education. However, a more comprehensive exploration of this relationship is still missing in the educational literature.

2.4. Mediators of the relationship between SES and academic performance

Several theories have been proposed to explain how students grow and change during their university studies (Long, 2012). A

well-known example within this body of literature is Astin's (1984, 1999) theory of involvement. Students' involvement refers to the extent to which a student invests energy into his or her university experience —the greater the student's involvement, the greater the students' learning and development (Astin, 1984, 1999). One analytic scheme drawn from Astin's theory of involvement is the input-environment-output (IEO) model (Astin, 1993). The I-E-O model suggests that students' educational outcomes are defined by the students' inputs (e.g., their demographic characteristics, prior academic achievement), the environmental elements (e.g., university organizations, peer relations), and the interaction among students' inputs and environmental elements (Astin, 1993). Most of the predictive studies in higher education lack of a theoretical foundation, being more empirically-based than theory-driven. Nevertheless, the I-E-O model seems to be a suitable approach to analyze the literature in higher education regarding the prediction of academic performance for two reasons. First, the I-E-O model allows for the investigation of the direct and indirect influence (via environmental characteristics) of students' inputs on students' educational outcomes. Second, the I-E-O model recognizes the longitudinal nature of the student retention process and provides a framework for the investigation of it (Kelly, 1996).

Starting from the I-E-O model, predictive studies in higher education can be classified into two types. The first type of predictive studies, which is most likely the most frequent one in higher education, has examined academic performance as an “input-output” process, a common approach in the educational field. A review of the literature on the input-output analysis of the schools was carried out by Glasman and Biniaminov (1981). The authors concluded that inputs can be categorized into either student or school type, while the outputs can be classified as either cognitive or non-cognitive. Furthermore, a causal model including both the direct and indirect effects of inputs on outputs was also proposed by Glasman and Biniaminov (1981). The second type of predictive studies in higher education has investigated academic performance as an “input-environment-output” process. A similar analytic scheme at the school level is the context, input, process, and output model proposed by Scheerens (1990). In brief, context here refers to the school environment as well as the policy measures at a higher administrative level, while input relates to the available resources, teacher qualifications, and student characteristics. Process includes curriculum, school organization, and school climate, while output is generally defined in terms of students’ achievement.

Furthermore, the I-E-O model can frame the analysis of the mediators of the relationship between SES and academic performance in higher education. First, several “input-output” studies in higher education (e.g., Crawford, 2014; Stratton & Wetzel, 2011; Warburton, Bugarin, & Nuñez, 2001) have shown that (1) prior academic achievement is strongly related to academic performance in university and (2) prior academic achievement might diminish the strength of the SES-academic performance relationship. Although it has been amply documented that SES determines prior academic achievement, Marks (2017) has suggested that the influence of prior academic achievement on students’ outcomes is not solely explained by their SES at previous stages of life. Therefore, the first mediator investigated in this systematic literature review is prior academic achievement.

Second, the “input-process-output” studies in higher education have suggested that university experience (Gerken & Volkwein, 2000; Smith, 2016; Walpole, 2003) does influence the relationship between SES and academic performance. University experience refers to how a student connects to the academic environment of the university (Astin, 1999). More specifically, perception of the learning environment, peer support, and institutional commitment could define university experience (Astin, 1999; De Clercq et al., 2013). Thus, the second mediator investigated in this systematic literature review is university experience.

Third, although Astin (1999) suggested that holding a part-time job on campus could have a beneficial influence on students' retention, the explanatory role of working status has usually been investigated separately from the university experience. In this respect, the general trend in the literature has been to analyze the influence of worked hours on students’ academic performance (e.g., Nonis & Hudson, 2006; Rochford et al., 2009; Stinebrickner & Stinebrickner, 2003). Nevertheless, the reasons why students decide to work when attending university are diverse; so, it can be argued that not only would low SES students work during their studies (Yanbarisova, 2015). Hence, the third mediator investigated in this systematic literature review is working status.

3. Present study

Past educational research has contributed to the understanding of the relationship between SES and academic performance. However, recent meta-analyses in higher education (Richardson et al., 2012; Schneider & Preckel, 2017; Westrick et al., 2015) are limited, for two main reasons. Firstly, both SES and academic performance had been operationalized in these studies using only one indicator, which narrowed the understanding regarding how additional measures to assess such complex terms are related. Secondly, these meta-analyses did not explore how SES is first related to several student characteristics and, subsequently, is related to academic performance. This systematic review focuses on investigating the relationship between socio-economic status and academic performance in higher education in a more comprehensive manner. The first objective of this study is to analyze the different measures of SES and academic performance in higher education. Thus, the first research question addressed in this study is: *How are SES and academic performance in higher education measured?* The second objective of this study is to determine the mediating role of several factors on the relationship between SES and academic performance in higher education. Therefore, the second pair of research questions of this study are: *(a) What is the relationship between SES and academic performance in higher education? And (b) Is the relationship between SES and academic performance in higher education mediated by (i) prior academic achievement, (ii) university experience, and/or (iii) working status?* To answer these research questions, a mixed-methods research synthesis (Heyvaert, Maes, & Onghena, 2013) of the selected studies has been carried out. A mixed-methods approach makes it possible to integrate both qualitative analyses (e.g., for this study, summative content analysis) and quantitative analyses (e.g., for this study, meta-analysis) of the results of the studies in order to obtain conclusions about the current state of the art of the literature (Heyvaert et al., 2013).

Table 1
Overview of the literature search hits.

Query	Search terms	ERIC (Ovid)	PsycArticles	Scopus	SSCI	
1	'Higher Education' AND 'Academic Achievement'	13,668	429	988	345	*15,430*
	Update May 2017	333	17	110	80	*540*
2	'Higher Education' AND 'Academic Performance'	9535	287	752	553	*11,127*
	Update May 2017	264	9	186	145	*604*
3	'Higher Education' AND 'Academic Outcomes'	0	1708	83	66	*1857*
	Update May 2017	395[a]	78	20	15	*508*
Sub-total initial search		23,203	2424	1823	964	*28,414*
Sub-total update May 2017		992	104	316	240	*1652*
Total		**24,195**	**2528**	**2139**	**1204**	***30,066***

[a] This number of hits was obtained using the multi-field function and selecting references between 2000 and 2017.

4. Method

This systematic review proceeded in three phases. In the first phase, an extensive literature search within several scientific databases was conducted. Next, the relevant literature retrieved from these databases was selected for inclusion according to several criteria. In the second phase, the quality of the selected studies was critically appraised, and finally, the primary studies were analyzed following the guidelines of Aveyard (2014) and the performance of both a summative content analysis and meta-analysis.

4.1. Literature search and literature selection

In this systematic review, four databases were consulted: ERIC, Scopus, SSCI, and PsycArticles, using combinations of the following search terms: "higher education", "academic performance", "academic achievement", and "academic outcomes". The initial search yielded 28,414 non-unique studies, as shown in Table 1. The selection of the literature was based on eight criteria for inclusion. As reported by Gamoran and Long (2007), the citations of Coleman's report increased again by the end of the '90s and achieved an average of 55 citations per year from 2000, which represents a new interest for studying academic performance since then. Thus, studies published after 2000 (Criterion 1) were considered for subsequent analysis. Second, only empirical studies exploring academic performance in higher education were included in this analysis (Criterion 2). Studies focusing on specific subgroups of students (i.e., students with disabilities; online learners) were excluded (Criterion 3). As this systematic literature review focused on variables related to SES, studies concerning learning styles were not included (Criterion 4). Similarly, studies regarding age differences (Criterion 5), gender differences (Criterion 6), and ethnic differences (Criterion 7) were not included in this analysis. Finally, only studies that explicitly report the relationship between SES and academic performance were selected for further analysis (Criterion 8).

The selection process of the initial 28,414 studies was carried out in six steps. In step 1, duplicate studies were eliminated using the EndNote software, leaving 24,246 studies. In step 2, studies published before 2000 were excluded, leaving 9928 studies. Next, in step 3, studies without a date, a wrong date, or those that were not written in English or Spanish were eliminated, leaving 9658 studies. As expected, a summative content analysis requires a full understanding of the reviewed studies. Therefore, in step 4, the title and the abstract of the remaining studies were screened using the first seven criteria for inclusion presented above. As a result of this fourth step, 208 studies were retained for further analysis. In step 5, a total of 202 studies were scanned/read diagonally as six full texts articles could not be retrieved. This fifth step, using the same inclusion criteria, led to a further reduction in the number of studies to a total of 100. In the final step, the full texts of these 100 studies were read in-depth, and 69 additional studies were excluded using Criterion 8 presented above. As a result of the selection process, 31 studies remained. As any systematic review is a challenging and time-consuming task, 18 months passed between the first literature search and the writing of the first draft of this article. Hence, an update of the literature search was carried out on May 2017. In total, 1652 new hits were retrieved, and after using the previously mentioned selection criteria, six additional studies were selected. Finally, a back-tracing process of the 37 resulting studies was performed to identify and select additional relevant studies. The outcome of this process was the selection of ten further studies, and as a result of the selection process, a total of 47 primary studies were considered for critical appraisal.

