Writing regulation processes in Higher Education: A review of two decades of empirical research.

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ABSTRACT

In Higher Education (HE), writers need to regulate their writing processes in order to achieve their communicative goals. Although critical for academic success and knowledge construction, writing regulation processes have been mainly researched in compulsory education rather than in HE, with no systematic review focused on this context. The purpose of this article was to build a comprehensive picture of the state of writing regulation research in HE by conducting a systematic analysis of the studies on this topic in the last two decades. Studies' characteristics were analysed in light of both their theoretical perspective and objectives. Results indicated the three theoretical perspectives and diversity of objectives were equally represented. Some methodological characteristics, such as context of study, were significantly related to theoretical perspectives, while the selection of instruments depended on their objectives. A qualitative analysis of the studies showed that cognitive studies methods' varied in relation to their objectives, while sociocognitive studies used heterogeneous methods, and sociocultural studies used similar methods regardless their objective. Writing regulation in HE is a growing field with great variety of topics and objectives, yet there are still some underdeveloped issues and research challenges such as integrating emotions in the analysis, looking for more comprehensive methods that account for regulation in situated HE writing contexts, and clarifying the conceptual underpinnings of the perspective of writing regulation adopted in each study.

Keywords: *writing regulation, higher education, writing monitoring, academic writing, composition process, writing regulation approaches*

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1. INTRODUCTION

In Higher Education (HE), academic writing plays a central role in students' professional development and the construction of knowledge within the disciplines. Research has repeatedly demonstrated that academic writing is a complex activity and that students struggle to successfully fulfil the variety of writing tasks they have to solve (Bazerman 2013; Lea & Stierer, 2000; Prior, 2006). Problems are related to their ability to manage the processes involved in writing in relation to the specific demands and characteristics of the task and its discipline. That is, writers have difficulties with the regulation processes involved in writing (Caffarella & Barnett, 2000; Iñesta & Castelló, 2012; Walker, 2007). Increasing our understanding of how these processes function and develop is essential if we want to help students to succeed in their professional development.

Writing regulation processes are considered individual cognitive activities that are influenced by the social context. Theoretical perspectives can be distinguished in relation to the extent to which they tend to focus on the individual, the social, or both characteristics to formulate their theoretical models and conduct empirical research. The most active approaches in the field of writing regulation can be grouped in cognitive, sociocognitive and sociocultural perspectives, although it is worth noting that frontiers and limits among the three perspectives are dynamic and attempts have been made to bring them closer together (Castelló, Bañales, & Vega, 2010; Järvelä, Volet & Järvenoja, 2010).

Cognitive traditions are based on Hayes and Flower's (1980) seminal work, which conceives writing as a problem-solving process comprised of a set of complex planning, translating and reviewing processes, with regulation being a key factor to monitor one's own cognitive writing behaviour (Flower & Hayes 1981; Hayes, 2012). The role of long-term and working memory are critical to understanding writers' knowledge (e.g. about the topic, audience and genre), and their capacity to process and use this information. Task environment is another important component of the initial model, and it has been further developed in revised versions, which also introduced the role of motivation and affective factors (Hayes, 2012). In this perspective, the focus remains on individual writers' conscious monitoring over the processes and its role and function along the writing activity, especially in terms of differences between

expert and novice writers (Bereiter & Scardamalia, 1987); while the social dimension is explored in regards to its effects on the organization of the writing processes (MacArthur & Graham, 2016).