4.2. Critical appraisal

The quality of the selected primary studies (n = 47) was evaluated using the checklists of the National Institute for Health and Clinical Excellence (2009). The main criteria for the quality appraisal were (a) a clear statement of the aims of the research, (b) an appropriate research design, (c) a well-described and appropriate sampling strategy, data collection, and analysis method; and (d) a clear description of the research findings. Each study was rated as either high, medium, or low quality. Following this critical appraisal, five studies were excluded due to their low quality, leaving 42 studies for analysis. Appendix A shows the results of the critical appraisal process.

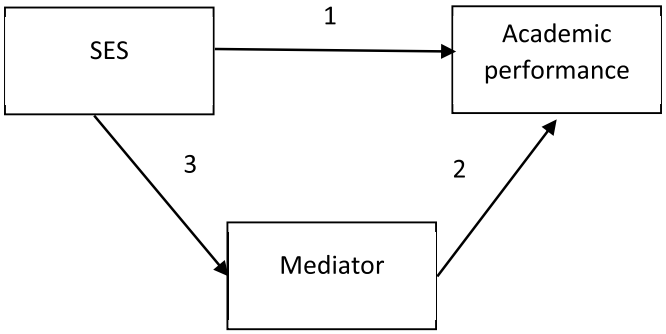

Fig. 1. Conceptual diagram for the analysis of the mediators.

4.3. Analysis of the literature

The analysis of the literature was conducted under the guidelines proposed by Aveyard (2014). First, the main characteristics of the selected studies were summarized (see Appendix B). Then, every study was reread to identify and codify the relevant information. Consequently, all the studies were coded and assigned the following themes: operationalizations of SES (Theme 1); operationalizations of academic performance (Theme 2); relationship between SES and academic performance (Theme 3); prior academic achievement (Theme 4), university experience (Theme 5), and working status (Theme 6). The first research question was answered by summative content analysis. The second research questions were answered using both summative content analysis and meta-analysis.

4.3.1. Summative content analysis

A summative content analysis goes beyond quantifying the occurrence of words and content within texts; it aims at analyzing and interpreting that content (Hsieh & Shannon, 2005). To address the first research question, a summative content analysis of the first two themes listed above was carried out. Therefore, the operationalizations of SES (Theme 1) were categorized as parental educational level, parental occupation, income, household resources, or neighborhood resources. Similarly, the operationalizations of academic performance (Theme 2) were categorized as achievement, competencies, or persistence.

To answer the first part of the second research question, the relationship between SES and academic performance in higher education (Theme 3) was classified into three categories: significant and positive; significant and negative; and not significant. Those categories were chosen as they are the three possible basic ways in which two variables are correlated. Subsequently, to answer the second part of the second research question, the mediating roles of prior academic achievement (Theme 4), university experience (Theme 5), and working status (Theme 6) were explored following the rationale that will be explained subsequently. The interest was to determine the effect size and the significance level of the relationships indicated with numbers in Fig. 1. That is, the relationship between SES and academic performance (1), once the mediator was also introduced into the same explanatory model; and, next, the relationship between the mediator and academic performance (2). As such, a larger and significant relationship between the mediator and academic performance would suggest mediation. It is worth noting, however, that not all the analyzed references provided information on the relationship between the SES and the mediator (3). Consequently, this third relationship could not be included in the analysis, so it was not possible to distinguish between complete and partial mediation.

4.3.2. Statistical meta-analysis

Hunter and Schmidt (1990) define a meta-analysis as the quantitative summary and analysis of different effect sizes retrieved from several various studies. To further extend the answer to the second research question, a meta-analysis was carried out to calculate the average effect size of (a) the relationship between SES and academic performance and (b) the relationship between the investigated mediators and academic performance.

Metric from expressing effect sizes. The effect size (ES) selected for this study was Pearson's correlation coefficient (r). Most of the included studies reported a standardized regression coefficient, which was converted into an r-value using the guidelines proposed by Peterson and Brown (2005). Although alternative methods for transforming standardized regression coefficients into either partial or semi-partial correlations exist (Aloe & Becker, 2012; Aloe & Thompson, 2013; Fernández-Castilla et al., 2019), there was not enough information in the primary studies to carry out such conversions. In four studies (Birch & Miller, 2006; Delaney, Harmon, & Redmond, 2011; Guimarães & Sampaio, 2013; Win & Miller, 2005) the unstandardized regression coefficient was first converted into a standardized coefficient using the standard deviation of both the predicted and the predictor variable as suggested by Bowman (2012). In six studies (Arulampalam, Naylor, & Smith, 2004; Hansen & Mastekaasa, 2006; Smith, 2016; Walpole, 2003; Yanbarisova, 2015; Yao, Zhimin, & Peng, 2015) the reported odds ratio were converted into an r-value following the procedure proposed by Borenstein, Hedges, Higgins, and Rothstein (2009). In one study (Waqas, Abbasi, & Idrees, 2013) the reported t-value was first converted into a standard mean difference (d-value) and, then, this d-value was converted into an r-value, also according to the procedure suggested by Borenstein et al. (2009).

In total, 13 studies were left out of the meta-analysis as will be explained next. The standardized regression coefficient in four

articles (Loehr, Almarode, Tai, & Sadler, 2012; Morlaix & Suchaut, 2014; Pedrosa et al., 2007; Rodríguez Albor, Ariza, & Ramos, 2014) could not be calculated due to insufficient information. It is essential to notice that the inclusion of unstandardized regression coefficients could dramatically increase the average effect size. Similarly, in two of the analyzed studies (Frischenschlager, Haidinger, & Mitteraurer, 2005; Stratton & Wetzel, 2011), it was not possible to convert the reported odds ratio due to a lack of information. In five of the articles (Anderton et al., 2016; Gerken & Volkwein, 2000; Ifenthaler & Widanapathirana, 2014; Nguyen, 2016; Zheng, Saunders, Shelley, Mack, & Whalen, 2002) the effect size was not reported due to it not being significant. Finally, in two of the articles (Bahamón & Reyes Ruiz, 2014; Triventi, 2014), the relationship between SES and academic performance was described but not reported through a specific effect size.

Statistical independence. One crucial methodological aspect when performing a meta-analysis is to ensure that the effect sizes are independent among them. To achieve such independence, the average effect size was calculated in studies reporting more than one effect size. In this way, the sample on which it was based contributed only with one effect size to the analysis (Sirin, 2005). One article (De Clercq et al., 2013) reported two different effect sizes coming from two different data sets. Both effect sizes were included in the meta-analysis.

Combining effect sizes across studies. Another major important consideration when conducting a meta-analysis is to decide how to transform the different effect sizes retrieved from the examined studies so that a meaningful and valid aggregation can be made. In this meta-analysis, the effect sizes were converted using Fisher's transformation as recommended by Hedges and Olkin (1985). Fisher's transformation is a variance stabilizing transformation so that the r-value becomes independent from the population p-value (Aloe & Becker, 2012; Bowman, 2012).

Homogeneity analysis. The homogeneity among the effect sizes was analyzed using Hedge's Q test for homogeneity. This test is based on chi-square statistics with k-1 degrees of freedom, where k is the number of investigated effect sizes. A significant result suggests that effect sizes across the studies are heterogeneous, so further exploration of the existence of possible mediators should be conducted.

Publication bias. A common fact in scientific literature is publication bias. Publication bias means that only statistically significant results or results which support the expected relationship are published (Rothstein, Sutton, & Borenstein, 2005). In this study, publication bias was assessed using the funnel plot. To evaluate the funnel plot symmetry, Egger's regression test (Egger, Smith, Schneider, & Minder, 1997) was performed, and the results indicated that there was no publication bias in the studies summarized through this meta-analysis ($z = .79$, $p = .43$).

Analysis of the mediators. Similar to the summative content analysis, the existence of mediators was analyzed by contrasting the effect size of the relationships indicated with numbers in Fig. 1. The average effect size between SES and academic performance (1) was compared to the average effect size between the presumed mediator and academic performance (2). As such, a larger and significant average effect size between the mediator and academic performance would suggest mediation.

5. Results

The results of this systematic literature review are presented in accordance with the research questions. Sections 5.1 and 5.2 are based on the results derived from the summative content analysis, while Section 5.3 is based on the results of both the summative content analysis and the meta-analysis.

5.1. Measuring SES

Table 2 presents the classification of the operationalizations of SES into five major measurements: parental educational level, parental occupation, income, household resources, and neighborhood resources. Table 2 also provides information regarding the type of measure (i.e., single or composite score) and the type of scale (i.e., categorical or continuous) of each one of the examined operationalizations. It is important to note that a study can appear more than once in Table 2, as it might have reported several indicators for the assessment of SES. The classification of the operationalizations of SES is described in detail in the following sections.