The sociocognitive perspective expands the initial cognitive models by adding emotional and contextual factors, such as motivation, task objectives and type of instruction (Zimmerman & Schunk, 1989). In contrast with the cognitive perspective, the emphasis here is not only on the cognitive processes but also on writers' behaviour, environment and personal characteristics. Writing regulation is conceived as writers' self-initiated thoughts, feelings and actions aimed at achieving writing objectives (Graham & Harris, 2000; Zimmerman & Risemberg, 1997). The three types of self-regulatory processes, namely environmental, behavioural and personal, interact with each other in a feedback loop by which writers adapt their output and modify their writing self-efficacy beliefs. The main focus of sociocognitive studies has been on the development and learning of writing abilities and strategies, an issue somehow disregarded by cognitive researchers (MacArthur & Graham, 2016). Thus, much of the research within this perspective has been devoted to the assessment of interventions on self-regulation skills, such as the well-known Self-Regulated Strategies Development (SRSD) programme (Graham, McKeown, Kiuhara, & Harris, 2012). In subsequent theoretical revisions, Zimmerman and Schunk formulated a model of the development of self-regulation to describe the phases or levels writers go through to improve their writing self-regulation skills: observation, emulation, self-control and self-regulation (Schunk & Zimmerman, 2007; Zimmerman, 2000). Despite their differences, both perspectives have a common focus on the individual processes involved in writing (Graham & Harris, 2012).

In contrast, sociocultural approaches emphasize the importance of the broad sociocultural context and disciplinary discourses. Sociocultural perspectives switched the focus away from the individual cognitive processes to explore and understand the situated cognition, that is, the socially mediated processes by which meanings are constructed, revised and transformed (Allal, 2000; Prior, 2006). In writing, the emphasis is on the written outputs and genres and their relationship with the social practices and activities where texts are produced. The role they play in the way individuals learn to write is also a critical issue for sociocultural scholars (Bazerman, 2013). Writing is defined as a socially and historically

situated activity, where each writing event is different and unique, and texts are mediating and collaborative artefacts of the activity (Prior, 2006). Thus, writing regulation is not only conceived individually but also as social processes: participation in communities of practice and co-regulation, that is, the process by which a novice writing acquires and internalizes writing regulation skills while working with a more skilled writer (Allal, 2000; Englert, Mariage, & Dunsmore, 2006; McCaslin & Hickey, 2001, Prior & Shipka, 2003).

Altogether, these perspectives have been crucial to enhancing our knowledge about writing regulation processes, since each of them highlights different dimensions of the processes and prioritize diverse methodologies and methods (Castelló, et al., 2010; Hyland, 2016). Nevertheless, historically there has been little dialogue between them (Hadwin & Oshige, 2011; Järvelä, et al., 2010). This review aims to contribute to this dialogue.

Several reviews and meta-analyses on writing regulation in primary and secondary school have been conducted (see, for instance, Bangert-Drowns, Hurley, & Wilkinson, 2004; Graham, 2006; Graham, et al., 2012); however, in the context of HE, we only found reviews on self-regulation of learning (de Bruijn-Smolders, Timmers, Gawke, Schoonman & Born, 2016; Roth, Ogrin, & Schmitz, 2016). Yet, to our knowledge, there are no systematic reviews exploring the field of writing regulation in HE writers. A review of the empirical research will allow us to assess the relevance and prevalence of each perspective, identify similarities and differences across them, and draw some methodological gaps. Ultimately, it will advance our understanding about writing regulation processes at university, and contribute to designing better writing interventions aimed at promoting students' learning and success.

Thus, we conducted a systematic review of empirical studies aimed at building a comprehensive picture of the state of writing regulation research in the context of HE. Specifically, our objectives were:

- To map the general characteristics of research on writing regulation in HE.
- To identify and analyse relationships between objectives and theoretical and methodological options of research on writing regulation in HE.

- To identify and explain groups within each theoretical perspective on the basis of their objectives.

HE writing processes are highly specific and complex (Hyland, 2013), and thus different from the processes that may emerge in other contexts and tasks and with other populations. Therefore, we assume that in order for research to understand HE students' processes and better inform evidence-based trainings, writing regulation needs to be explored in the context of authentic activities and situations that account for the specificity and complexity of these processes; authentic activities in terms of those that are relevant in each discipline, that is, those activities that prepare students for their (future) professional careers. Our position, however, does not necessarily favour one perspective over the others; writing regulation processes happening in real contexts and with authentic tasks can be explored from any of the theoretical perspectives and using any methodology (Hyland, 2016).