5.1.1. Parental educational level

This category ($n = 25$) comprises operationalizations that assessed parental educational level as a single indicator ($n = 21$) or within a composite score ($n = 4$). With regard to "*single indicator*" ($n = 21$), the use of categorical scales ($n = 19$) was identified to assess parental educational level in three possible ways: (a) the highest level of parental education ($n = 4$); (b) a dichotomous variable which indicated whether the parents had attended college ($n = 3$); and using several categories—ranging from no level of education to a university degree —to measure (c) both parents' level of education ($n = 9$); (d) only the mother's level ($n = 2$); and (e) only the father's level. Additionally, continuous scales ($n = 2$) were utilized to measure the length of the parents' education in two different ways. Firstly, Rothstein (2004) used the average number of years of education of the students' parents. Secondly, Delaney et al. (2011) converted the qualifications reported by the parents into years of education by estimating the number of years which are required to obtain those degrees. Consequently, this variable ranges from 8 (time necessary to complete primary school) to 19 (time necessary to complete a Ph.D.).

Regarding "*within a composite score*" ($n = 4$), parental educational level was assessed through both categorical ($n = 3$) and continuous scales. On the categorical scales ($n = 3$), De Clercq et al. (2017), and Rodríguez Albor et al. (2014), reported the use of the highest level of parental education ($n = 2$). In addition, Gouvias, Katsis, and Limakopoulou (2012) measured parental education

Table 2
Operationalizations of SES.

Measurement	Type of measurement	Scale	Operationalization	Reference(s)
Parental Educational level (n = 25)	As a single indicator (n = 21)	Categorical (n = 19)	Highest level of parental education (n = 4)	Bruinsma and Jansen (2007); Ifenthaler and Widanapathirana (2014); Loehr et al. (2012); Tai, Sadler, and Loehr (2005)
			A dichotomous variable to determine whether parents have attended college (n = 3)	Bonsaksen (2016); Nguyen (2016); Waqas et al. (2013)
			3 categories	Rodríguez Ayan and Ruiz Díaz(2011)
			4 categories	Stratton and Wetzel (2011)
			4 categories	De Clercq et al. (2013)
			4 categories (years of education)	Triventi (2014)
			5 categories	Beyene and Yimam (2016)
			5 categories	Frischenschlager, Haidinger, and Mitterauer (2005)
			5 categories	Gerken and Volkwein (2000)
			5 categories	Harb and El-Shaarawi (2007)
			7 categories	Guimarães and Sampaio (2013)
			Only father's educational level (8 categories)	Morlaix and Suchaut (2014)
			Only mother's educational level (3 categories)	Wolniak and Engberg (2010)
			Only mother's educational level (5 categories)	Black et al. (2015)
		Continuous (n = 2)	Years of education (average)	Rothstein (2004)
			Years of education: going from 8 to 19	Delaney et al. (2011)
	Within a composite score (n = 4)	Categorical (n = 3)	Highest level of parental education (n = 2)	De Clercq et al. (2017); Rodríguez Albor et al.(2014)
			ISCED (International Standard Classification of Education)	Gouvias et al. (2012)
		Continuous	Occupational prestige and socioeconomic scores (Nakao & Treas, 1994).	Walpole (2003)
Parental Occupation (n = 10)	As a single indicator (n = 7)	Categorical (n = 7)	Dichotomous variable to indicate whether parents work	Guimarães and Sampaio (2013)
			Dichotomous variable to indicate whether parents' occupation(s) requires higher education	Bonsaksen (2016)
			4 categories	Yao et al. (2015)
			5 categories	Arulampalam et al. (2004)
			8 categories	Morlaix and Suchaut (2014)
			10 categories	Hansen and Mastekaasa (2006)
			The Standard Occupational Classification scale 2000	Smith (2016)
	Within a composite score (n = 3)	Categorical (n = 2)	7 categories	Gouvias et al. (2012)
			12 categories	Rodríguez Albor et al. (2014)
		Continuous	Occupational prestige and socioeconomic scores (Nakao & Treas, 1994).	Walpole (2003)

(*continued on next page*)

Table 2 (*continued*)

Measurement	Type of measurement	Scale	Operationalization	Reference(s)
Income (n = 20)	As a single indicator (n = 17)	Categorical (n = 16)	3 categories (high, middle and low) (n = 3)	Frischenschlager et al. (2005); Wolniak and Engberg (2010); Yao et al. (2015)
			5 categories	Black et al. (2015)
			5 categories	Stratton and Wetzel (2011)
			5 categories (quintiles)	Bozick (2007)
			6 categories	Yanbarisova (2015)
			7 categories	Guimarães and Sampaio (2013)
			7 categories	Waqas et al. (2013)
			Financial aid (receiving a scholarship or a loan) (n = 4)	Black et al. (2015); Morlaix and Suchaut (2014); Stratton and Wetzel (2011); Triventi (2014)
			To receive subsidized lunches (n = 2)	Black et al. (2015); Rothstein (2004)
			University tuition fees (quartiles)	Triventi (2014)
		Continuous	Parents' relative income going from 0 to 1	Hansen and Mastekaasa (2006)
	Within a composite score (n = 3)	Continuous (n = 3)	Monthly income	Rodríguez Albor et al.(2014)
			Occupational prestige and socioeconomic scores (Nakao & Treas, 1994)	Walpole (2003)
			University tuition fees	Rodríguez Albor et al. (2014)
Household resources (n = 8)	As a single indicator (n = 6)	Categorical (n = 4)	Computer at home and internet connection (n = 3)	Gouvias et al. (2012); Guimarães and Sampaio (2013); Pedrosa et al. (2007)
			Possession of books related to schoolwork	Gouvias et al. (2012)
		Continuous (n = 2)	Household crowding (n = 2)	Harb and El-Shaarawi (2007); Gouvias et al. (2012)
	Within a composite score (n = 2)	Continuous (n = 2)	Number of possessions (car, books, musical instruments, computer) (n = 2)	De Clercq et al. (2017), Pedrosa et al. (2007)
Neighborhood resources (n = 9)	As a single indicator (n = 3)	Categorical (n = 3)	Students' stratum (n = 2)	Bahamón and Reyes Ruiz (2014); Rodríguez Albor et al. (2014)
			Degree of urbanization	Hansen and Mastekaasa (2006)
	As a composite score (n = 6)	Continuous (n = 6)	Index of Economic Resources (IER) (n = 2)	Birch and Miller (2006); Win and Miller (2005)
			Index of Education and Occupation (IEO)	Win and Miller (2005)
			Index of Multiple Deprivation (IMD)	Thiele et al. (2016)
			Index of Relative Socioeconomic Advantage and Disadvantage (IRSAD)	Puddey and Mercer (2014)
			School decile	Shulruf et al. (2008)

using the International Standard Classification of Education (ISCED). The ISCED is a classification of educational programs based on levels and areas of knowledge proposed in 1997 by the United Nations Educational, Scientific, and Cultural Organization (UNESCO), and then revised in 2011. The main goal behind this classification is the need to compare internationally different educational systems (Schneider, 2013). More specifically, there are nine ISCED levels ranging from early childhood education to a doctoral or equivalent level. On the continuous scales, Walpole (2003) recoded the parental educational level into a continuous SES variable based on the occupational prestige and socioeconomic scores as proposed by Nakao and Treas (1994). In particular, Nakao and Treas (1994) suggested the following regression equation to calculate a socio-economic index (SEI): SEI = 9.24 + 0.64 (Education) + 0.31 (Income).

5.1.2. Parental occupation

This category (n = 10) includes operationalizations of parental occupation as a single indicator (n = 7) or within a composite score (n = 3). Regarding "*single indicator*" (n = 7), the use of categorical scales (n = 7) was identified to assess parental occupation in three possible ways: (a) as a dichotomous variable to indicate whether the parents worked; (b) as a dichotomous variable to indicate whether the parents' occupation(s) required a higher educational degree; (c) as several scales ranging from unskilled worker/unemployed to managerial/professional (n = 4). In addition, Smith (2016) reported the use of the 2000 Standard Occupational Classification (SOC). The 2000 SOC is a classification system of the occupational structure of the United States, proposed by The Bureau of Labor Statistics. The 2000 SOC allows for comparisons to be made among paid occupations, based on the type of work, required skills, education, and training. More specifically, the 2000 SOC includes occupations from the public, private, and military sectors (Bureau of Labor Statistics, 2006).

Regarding "*within a composite score*" (n = 3), Rodríguez Albor et al. (2014) used nominal categories which described parental occupation. In addition, Gouvias et al. (2012) reported the use of seven categories which ranged from unemployed to professionals, managers, and business owners. Finally, Walpole (2003) utilized the occupational prestige and socioeconomic scores, proposed by Nakao and Treas (1994), to recode parental occupation into a continuous SES variable.

5.1.3. Income

This category (n = 20) sorts between operationalizations that measured income as a single indicator (n = 17) or within a composite score (n = 3). Regarding "*single indicator*" (n = 17), the use of categorical scales (n = 16) was identified to measure income with: (a) several categories to discriminate between low and high income (n = 9); (b) dichotomous scales to determine whether students received financial aid (n = 4) or received subsidized lunches (n = 2); and (c) quartiles to classify university tuition fees. Additionally, Hansen and Mastekaasa (2006) proposed a continuous scale between 0 and 1 to determine the relative position of a student's family within the distribution of all family incomes (i.e., a score of 0.52 indicates that 52% of the families have less income).

Concerning "*within a composite score*" (n = 3), continuous scales were used by Rodríguez Albor et al. (2014) to combine tuition fees and monthly income into a composite score. Similar to parental educational level and occupation, parental income was also recoded by Walpole (2003) into a continuous SES variable, based on the occupational prestige and socioeconomic scores proposed by Nakao and Treas (1994).

5.1.4. Household resources

This category (n = 8) contains operationalizations of household resources as a single indicator (n = 6) or within a composite score (n = 2). Regarding "*single indicator*" (n = 6), categorical scales (n = 4) were selected to determine whether students have a computer and internet connection (n = 3); and books related to schoolwork. In addition, continuous scales (n = 2) were used to calculate household crowding. Harb and El-Shaarawi (2007) defined household crowding as the proportion of the number of family members to the number of rooms in the house. Concerning "*within a composite score*" (n = 2), continuous scales were used to include the number of possessions as an indicator of household resources.

5.1.5. Neighborhood resources

This category (n = 9) presents operationalizations of socio-economic conditions at the area level. The use of both a single indicator (n = 3) and a composite score (n = 6) was identified in the examined primary studies. Among "*single indicator*" (n = 3), categorical scales (n = 3) were used to assess the students' stratum (n = 2) and degree of urbanization. In particular, the students' stratum refers to the six categories used by the Colombian government to classify households based on their physical characteristics and surroundings. The main reason behind this classification is to establish the price of public services hierarchically in each area (The World Bank, 2012).

Regarding "*composite score*" (n = 6), the connection of students' postal codes to several indices aimed at classifying areas based on socio-economic advantages and disadvantages was reported in the analyzed primary studies, with these indices being the Socio-Economic Indices for Areas (SEIFA) first developed by the Australian Bureau of Statistics. In particular, the Index of Economic Resources (Birch & Miller, 2006; Win & Miller, 2005); the Index of Education and Occupation (Win & Miller, 2005); and the Index of Relative Socioeconomic Advantage and Disadvantage (Puddey & Mercer, 2014) were identified in the examined references. Additionally, Thiele, Singleton, Pope, and Stanistreet (2016) used indices suggested by the Higher Education Funding Council for England (HEFCE). More specifically, the Index of Multiple Deprivation (IMD) was utilized to rank area deprivation in five quintiles (where the first quintile included the most deprived areas, and the fifth quintile included the least deprived areas). Finally, Shulruf, Hattie, and Tumen (2008) reported the use of the school decile, which is a system from New Zealand aimed at classifying schools into ten categories according to their students' socio-economic conditions. Such a classification makes it possible to determine, for

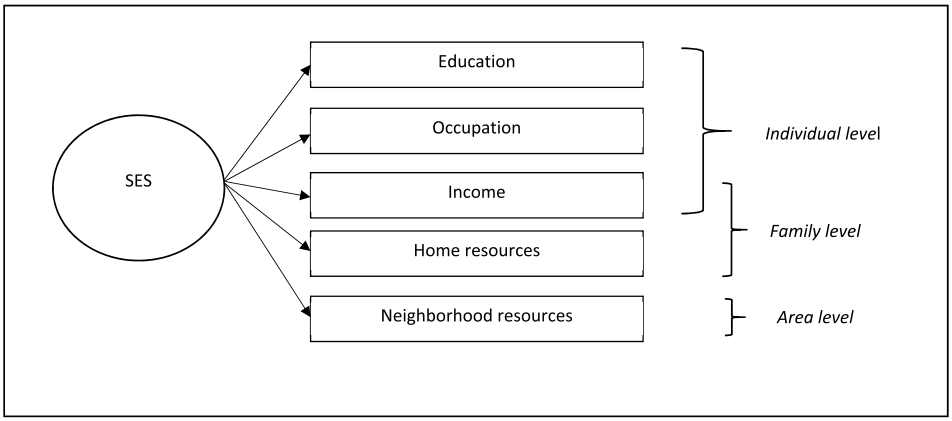

Fig. 2. Authors' model for measuring SES.

instance, whether schools are receiving students coming from low-SES areas.

5.1.6. Model for measuring SES

Fig. 2 shows the model to assess SES resulting from the summative content analysis carried out in section 5.1. Education, occupation, income, household resources, and neighborhood resources are the five major measurements for assessing SES. Moreover, such measurements can be assessed at different possible levels, namely, the individual, family, or area levels.

5.2. Measuring academic performance in higher education

Table 3a and Table 3b present the classification of the operationalizations to assess academic performance in higher education into three measurements: achievement, competencies, and persistence, both before and during university. Tables 3a and 3b also display information regarding the level of measurement (i.e., categorical or continuous) as well as the scale used in each of the examined references. Again, the studies can appear more than once in Tables 3a and 3b, as they might have used several indicators to assess academic performance. The classification of the operationalizations of academic performance in higher education is explained in the upcoming sections.

5.2.1. Academic performance at university

This category includes operationalizations which assessed academic performance at university ($n = 55$). Operationalizations conforming to this category were grouped into three subcategories: academic achievement ($n = 43$); competencies ($n = 6$), and persistence ($n = 6$). Regarding the subcategory *academic achievement* ($n = 43$), the operationalizations identified in the analyzed studies were Grade Point Average (GPA; $n = 32$); single grades ($n = 4$); number of credits ($n = 6$) and the relative achievement index. More specifically, three different types of GPA were identified in the examined references: the average at the end of the first year ($n = 16$), the current average when the study was conducted ($n = 8$), and the final average upon graduation ($n = 8$). Although both categorical ($n = 8$) and continuous ($n = 24$) scales were used to assess GPA, the most frequently used scales for measuring GPA were continuous from 0 to 4 ($n = 15$) and from 0 to 100 ($n = 5$). In addition, the use of a single grade was identified as the grades in subject areas ($n = 3$) and the grades on a first-year test. In the case of the number of credits ($n = 6$), Rodríguez Ayan and Ruiz Díaz (2011) proposed an original indicator —the degree progression index—which is the relationship between the actual number of credits, and the expected number of credits that a student must take. Moreover, Triventi (2014) suggested that ECTS credits are a concise way to measure students' academic achievement because they represent not only how many exams a student has completed satisfactorily but also their importance. Finally, the relative achievement index was proposed by Pedrosa et al. (2007) to compare students' performance at the entrance and exit of all courses. Differences in both the grading system and the number of students enrolled in the courses were the main reasons for developing this index, instead of using the actual numerical value of the grades.

In the subcategory *competencies* ($n = 6$), Bahamón and Reyes Ruiz (2014) and Rodríguez Albor et al. (2014) used the SABER PRO test, which is a standardized test taken by the students at the end of the university level in Colombia to determine both their general competencies (e.g., quantitative reasoning, critical reading) and specific competencies within each field of study. Similarly, students' proficiency in English was assessed through several standardized tests such as the College English Test (CET) and the internal Post-Entrance Literacy Assessment (PELA). In addition, Morlaix and Suchaut (2014) reported the use of the *Diplôme Approfondi de Langue Française* (DALF) test to evaluate the first-year students' written comprehension of French. Finally, Puddey and Mercer (2014) reported the use of the Graduate Medical School Assessment Test (GAMSAT) to assess the level of preparation for undertaking studies in medicine and/or attending medical school at the graduate level at Australian, British, and Irish universities.

Regarding the subcategory *persistence* ($n = 6$), all the analyzed operationalizations were related to completion status. As such, the operationalizations grouped in this subcategory were dropout ($n = 2$), final degree classification ($n = 2$), attending graduate school, and graduation rate. In particular, the UK undergraduate degree classification was sorted into this subcategory.

Table 3a
Operationalizations of academic performance at university.