2. METHOD

2.1. Criteria of inclusion

- Social Sciences studies published in the last 22 years were included. We wanted to set a timeframe long enough to provide an extensive overview of the empirical writing regulation research. Moreover, the first publication that addresses the specific issue of writing regulation did not appear until 1994 (Zimmerman & Bandura, 1994), although previously many studies had been conducted in the field of self-regulated learning.

- Only empirical research was included since the focus of this review is on the relationship between theoretical and methodological options. Furthermore, theoretical papers are more likely to present general models of writing processes and were included in the introduction of the article (e.g. Castelló, et al., 2010; Zimmerman & Risemberg, 1997).

- Only peer-reviewed journal articles were considered.

- We included papers published in English, Spanish, French and Italian. We broadened the scope to languages other than English to include different research cultures.

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2.2. Search terms and databases

The most relevant online databases in the educational field, that is, Thomson Reuters Web of Science, Scopus and ERIC were used. We defined five primary keywords, related to writing regulation, and 12 secondary keywords, related to the educational level and type of writing at which we aimed. Primary keywords were: writing regulation, writing coregulation, writing monitoring, writing process and writing processes. Secondary keywords were: higher education, university, college, academic writing, undergraduate, graduate, PhD, doctoral, doctorate, Writing in the Disciplines, Writing Across the Curriculum and scientific writing. Each primary keyword was separately combined with each of the secondary keywords, which resulted in 60 independent searches in each database. Results were integrated into one database. After removing duplicates, 840 articles remained.

After reviewing all abstracts, we excluded a large pool of papers (n = 508) not related to the topic of writing regulation processes. The polysemy of some keywords (e.g. 'regulation' in Law and Medicine, or 'monitoring' in Technology and ICT), the common use of the word 'writing' in abstracts and titles, and the frequent appearance of authors' affiliation and publishers in the abstracts (and therefore the use of 'university' and 'college'), led to a great number of articles (n = 232) related to other topics and disciplines, such as Medicine, Law, ICT or Literature Studies topics. Even within Education and Social Sciences, the search resulted in many studies focused in a great variety of topics not related to writing regulation processes (e.g. learning regulation, assessment instruments, educational policy or genre studies) (n = 276). From those with a focus on writing regulation processes, we also excluded non-empirical articles (n = 116, including theoretical papers, revisions, descriptions of interventions and programmes and reports), and those whose only aim was to explore descriptive questions about participants' sociodemographic features (such as gender, race or disabilities) in relation to writing regulation (n = 161). From the remaining articles, four were excluded due to weak or insufficiently described methods. Finally, 51 articles met the criteria for inclusion and were included in this review.

2.3. Procedure of analysis

The analysis was conducted in four phases. First, after carefully reading all the selected articles, we summarized them in a descriptive table. Second, an iterative process of data categorization was followed for all the dimensions related to research objectives, that is, theoretical background, research objectives and methods. Initial dimensions and codes were discussed and redefined.

Theoretical backgrounds were classified into *perspectives*, whereas the variety of research *objectives* and questions was reduced by grouping studies on whether they explored writing regulation processes of specific texts (hereafter referred to as *writing processes*), they assessed the effects of an intervention (hereafter referred to as *intervention effects*), or they explored writers' beliefs and perceptions about writing regulation (hereafter referred to as *perceptions and beliefs*). Due to the prevalence of studies conducted with undergraduate students, type of participants was only divided into undergraduate and graduate, the latter group including master's and PhD students, as well as professors in one case. Regarding the method, *designs* were divided into observational and (quasi)experimental; *research settings* were grouped in natural contexts (regular classroom and courses) and lab (specifically designed by researchers). As for *instruments*, we grouped codes in five groups, similar to Hyland's (2016) classification, in relation to the type of data they collected: retrospective self-reports (e.g. questionnaires, interviews and process logs), online activity recordings (e.g. time measures, keystroke logging, screen-captures and eye-movement devices), self-reported on-line processes (different methods of think-aloud protocols), concurrent tasks (reaction time tasks), and interaction (recordings of peer or expert feedback and discussion)[2]. The type of writing task used -when appropriate- was included as a separate dimension, and divided into disciplinary and non-disciplinary texts, based on whether they were authentic tasks and genres in the professional future –or current activity- of the participants in each study. This classification was considered the most suitable for our purpose of informing HE teaching practices. Moreover, *text analysis* was included as another dimension, where studies were divided into those that did not analyse