Measurement	Operationalization		Type of scale	Scale	Reference(s)
Achievement (n = 43)	GPA (n = 32)	First year GPA (n = 16)	Categorical (n = 4)	3 categories (high, medium, low) (n = 2)	Shulruf et al. (2008); Yao et al. (2015)
				4 categories	De Clercq et al. (2017)
				5 categories	Hansen and Mastekaasa (2006)
			Continuous (n = 12)	From 0 to 4 (n = 6)	Anderton et al. (2016); Black et al. (2015); Rothstein (2004); Sackett et al. (2009); Wolniak and Engberg (2010); Zheng et al. (2002)
				From 1 to 10	Bruinsma and Jansen (2007)
				From 0 to 20	Morlaix and Suchaut (2014)
				From 0 to 100 (n = 4)	Birch and Miller (2006); De Clercq et al. (2013); De Clercq et al. (2017); Win and Miller (2005)
		GPA (n = 8)	Categorical (n = 2)	3 categories	Yao et al. (2015)
				3 categories	Yanbarisova (2015)
			Continuous (n = 6)	From 0 to 4 (n = 5)	Black et al. (2015); Bonsaksen (2016); Harb and El-Shaarawi (2007); Sackett et al. (2009); Wang et al. (2010)
				From 0 to 12	Rodríguez Ayan and Ruiz Díaz(2011)
		Final GPA (n = 8)	Categorical (n = 2)	3 categories	Yao et al. (2015)
				5 categories	Waqas et al. (2013)
			Continuous (n = 6)	From 0 to 4 (n = 4)	Black et al. (2015); Gerken and Volkwein (2000); Sackett et al. (2009); Zheng et al. (2002)
				From 0 to 7	Puddey and Mercer (2014)
				From 0 to 100	Thiele et al. (2016)
	Single grade (n = 4)	Test at the end of the first year	Categorical	High or low performance	Frischenschlager et al. (2005)
		Introductory college chemistry	Continuous (n = 3)	From 0 to 12	Rodríguez Ayan and Ruiz Díaz(2011)
		Introductory college chemistry		From 0 to 100	Tai et al. (2005)
		Introductory college biology		From 0 to 100	Loehr et al. (2012)
	Number of credits (n = 6)	Course credits (n = 2)	Continuous (n = 4)		Black et al. (2015); Gerken and Volkwein (2000)
		Study unit outcomes (n = 2)			Ifenthaler and Widanapathirana (2014); Puddey and Mercer (2014)
		Degree progression index	Continuous	From 0 to 1	Rodríguez Ayan and Ruiz Díaz(2011)
		ECTS credits	Continuous		Triventi (2014)
	Relative achievement	Index to compare students' performance at the entrance and exit of all courses	Continuous	From −1 to 1	Pedrosa et al. (2007)
Competencies (n = 6)	Standardized test (n = 6)	SABER PRO (Colombia) (n = 2)	Continuous (n = 2)	From 1 to 300	Bahamón and Reyes Ruiz (2014); Rodríguez Albor et al. (2014)
		CET (College English Test) (China)	Continuous	The highest possible score is 710	Yao et al. (2015)
		DALF (France)	Continuous	From 0 to 100	Morlaix and Suchaut (2014)
		GAMSAT (Australia)	Continuous	From 0 to 100	Puddey and Mercer (2014)
		PELA (Australia)	Continuous	From 0 to 10	Anderton et al. (2016)
Persistence (n = 6)	Completion status (n = 6)	Dropout (n = 2)	Categorical (n = 2)	Yes/No	Arulampalam et al. (2004); Gerken and Volkwein (2000)
		Final degree classification (n = 2)	Categorical (n = 2)	British undergraduate degree classification	Smith (2016); Thiele et al. (2016)
		Attending graduate school	Categorical	Yes/No	Walpole (2003)
		Graduation rate	Continuous		Stratton and Wetzel (2011)

Table 3b
Operationalizations of academic performance before university.

Measurement	Operationalization		Type of scale	Scale	Reference
Achievement (n = 20)	HSGPA (n = 14)		Categorical (n = 4)	2 categories	Smith (2016)
				4 categories	Stratton and Wetzel (2011)
				4 categories	Triventi (2014)
				4 categories	Morlaix and Suchaut (2014)
			Continuous (n = 10)	From 0 to 4 (n = 4)	Gerken and Volkwein (2000); Rothstein (2004); Wolniak and Engberg (2010); Zheng et al. (2002)
				From 1 to 4	De Clercq et al. (2017)
				From 1 to 5 (being 1 the best, and 5 the worst)	Frischenschlager et al. (2005)
				From 1 to 6	Hansen and Mastekaasa (2006)
				From 1 to 10	Bruinsma and Jansen (2007)
				From 1 to 20	Gouvias et al. (2012)
				UCAS tariff points	Thiele et al. (2016)
	Single grade (n = 3)		Continuous (n = 3)	HS grades in science, mathematics, and English courses (n = 2)	Loehr et al. (2012); Tai et al. (2005)
				HS grades in biology, chemistry and physics courses	Arulampalam et al. (2004)
	Subject area exams (n = 3)	Leaving Certificate (Ireland)	Continuous	From 0 to 600	Delaney et al. (2011)
		NCEA (New Zealand)	Continuous	From 0 to 80 credits (each NCEA level)	Shulruf et al. (2008)
		SABER 11 (Colombia)	Continuous	Before 2014: From 0 to 400 As of 2014: From 0 to 500	Bahamón and Reyes Ruiz (2014)
Competencies (n = 15)	Aptitude exams (n = 12)	SAT (USA) (n = 9)	Continuous (n = 9)	Before 2016: from 600 to 2400 As of 2016: from 400 to 1600	Black et al. (2015); Gerken and Volkwein (2000); Loehr et al. (2012); Rothstein (2004); Sackett et al. (2009); Stratton and Wetzel (2011); Tai et al. (2005); Walpole (2003); Wolniak and Engberg (2010)
		ACT (USA) (n = 3)	Continuous (n = 3)	From 1 to 36	Stratton and Wetzel (2011); Wolniak and Engberg (2010); Zheng et al. (2002)
	Subject area exams (n = 3)	Vestibular (Brazil)	Continuous (n = 3)		Guimarães and Sampaio (2013)
		Not specified (Greece)			Gouvias et al. (2012)
		Not specified (Vietnam)			Nguyen (2016)
Persistence (n = 8)	Admission ranks (n = 5)	High school rank (n = 2)	Continuous (n = 2)		Black et al. (2015); Zheng et al. (2002)
		Tertiary Entrance Rank (TER) (n = 2)	Continuous (n = 3)	From 0 to 99.95	Birch and Miller (2006); Win and Miller (2005)
		Australian Tertiary Admission Rank (ATAR)			Anderton et al. (2016)
	Grade retention (n = 3)	Years repeated in high school	Categorical	Yes/No	De Clercq et al. (2013)
		Number of class repetitions	Continuous (n = 2)		Frischenschlager et al. (2005)
		Years repeated in high school			Morlaix and Suchaut (2014)

5.2.2. Academic performance before university

This category includes operationalizations which assessed academic performance before attending university (n = 43). In this case, the analyzed operationalizations were also grouped in three subcategories: prior academic achievement (n = 20), competencies (n = 15), and persistence (n = 8).

In the subcategory *prior academic achievement* (n = 20), academic performance before university was measured using HSGPA (n = 14), single grades (n = 3), and subject area exams (n = 3). HSGPA was calculated through both categorical (n = 4) and continuous (n = 10) scales. In particular, the continuous scale ranging from 0 to 4 (n = 4), was the most frequently reported in the analyzed studies. Regarding single grades, grades in specific subjects such as science, mathematics, and English (n = 2) alongside biology, chemistry, and physics, were reported in the examined primary studies. Furthermore, subject area exams such as the NCEA qualification system in New Zealand (Shulruf et al., 2008), the Leaving Certificate in Ireland (Delaney et al., 2011), and the SABER 11 test in Colombia (Bahamón & Reyes Ruiz, 2014) were identified in the examined studies.

In the subcategory *competencies* (n = 15), several entrance exams to university were identified in the analyzed studies. These exams were the SAT (formerly known as the Scholastic Assessment Test; n = 9) and the ACT (originally American College Testing; n = 3) in the USA. These entrance exams are of importance because they indicate students' academic preparation for university. Remarkably, in three of the investigated references (Gouvias et al., 2012; Guimarães & Sampaio, 2013; Nguyen, 2016), *subject area exams* were used as entrance exams to the university.

Within the subcategory *persistence* (n = 8), the operationalizations of academic performance before university were grouped between admission ranks (n = 5) and grade retention (n = 3). In relation to admission ranks, the Tertiary Entrance Rank (TER) and the Australian Tertiary Admission Rank (ATAR) were identified in the analyzed studies. ATAR ranks students' previous academic achievement in high school and is mostly used as an admission criterion for university in Australia (Li & Dockery, 2014). It is important to note that the ATAR replaced the TER in 2010. Regarding grade retention (n = 3), the operationalizations identified in the analyzed studies were the years repeated in high school (n = 2) and the number of class repetitions.

5.2.3. Model for measuring academic performance in higher education

Fig. 3 proposes a model to measure academic performance in higher education drawn from the summative content analysis conducted in section 5.2. Achievement, competencies, and persistence are the three measurements used to assess academic performance in higher education. Furthermore, those measurements can be assessed both during and before university.

5.3. The relationship between SES and academic performance in higher education

Table 4 provides information on the relationship between SES and academic performance in higher education, as well as the mediators identified in the analyzed primary studies. Such information was analyzed through both summative content analysis and meta-analysis. This section first presents the results for the SES-academic performance relationship. Next, the results for the investigated mediators are provided.

The summative content analysis demonstrated that there are three types of relationships between SES and academic performance in higher education: namely, positive (n = 25), negative (n = 6), and no significant (n = 12) relationships. A *positive relationship* indicated that the better one's socio-economic conditions, the better one's academic performance in higher education. However, a closer review of the *negative relationship* (n = 6) revealed enlightening information. Pedrosa et al. (2007) indicated that students who came from public schools had a better academic performance than their counterparts coming from private schools. Those students with less favorable socio-economic conditions were able to develop a certain "educational resilience", which was described by Pedrosa et al. (2007) as the process of transforming early disadvantages in life into better academic performance in higher education. In addition, students who either (a) were scholarship holders (Morlaix & Suchaut, 2014), (b) lived in a crowded house (Harb & El-

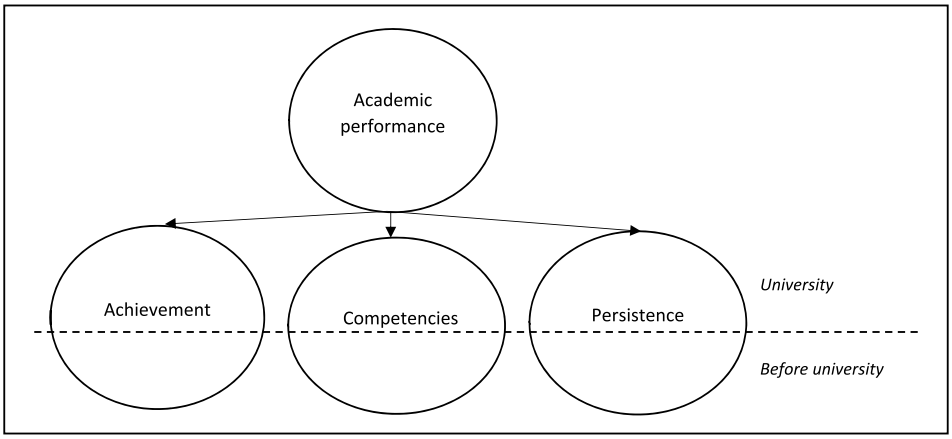

Fig. 3. Authors' model for measuring academic performance in higher education.

Table 4
The relationship between SES and academic performance in higher education.

Reference	N	SES-Academic performance relationship	Average effect size	Prior academic achievement (PAA) measure	PAA-AP relationship	Average effect size	University experience (UE) measure	UE-AP relationship	Average effect size	Working status (WS) measure	WS-AP relationship	Average effect size
Anderton et al. (2016)	414	Not significant		ATAR score	Positive							
Arulampalam et al. (2004)	51,810	Negative	−0.01	HSGPA	Negative	−0.02						
Bahamón and Reyes Ruiz (2014)	68	Positive										
Beyene and Yimam (2016)	925	Positive	0.14	Entrance exam score	Positive	0.05	Academic experience (number of assessments)	Positive	0.12			
Birch and Miller (2006)	1803	Negative	−0.04[+]	TER score	Positive	0.58						
Black et al. (2015)	23,792	Negative	−0.32[+]									
Bonsaksen (2016)	123	Not significant	0.02	Prior experience in higher education	Positive	0.26				Employed or not	Not significant	−0.04
Bozick (2007)	10,164	Positive	0.01							Employed or not	Negative	−0.13
Bruinsma and Jansen (2007)	62	Not significant	0.06	HSGPA	Positive	0.56	Academic experience (classroom climate, quantity and quality of the instruction)	Negative	−0.04	Employed or not	Not significant	0.07
De Clercq et al. (2013)	111	Positive	0.26	Failure in secondary school	Negative	−0.21						
De Clercq et al. (2013)	206	Not significant	0.15	Failure in secondary school	Negative	−0.19	Social experience (peer support)	Not significant	0.15			
De Clercq et al. (2017)	2178	Positive	0.12	HSGPA	Positive	0.37						
Delaney et al. (2011)	1867	Not significant	−0.02	Entrance exam score	Positive	0.31						
Frischenschlager et al. (2005)	245	Not significant		HSGPA	Positive							
Gerken and Volkwein (2000)	–	Not significant		HSGPA	Positive		Academic experience	Positive				
Gouvias et al. (2012)	874	Positive	0.06	HSGPA	Positive	0.79						
Guimarães and Sampaio (2013)	54,877	Positive	0.09									
Hansen and Mastekaasa (2006)	56,792	Positive	0.02	HSGPA	Positive	0.36						
Harb and El-Shaarawi (2007)	296	Negative	−0.05	Science HS diploma	Positive	0.11	Institutional experience (positive attitude towards university)	Positive	0.17	Employed or not	Negative	−0.3
Ifenthaler and Widanapathirana (2014)	146,001	Not significant										
Loehr et al. (2012)	2667	Positive		HSGPA	Positive							

(*continued on next page*)

Table 4 (*continued*)

Reference	N	SES-Academic performance relationship	Average effect size	Prior academic achievement (PAA) measure	PAA-AP relationship	Average effect size	University experience (UE) measure	UE-AP relationship	Average effect size	Working status (WS) measure	WS-AP relationship	Average effect size
Morlaix and Suchaut (2014)	543	Negative		HSGPA, no failure in secondary school	Positive							
Nguyen (2016)	616	Not significant										
Pedrosa et al. (2007)	6701	Negative		HS school courses	Positive							
Puddey and Mercer (2014)	219	Positive	0.17+	GPA at entry of graduate program, GAMSAT score	Positive	0.25						
Rodríguez Albor et al. (2014)	14,829	Positive								Employed or not	Negative	
Rodríguez Ayan and Ruiz Díaz(2011)	312	Not significant	−0.02							Employed or not	Negative	−0.22
Rothstein (2004)	14,102	Positive	0.07	HSGPA, SAT	Positive	0.71						
Sackett et al. (2009)	17,630	Positive	0.09	SAT	Positive (n = 17,244)	0.37						
Shulruf et al. (2008)	1880	Positive	0.01+									
Smith (2016)	23,793	Positive	0.03	HSGPA	Positive	0.34						
Stratton and Wetzel (2011)	5823	Positive		HSGPA	Positive							
Tai et al. (2005)	1333	Positive	0.12	HSGPA, SAT	Positive	0.17						
Thiele et al. (2016)	3730	Positive	0.05+	UCAS points	Positive	0.003						
Triventi (2014)	1834	Positive										
Walpole (2003)	6470	Positive	0.01	GPA at entry of graduate program	Positive (n = 1177)	0.09	Academic experience (working on research)	Positive (n = 1177)	0.13			
Wang et al. (2010)	323	Positive	0.06				Institutional experience (sense of belonging and school integration)	Positive	0.12	Reasons for working and characteristics of work	Positive	0.06
Waqas et al. (2013)	267	Positive	0.05							Employed or not	Negative	−0.14
Win and Miller (2005)	1803	Positive	0.03+	TER score	Positive	0.1						
Wolniak and Engberg (2010)	3750	Positive		HSGPA, SAT	Positive	0.26						
Yanbarisova (2015)	1988	Not significant	0.03							Characteristics of work	Negative	−0.01
Yao et al. (2015)	2989	Positive	0.16									
Zheng et al. (2002)	1166	Not significant		HSGPA	Positive							

(+) Effect sizes calculated from SES indicators at area level. Not considered in the analysis.

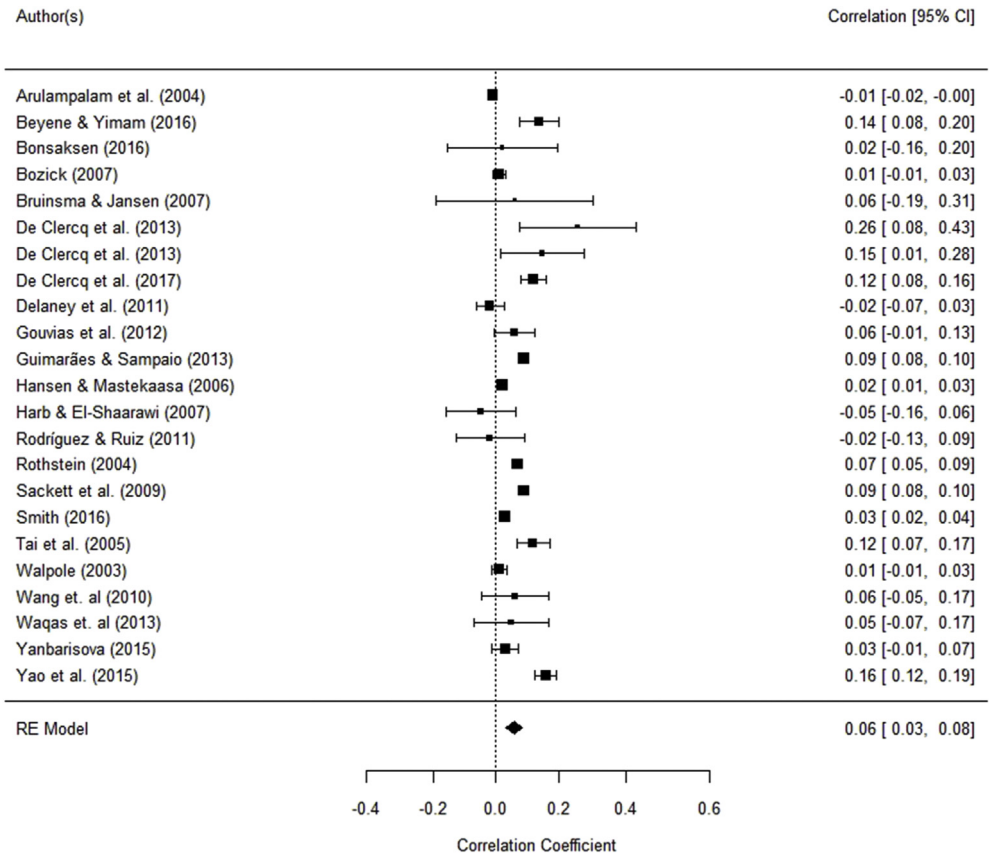

Fig. 4. Forest plot of the relationship between SES and academic performance in higher education.