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[2] Stimulated recall interviews were classified as on-line activity recordings or retrospective self-reports depending on whether the study analysed the on-line processes recorded, or only interview data.

texts, those that assessed only final texts, and those that analysed their evolution through drafts of the same text. The final code included studies tracking the changes incorporated in the text as a result of peer- or expert-feedback.

Finally, we included a dimension for the *emotions* involved in the writing process, because the affective dimension of writing is seen as a differential element among theoretical perspectives: while some perspectives, like the self-regulation theory, highlight emotions as a central factor, others, such as Hayes & Flower's (1980) model, do not include an affective dimension (Castelló et al., 2010; Mackiewicz & Thompson, 2014; Zimmerman & Risemberg, 1997). Moreover, traditionally educational and self-regulation research have focused on the cognitive processes, and has neglected the study of emotions (Pekrun & Linnenbrink-García, 2014; Schutz & DeCuir, 2002), despite their critical role in students' and teachers' learning and experiences. Thus, it is worth exploring whether studies on writing regulation processes follow the same trend or if, conversely, they include emotions in the analysis of the processes. Studies were coded into only one category of each dimension, with the only exception of *instruments*, where multicoding was done when appropriate.

In the third phase, we analysed the relationship between studies' theoretical perspectives and objectives, and between the objectives and the theoretical and methodological options, using *Pearson's chi-square test*. Cramer's V was used to measure the strength of the association between the variables. All the quantitative analyses were conducted using SPSS (v19) package.

Finally, in order to provide more detail on studies' characteristics, and on how studies' objectives differ depending on their perspective, we conducted a qualitative analysis of the nine subgroups emerged from the intersection between perspectives and objectives.

3. RESULTS

3.1. General characteristics of research on writing regulation in HE

Most of the articles in our sample were published in the last five years (n = 36). Six articles were published between 1994 and 1999, and 2005 and 2009, and only three between 2000 and 2004. Studies in this review were from the United States of America (n = 15), Taiwan (n = 7), Spain (n = 6), United Kingdom (n = 5), China (n = 4) and France (n = 4). Researchers from New Zealand and Sweden conducted two articles each and the rest of the studies were from Belgium, Canada, Germany, Mexico, Portugal and Puerto Rico[3]. Regardless the country, most articles (n = 47) were written in English. Only three papers were written in Spanish, and one in French.

Table 1 shows the distribution of studies' characteristics. There were no big differences in the distribution of the studies in relation to their *perspectives* and *objectives*, with studies using sociocultural approaches (n = 19) and exploring writing processes (n = 21) being a little more prevalent in the sample. As mentioned in the previous section, the *level of participants* was not so well-balanced, with 38 of the 51 studies focused on undergraduate students. As for the *designs*, observational methods (n = 32) were far more used than experimental ones (n = 18), and even larger differences were observed regarding the *context*, with natural settings representing 72.55% of the sample. Nevertheless, only 49.02% of the *tasks* used were disciplinary. Regarding the *instruments*, retrospective self-reports were the most used (n = 35), followed by recordings of participants' online writing activity (n = 10) (e.g. screen capture and keystroke logging) and interactions with others (n = 8) (e.g. peer and mentoring conversations). Think-aloud protocols (n = 5) and reaction time tasks (n = 3) were rarely used.

In relation to the data analysis, most of the papers of the sample (82.35%) did not analyse the *emotions* involved in the writing. Finally, 18 did not analyse the *texts* written by students, and those that did it mainly focused on the analysis of the final text (n = 20).

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[3] Country of the studies was identified using first authors' affiliation.

Table 1. Frequencies and percentages of the studies' characteristics.

Dimensions	Codes	Frequency	%
Perspective	Cognitive	17	33,33%
	Sociocognitive	15	29,41%
	Sociocultural	19	37,25%
Objectives	Writing processes	21	41,18%
	Intervention	16	31,37%
	Perceptions & beliefs	14	27,45%
Level	Undergraduate	38	74,51%
	Graduate	13	25,49%
Design	Experimental	18	35,29%
	Observational	32	62,75%
Context	Lab	14	27,45%
	Real	37	72,55%
Tasks	Disciplinary	25	49,02%
	Not disciplinary	20	39,22%
Instruments	Retrospective self-reports	35	68,63%
	Activity recordings	10	19,61%
	Self-reported on-line processes	5	9,80%
	Concurrent tasks	3	5,88%
	Interaction	8	15,69%
Emotions	Yes	9	17,65%
	No	42	82,35%
Texts	No analysis	18	35,29%
	Final text	20	39,22%
	Evolution	13	25,49%

Note: One study (MacArthur, Philippakos & Ianetta, 2015) could not be classified in the dimension *design*, due to their use of a design based research approach. Likewise, six studies (Ho, 2015; Guzmán-Simon & García-Jiménez, 2015; MacArthur et al., 2015; Morrison, 2014; Wisker, 2015; Zimmerman & Bandura, 1994) did not provide information of the text used in the research and therefore were not included in the frequencies of the dimension *tasks*.

3.2. Relationships between studies' theoretical perspectives, objectives and methodology

Comparisons among and between theoretical perspectives and objectives revealed some interesting results (tables with the characteristics of the studies included in the review are available in the Supplementary online materials).

First, in relation to our second objective, we present the distribution of the studies within each perspective in relation to their objectives. As shown in Table 2, both cognitive and sociocultural perspectives were mostly focused on exploring writing processes, although to a different extent: in the latter perspective, these studies represented more than half of the sample (11/19), whereas in the former the three objectives were more balanced. Within the sociocognitive perspective, half of the studies were focused on exploring writers' perceptions and beliefs about writing regulation. Nevertheless, the relationship between theoretical perspectives and objectives was not statistically significant ($p = .182$).

Table 2. Distribution of the studies in relation to their theoretical perspective and objectives.

			Objectives			
			Processes	**Intervention**	**Perceptions**	**Total**
Perspectives	Cognitive	Count	7	6	4	17
		% within perspectives	41,2%	35,3%	23,5%	100,0%
	Socio-cognitive	Count	3	5	7	15
		% within perspectives	20,0%	33,3%	46,7%	100,0%
	Socio-cultural	Count	11	5	3	19
		% within perspectives	57,9%	26,3%	15,8%	100,0%
Total		Count	21	16	14	51
		% within perspectives	41,2%	31,4%	27,5%	100,0%

In relation to the methodology, significant differences among the three theoretical perspectives were found. Regarding *participants' level*, sociocognitive studies focused significantly more on undergraduate students (93.3%) than sociocultural studies (52.6%) ($\chi^2(2) = 7.17$, $p = .028$, Cramer's $V = .375$). A strong

relationship was found in relation to their *design* ($\chi^2(2) = 22.77$, $p = .000$, Cramer's $V = .675$), with all the sociocultural studies using observational approaches, and cognitive studies using significantly more experimental and quasiexperimental designs (76.5%). Similarly, regarding the research *context* ($\chi^2(2) = 15.60$, $p = .000$, Cramer's $V = .553$), all sociocultural studies were conducted in natural contexts whereas cognitive studies were set in lab settings significantly more often (58.8%), the latter being also the perspective using concurrent task *instruments* more frequently (17.6%) ($\chi^2(2) = 6.38$, $p = .041$, Cramer's $V = .354$). Finally, both perspectives were also significantly different in relation to the *analysis of texts*, with cognitive studies mostly analysing final texts and sociocultural mostly analysing drafts evolution ($\chi^2(4) = 21.36$, $p = .000$, Cramer's $V = .647$).