Shaarawi, 2007), or (c) came from high schools with a high proportion of free/reduced lunches (Black, Lincove, Cullinane, & Veron, 2015), also had low academic performance in university. Finally, Arulampalam et al. (2004) suggested that students who had higher scores in biology, chemistry, and physics in high school also had a lower likelihood of dropping out during university.

The meta-analysis revealed that the average effect size of the relationship between SES and academic performance in higher education was weak and significant (ES = .06, Se = .013, CI = [.03; .08], $p < .001$). The Q test for homogeneity for this average effect size was significant (Q = 460.30, df = 22, $p < .001$). Fig. 4 displays the forest plot with the average effect size of the relationship between SES and academic performance in higher education.

5.3.1. Prior academic achievement

The mediating role of prior academic achievement was investigated based on the information presented in Table 4 and following the rationale explained in section 4.3.1. Therefore, it was possible to compare the relationship between SES and academic performance with the relationship between prior academic achievement and academic performance.

The summative content analysis suggested that HSGPA ($n = 15$), entrance exams ($n = 5$), admission ranks ($n = 3$), failure in secondary school ($n = 2$), and type of high school diploma were the potential mediators of the relationship between SES and academic performance in higher education. Regarding *HSGPA* ($n = 15$), high school grades were more strongly related to academic performance than SES. In such cases, the relationship between SES and academic performance was (a) positive ($n = 9$), (b) negative ($n = 2$), and (c) not significant ($n = 4$). Concerning *entrance exams* ($n = 5$), it was found that SAT scores ($n = 4$) and Leaving Certificate scores were more strongly related to academic performance than SES. Correspondingly, the reported relationship between SES and academic performance was (a) positive ($n = 4$) and (b) not significant. In addition, *failure in secondary school* ($n = 2$) was more strongly related to academic performance than SES. In such cases, the relationship between SES and academic performance was (a) negative and (b) not significant. Finally, Harb and El-Shaarawi (2007) indicated that receiving a scientific diploma in high school was more strongly related to GPA than living in a crowded household.

The meta-analysis demonstrated that the average effect size of the relationship between prior academic achievement and academic performance in higher education was positive and significant (ES = .29, Se = .07, CI = [.15; .42], $p < .001$). The Q test for homogeneity for this average effect size was significant (Q = 12088.23, df = 20, $p < .001$).

5.3.2. University experience

The mediating role of university experience was investigated based on the information presented in Table 4 and following the rationale explained in section 4.3.1. Thus, the relationship between SES and academic performance was compared to the relationship between university experience and academic performance.

The summative content analysis revealed that academic experience (n = 3) and institutional experience (n = 2) were the potential mediators of the relationship between SES and academic performance in higher education. Regarding *academic experience* (n = 3), Bruinsma and Jansen (2007) indicated that students who had higher grades were also more satisfied with the teacher's ability to explain the topic, the teacher's ability to use the resources, and the teacher's openness to questions. Moreover, the higher the study load, the lower the grades in the course would be, while the higher the number of contact hours, the higher the grades. In this case, Bruinsma and Jansen (2007) also found no significant relationship between SES and academic performance in higher education. Similarly, Walpole (2003) suggested that low-SES students who had worked on their professors' research during university were more likely to enroll in graduate programs following their completion of their undergraduate degree at university. In this case, the relationship between SES and academic performance was significant but weaker. Finally, Gerken and Volkwein (2000) identified that students' academic conscientiousness was more strongly related to their degree completion and GPA than their parental educational level. Regarding *institutional experience* (n = 2), Harb and El-Shaarawi (2007) found that students who had a positive attitude towards university also performed better academically. This influence was greater than the influence of SES on academic performance. Also, Wang, Kong, Shan, and Vong (2010) reported that students' sense of belonging was more strongly related to students' GPA than their father's education and family income.

The meta-analysis revealed that the average effect size of the relationship between university experience and academic performance in higher education was positive and significant (ES = .13, Se = .02, CI = [.09; .16], $p < .001$). The Q test for homogeneity for this average effect size was not significant (Q = 2.4094, df = 5, p = .79).

5.3.3. Working status

The mediating role of working status was investigated based on the information presented in Table 4 and following the rationale explained in section 4.3.1. Hence, a comparison was made between the relationship between SES and academic performance and the relationship between working status and academic performance.

The summative content analysis indicated that whether a student was employed or not (n = 5), the characteristics of their work (n = 2) and their reasons for working were the potential mediators of the relationship between SES and academic performance in higher education. Regarding *being employed or not* (n = 5), the influence of employment on academic performance was stronger than the influence of SES. In such cases, the relationship between SES and academic performance was (a) positive (n = 3), (b) negative, and (c) not significant. With respect to the *characteristics of work*, Yanbarisova (2015) found that students who were working full-time outside their academic fields displayed worse academic performance than their counterparts. In this case, the relationship between SES and academic performance was not significant. In addition, Wang et al. (2010) indicated that jobs that provided students the opportunity to learn new things had a greater influence on their academic performance than their father's education and occupation, and their family income. Regarding the *reasons for working*, Wang et al. (2010) also indicated that when the reason for working was to acquire working experience, the part-time jobs were more strongly related to students' GPA than their father's education and occupation, and their family income.

The meta-analysis demonstrated that the average effect size of the relationship between working status and academic performance in higher education was negative and significant (ES = −.10, Se = .05, CI = [-.19; −.01], $p < .001$). The Q test for homogeneity for this average effect size was significant (Q = 51.7643, df = 7, $p < .001$).

In summary, the summative content analysis suggested that the investigated mediators were more strongly related to academic performance than SES. Furthermore, the meta-analysis showed that the average effect sizes of the mediators were significant and larger than the effect size of the SES-academic performance relationship. The mediator with the largest average effect size was prior academic achievement, followed by university experience, and working status.

6. Discussion

The objectives of this systematic literature review were (1) to analyze how SES and academic performance in higher education are measured; (2) to determine whether the relationship between SES and academic performance in higher education is mediated by a) prior academic achievement; b) university experience; and c) working status.

6.1. Conclusions and implications for practice

6.1.1. Measuring SES

The first conclusion of this study is that five major measurements should be considered when assessing SES: education, occupation, income, household resources, and neighborhood resources. The findings of this systematic literature review also suggest specific ways to operationalize each one of the measurements of SES.

First, it was found that education is traditionally assessed through categorical variables that indicate the achieved academic degree, ranging from no education up to a doctoral degree. In this respect, the use of the International Standard Classification of Education (ISCED) is highly recommended. The ISCED has established a unique scale which allows for comparisons to be made among different international contexts.

Second, the results of this study showed that occupation is predominantly assessed using categorical scales. In this regard, a well-established classification to measure occupation is the Standard Occupation Classification (SOC). Such a classification is based on the type of work, skills, and level of education. Even though the SOC was first proposed in the USA, national variants also exist in countries within Europe and Asia. Therefore, the SOC could be used not only for international comparisons but also as a classification system for countries which have not developed their own classification system.

Third, the findings of this study indicated that income is typically measured with intervals to categorize the amount of money being earned. However, a more advisable way to operationalize income is through a multiple of the minimum wage paid in each country (i.e., equivalent to one minimum wage, twice minimum wage, etc.). As such, the minimum wage could be related to the type of work and level of education of a wage-earner. Besides, the use of the minimum wage as a measurement would allow for the comparison of socio-economic conditions across several different countries.

Fourth, although the results from this study revealed that measures of household resources are related to the possessions available at home, it seems adequate to distinguish between material resources and cultural resources (Gouvias et al., 2012). Material resources are merely the items students have at home (i.e., a personal computer, internet connection, an individual room), while cultural resources are items which might represent an intellectual added value to the students (i.e., books related to schoolwork or musical instruments).

Finally, this study revealed that neighborhood resources can be operationalized through indexes which rank areas according to their socio-economic advantages and disadvantages. Well-established examples of these indexes are the Socio-Economic Indexes for Areas (SEIFA) proposed by the Australian Bureau of Statistics and the Index of Multiple Deprivation (IMD) proposed by the UK government. Even though these indexes were developed for specific national contexts, the methodology underlying their creation can be replicated to develop indexes within each country. However, it does not seem convenient to use these indices directly to measure students' SES. What is recommended, instead, is to use area-based indicators such as SEIFA to achieve a better understanding of the social and economic conditions where students live (Australian Bureau of Statistics, 2011). This suggestion is consistent with previous meta-analytic studies focusing on primary and secondary education (e.g., Sirin, 2005; White, 1982), where it has been recommended to avoid using aggregated indicators to assess SES at the individual level, as they can overestimate the effect of the relationship between SES and academic performance.

6.1.2. Measuring academic performance in higher education

The second conclusion of this study is that academic performance in higher education should be assessed considering three major measurements: academic achievement, competencies, and persistence. This study also identified several ways to operationalize such measures both during and prior to university.