Homogeneous distributions across perspectives were observed in relation to the other four types of instruments, namely retrospective self-reports, online activity recordings, online self-reported processes and interaction recordings, although a tendency was observed in the latter with cognitive studies using them less than the other perspectives ($\chi^2(2) = 5.00$, $p = .082$, Cramer's $V = .313$). Likewise, studies in this perspective tended to explore emotions involved in writing significantly less ($\chi^2(2) = 5.47$, $p = .065$, Cramer's $V = .327$). In fact, none of the cognitive studies included both methodological options (interaction recordings and emotions). Interestingly, no significant differences were observed in the type of tasks used within each perspective.

A different picture emerges when we look at the relationships between studies' objectives and methods. Studies focused on the analysis of writers' perceptions and beliefs used observational designs to a greater extent (92.9%) ($\chi^2(2) = 7,45$, $p = .024$, Cramer's $V = .386$). Likewise, they used retrospective self-reports significantly more than the others ($\chi^2(2) = 8.83$, $p = .012$, Cramer's $V = .416$): all the studies on writers' perceptions and beliefs employed these instruments, whereas only 57.1% of the studies exploring the writing processes and 56.3% of the interventions studies used them. In contrast, interaction recordings were significantly more utilized by studies assessing interventions effects (37.5%) ($\chi^2(2) = 8.96$, $p = .011$, Cramer's $V = .419$), and self-reported on-line processes instruments were more frequently employed by studies focused on the analysis of writing processes (23.8%) ($\chi^2(2) = 7.92$, $p = .019$,

Cramer's $V = .394$). The analysis of the evolution of the drafts was mostly used to assess the effects of interventions (43.8%), and those studies exploring perceptions and beliefs did not analyse texts frequently (64.3%) ($\chi^2(4) = 10.71$, $p = .030$, Cramer's $V = .458$).

It is important to mention that, although not significant, some tendencies were observed in the other *instruments*. On-line activity recordings were more frequently used by studies exploring writing processes (n = 7) than by those focusing on students' perceptions and beliefs, that did not use these instruments at all ($\chi^2(2) = 5.68$, $p = .058$, Cramer's $V = .334$). Finally, homogeneous distribution across objectives was observed in relation to the *level of participants*, *use of concurrent tasks instruments*, *type of task* written by students, *research contexts* and the analysis of *emotions*.

3.3. Detailed analysis of interactions between theoretical perspective and objectives

Qualitative analysis of studies' characteristics, in relation to both their perspective and objectives, is presented in this section to highlight differences and similarities within subgroups in order to draw a more precise picture of research developed in each perspective.

3.3.1. Analysis of the cognitive studies' objectives and related characteristics

For those studies that share a cognitive background (n = 17), writing regulation is mostly understood as a set of strategies that writers organize and distribute along writing in order to efficiently manage and control recursive writing processes (normally planning, translating and revising) and achieve a communicative goal. Furthermore, the organization of the writing processes of each individual writer is thought to be fairly stable across tasks and contexts.

The first group of studies (n = 7) is aimed at exploring *writing processes*. More precisely, they explored differences and relationships between specific aspects of writing regulation processes and other variables, such as the relationship between: working memory, as a measure of cognitive effort, and the distribution of the writing processes (Alamargot, Caporossi, Chesnet, & Ros, 2011; Alves, Castro, & Olive, 2008; Olive, Kellogg, & Piolat, 2008; Ransdell, Levy, & Kellogg, 2002); students' learning styles

and processes distribution (Van Waes, Van Weijen, & Leijten, 2014); strategy use and goal approach (He, Chang, & Chen, 2011); and differences in time allocation of the writing subprocesses between two languages (Mikulski & Elola, 2011). They focused on undergraduate students, with only one exception (Alamargot et al., 2011), and were mostly conducted in laboratory settings, where participants wrote non-disciplinary writing tasks. Although different in genre, tasks used were similar in text length and time constraints. Only van Waes et al. (2014) used a disciplinary and longer writing task. They collected information about the online writing processes using thinking-aloud protocols and working memory testing tasks; or less intrusive instruments, such as eye-movement tracking devices, keystroke logging and screen recorder devices. Moreover, two studies used questionnaires, one about learning approaches (van Waes et al. 2014) and the other about goal approaches (He et al. 2011), to assess differences across groups in relation to the management of the writing processes. They all analysed the quality of the final text.

A second group of studies (n = 6) was aimed at exploring the *effects* on the writing process and product of *interventions* about academic writing and regulation (Kolb, Longest, & Jensen, 2012; Proske, Narciss, & McNamara, 2012), metacognitive self-regulation strategies instruction (De Silva & Graham, 2015; Nguyen & Gu, 2013) and the use of specific writing supports (Butcher & Kintsch, 2001; Reynolds & Bonk, 1996). Groups of undergraduate students were compared in quasi-experimental designs to assess the intervention effects in the type and distribution of writing activities and phases, in learners' autonomy and self-regulation skills. Instruments ranged from time recorders and keystroke logging to questionnaires, interviews and stimulated recall interviews. Although some used disciplinary tasks (Kolb et al., 2012; Proske et al., 2012), the majority did not. Moreover, they analysed the final text, with only two exceptions (De Silva & Graham, 2015; Kolb et al. 2012).

Finally, four studies were focused on students' *perceptions and beliefs* about their writing strategies and regulation. Despite sharing the broad assumptions of cognitive approaches, they were observational, conducted in natural settings, and mostly used disciplinary tasks (Lavelle & Bushrow, 2007; Torrance, Thomas, & Robinson, 1994; 2000; Yang & Plakans, 2012). They all used questionnaires

to explore undergraduate or graduate processes, and most of them analysed the quality of the final text composed by students.

3.3.2. Analysis of the sociocognitive studies' objectives and related characteristics

Studies sharing a sociocognitive approach (n = 15) define writing regulation as the ability to monitor and direct one's cognitive, motivational, affective and social aspects of intellectual functioning while writing to achieve a communicative goal. Nevertheless, it should be noted that some studies in this group were not explicit regarding their definition of regulation (Cho & MacArthur, 2010; Cumming & So, 1996; Ferris, Liu, Sinha, & Senna, 2013; Ho, 2015; MacArthur et al., 2015; Yeh, 2014).

Almost half of the studies (n = 7) in this group focused on the identification and analysis of undergraduate students' *perceptions and beliefs* about their self-regulation ability or some of its components (as defined by the social cognitive theory; see Zimmerman & Schunk, 1989), that is, self-efficacy (Ekholm, Zumbrunn, & Conklin, 2015; Prat-Sala & Redford, 2012; B. Zimmerman & Bandura, 1994), metacognition (Escorcia, 2010; Escorcia & Fenouillet, 2011; Negretti, 2012), and task representation and goals (Negretti, 2012; Nicolás-Conesa, Roca de Larios, & Coyle, 2014). In one case, they related these components with students' success and feedback perceptions (Ekholm et al., 2014). They all used observational designs and interviews, logs and questionnaires to explore students' self-regulation abilities for academic writing in general or for specific disciplinary tasks. Almost half of them explored students' emotions (Negretti, 2012; Ekholm et al. 2014; Nicolás-Conesa et al. 2014). When used, tasks were mostly disciplinary and authentic, although they were only analysed in three studies (Escorcia & Fenouillet, 2011; Nicolás-Conesa et al. 2014; Prat-Sala & Redford, 2012). None of them analysed texts' evolution.