Regarding academic achievement, the results from this study corroborate the assertion that first-year GPA is the most used operationalization of academic achievement at university, as first-year GPA is considered a strong predictor of subsequent academic outcomes at university (Cliffordson, 2008; Gerken & Volkwein, 2000). When the interest is to compare GPA across different fields and institutions, it is necessary to take into account that the grading system does change between fields and institutions of higher education; furthermore, there could also be variations in the assessment process regardless of the use of the same grading scale (Hansen & Mastekaasa, 2006). In addition, the findings of this study also reveal that HSGPA is the most common operationalization of prior academic achievement before university. HGSPA depends on the curriculum followed in each institution (Westrick et al., 2015), the quality and strictness of the scoring system, as well as the student population in each institution. The selection of HSGPA as a predictor of academic performance increases the explained variance of GPA at university (Zheng et al., 2002), and furthermore, HSGPA seems to have a larger predictive validity than entrance exams, regardless of the grading system and the academic program (Cliffordson, 2008).

With reference to competencies, the findings of this systematic literature review indicate that competencies have been operationalized through the outcomes of standardized testing both during and prior to university. However, the difference across levels might lie on the purpose of such tests. In the case of academic performance at university, standardized tests aim to evaluate the acquisition of both general and specific competencies pertaining to each study area. In the case of academic performance before enrolling in university, standardized tests are designed as entrance exams to estimate the students' academic preparation for their university studies.

Nevertheless, the use of achievement tests as entrance exams to university was also identified in the examined primary studies. This finding is somewhat problematic for several reasons. Firstly, achievement tests are designed to measure past accomplishment in learning instead of measuring the capacity for future accomplishment (Sidhu, 2005). Secondly, whereas a great deal is known about the predictive validity of aptitude tests (e.g., the SAT I), the predictive validity of achievement tests (e.g., the SAT II) is still unclear in the literature (Cliffordson, 2008). Thirdly, Zwick (2012) has suggested that achievement tests might indicate the degree to which wealthier students have access to either better information for the test (content hypothesis) or better preparation for the test (coaching hypothesis). Therefore, achievement tests seem to be more related to students' SES than aptitude tests.

Finally, this study suggests that persistence in university can be measured in terms of students' degree completion. In addition, persistence before university can be assessed as the students' academic rank and grade repetition. An important conceptual distinction between persistence and retention should be acknowledged, as persistence is an individual phenomenon, while retention is an institutional one; therefore, these terms should not be used interchangeably (Reason, 2009).

6.1.3. The relationship between SES and academic performance in higher education

The third conclusion of this study is that the relationship between SES and academic performance in higher education is weak.

This result is coherent with previous meta-analyses in higher education, which have also reported a weak effect size (e.g., Richardson et al., 2012). A critical interpretation of the findings of this study could beg the question of the actual importance of SES as a predictor of academic performance in higher education. To begin with, it could be the case that the influence of socio-economic conditions on students' performance is lower in higher education than in previous levels of education (the influence of SES on prior academic achievement has been well-established in educational research). One can also argue that regardless of the hindrances that low-SES students face when entering university, those who are admitted share a similar educational experience to their wealthier counterparts (Smith, 2016). Therefore, the higher education system could have the same influence on any student despite his or her socio-economic conditions.

Furthermore, the findings of this study indicate that the relationship between SES and academic performance in higher education is weak when other factors are considered. This fact urges the educational research field to select more robust analytical techniques when investigating academic performance in higher education. A mere bivariate analysis no longer suffices. In addition, regardless of the multiple theories in higher education which suggest that SES and academic performance are positively related, strong empirical evidence supporting these theoretical claims is still missing in the educational literature (Marks, 2017).

However, a weak relationship between SES and academic performance in higher education does not imply that low-SES students should be ignored or that increasing their participation in university should be dismissed. How to efficiently attend to low-SES students' educational needs remains a challenge for the higher education system, and in this respect, the findings of this systematic literature review might be transferred in one of three ways to properly deal with that challenge.

Firstly, it was identified that prior academic achievement is more strongly related to academic performance in university than SES. While this finding is not surprising, it does support the need to reinforce the past performance of low-SES students through, for instance, academic preparation courses before university. An example of this type of program is the enabling programs proposed by the Australian government. Enabling programs are designed to provide disadvantaged students with specific competencies (e.g., literacy, numeracy, communication, and critical thinking skills) so that they can be prepared for their university studies (Pitman et al., 2016). Moreover, enabling programs are effective pathways to higher education for almost half of the enrolled disadvantaged students (Hodges et al., 2013).

Secondly, the findings from this study also revealed that the influence of university experience on academic performance is larger than the influence of SES. The defining factors of the university experience such as classroom climate, quantity and quality of the instruction (Bruinsma & Jansen, 2007), sense of belonging and school integration (Wang et al., 2010), and peer support (De Clercq et al., 2013) would help low-SES students to adapt to their new academic settings at university. Interestingly, Devlin, Kift, Nelson, Smith, and McKay (2012) have proposed a set of teaching guidelines in order to foster low-SES students' academic performance. Far from being prescriptive, these guidelines can be understood as key practical advice for teachers whose students come from low socio-economic settings.

Thirdly, there was also evidence of the likely mediating role of working status in the SES-academic performance relationship. This finding supports the assumption that working during university studies might have a negative influence on students' performance. However, students who work part-time within their academic fields might perform better academically than students who work outside their academic areas (Wang et al., 2010; Yanbarisova, 2015). Thus, working should allow low-SES students not only to overcome their financial needs but also to extend their academic experience by increasing their body of knowledge while attending university. A concrete example of this type of job for low-SES students is serving as an undergraduate teaching assistant (UTA).

6.2. Limitations

Although the results of this systematic literature review provide insights into the relationship between SES and academic performance in higher education, several limitations of the present study should be acknowledged. First, the number of studies which explore the relationship between SES and academic performance is quite low. Hence, all studies that have aimed to predict academic performance in higher education were considered. However, a precise definition of the relationship between SES and academic performance was often lacking in the analyzed studies. Second, several additional variables which might also interact with SES were not always reported in the reviewed studies. Thus, variables such as students' cognitive factors could not be considered for the summative content analysis. Third, information about the students' academic programs was not always reported in the analyzed studies. Therefore, whether the relationship between SES and academic performance in higher education depends on students' academic programs could not be determined. Fourth, there was no information on the relationship between SES and the meta-analyzed mediators. Therefore, a complete analysis of the selected mediators could not be carried out. Finally, the Q test for homogeneity was not significant for the average effect size of university experience. This result might be suggesting that the resulting average effect size is less generalizable.

6.3. Implications for future research

Starting from the findings and limitations of this systematic literature review discussed earlier, future research in higher education could benefit from focusing on several topics, listed as follows. Firstly, it is interesting to note that using dimensional reduction techniques such as Principal Component Analysis (PCA) leads to a composite score to assess SES. However, composite scores also represent a limitation to fully capturing the underlying variance of SES indicators. Therefore, the matter of how to construct composite scores to assess SES is an issue which requires further exploration.

Secondly, previous research at the elementary and secondary educational levels (e.g., Sirin, 2005; White, 1982) has demonstrated

the moderating role of methodological aspects, such as the type of SES-achievement measure, on the relationship between SES and academic performance. However, exploring such a moderating role still remains an unfinished task for the higher education field.

Thirdly, the criticism that standardized tests merely measure students' socio-economic conditions and do not predict their future academic performance in higher education (Mattern, Shawn, & Williams, 2008) persists among some educational researchers. Therefore, further research could contribute to clarifying the relationship between standardized test outcomes, SES, and academic performance at university.

Fourthly, when considering working status to predict academic performance, it seems essential to include additional characteristics such as the type of work (part-time or full-time), correspondence with the academic field, and reasons for working. In fact, including working status merely as a dichotomous variable in any predictive analysis of academic performance could be misleading (Wang et al., 2010). Therefore, to gain a better understanding of the influence of working status, both quantitative and qualitative research methods are highly recommended (Yanbarisova, 2015).

Fifthly, after completion of their undergraduate degree, low- SES students are more likely to join the workforce instead of pursuing a postgraduate degree, as seems to be the case with high- SES students (Walpole, 2003). However, an additional question worth exploring is what happens with the relationship between SES and the academic performance of low- SES students who do continue to the postgraduate educational level.

Finally, recent educational research (Musso, Kyndt, Cascallar, & Dochy, 2012, 2013; Cascallar, Musso, Kyndt, & Dochy, 2015; Kyndt, Musso, Cascallar, & Dochy, 2015; Musso & Cascallar, 2009) has utilized predictive systems based on neural network approaches to study academic performance in primary, secondary, and higher education. The improvement of the validity, the increase in the accuracy of the predictions and classifications, and the possibility to determine the predictive weight contributions of each of the variables in the models are the principal advantages of developing predictive systems based on neural networks. Therefore, we would like to encourage the use of neural networks in order to gain a more exhaustive understanding of the relationship between SES and academic performance in higher education.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.edurev.2019.100305.

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Studies marked with an asterisk (∗) were included in the summative content analysis.
Studies marked with a cross (+) were included in the meta-analysis.

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