Five studies aimed at exploring *intervention effects* on undergraduate students' writing processes and products. More specifically, one study assessed a self-regulated strategy instruction (MacArthur et al., 2015), another explored the utility of written corrective (teacher) feedback (Ferris et al., 2013), and three analysed the impact of types of tutor and peer feedback (Cho & MacArthur, 2010; Cumming & So, 1996; Ho, 2015). Except for Ferris et al. (2013), these studies had quasi-experimental designs, and they all

collected students' discourse, either via feedback and revision comments, or interviews, about the process of writing disciplinary or non-disciplinary tasks. Most of them analysed texts, either in terms of changes performed after the peer-feedback, or the quality of the final text and only one (Ferris et al., 2013) explored students' emotions.

Finally, three studies were devoted to the description and analysis of undergraduate students' *writing processes* in a specific task (Franklin & Hermsen, 2014; Stapleton, 2010), in one case focusing on the differences between good and poor writers (Ferrari, Bouffard, & Rainville, 1998). Two of them were quasi-experimental studies, conducted in laboratory settings. They both used non-disciplinary and short writing tasks, but they differed in the data collection instruments: whereas Franklin & Hermsen (2014) employed keystroke loggings to observe the evolution of the text, Ferrari et al. (1998) collected data through direct observation and writers' self-reports to assess students' writing processes and self-regulation, and their relationships with final texts' quality. Writing tasks were non-disciplinary and short in both cases. In contrast, Stapleton (2010) used a longitudinal single case-study design to describe one graduate student's composing processes and their time allocation. To this end, logs and interviews were collected during the process of writing a long and disciplinary essay. The task was specifically designed for the research and it was not included in the analysis of the processes. None of the three studies explored the emotions involved in these processes.

3.3.3. Analysis of the sociocultural studies' objectives and related characteristics

All the studies included in this group (n = 19) conceptualize writing regulation as a result of the social mediation, that is, they understand writing regulation as intrinsically related to the processes of internalisation of cultural activities, discourses and actions. As it also happened in the previous group, some studies did not provide any clear definition or conceptualization of this core concept (e.g. Alvarez, Espasa, & Guasch, 2012; Li, 2013; Morrison, 2014).

Most of the studies in this group (n = 11) were aimed at analysing the *processes* involved in writing and revising a specific text. More specifically, they focused on analysing the problems faced by writers and the solutions and strategies implemented (Lei, 2008; Li, 2013; Castelló, Iñesta, & Corcelles, 2013; Castelló, Iñesta, & Monereo, 2009; Castelló, González, & Iñesta, 2010; Zanotto, Monereo, & Castelló, 2011); the understanding and use of sources and their impact on writing practices (Zhao & Hirvela, 2015); the use of corpus and dictionaries during writing (Lai & Chen, 2015); one writer's interaction with teacher's feedback (Kumar & Kumar, 2012) and the importance of the relationship teacher-student on the writing process (Eriksson & Makitalo, 2015; Lee & Schallert, 2008). All these studies adopted observational designs and took place in authentic settings, although some (Kumar & Kumar, 2012; Lei, 2008; Lai & Chen, 2015) used non-disciplinary tasks. As for the type of participants, five studies focused on undergraduate students, two on master's, three on PhD students, and one on senior professors. Instruments were diverse: some studies were based on interviews and questionnaires, and others also included writing logs or teacher-student conversations. Think-aloud protocols, sometimes combined with interviews were also used, as well as stimulated recall interviews. Finally, one study was based on peer-revision conversations. Only three studies included the analysis of the emotions involved in the process (Castelló et al., 2013; Castelló et al., 2009; Lee & Schallert, 2008), and, except in one case (Lei, 2008), all of them included the evolution of the text in the analysis.

Five studies were aimed at exploring the *effects of an intervention* on writers' regulation. More specifically, some analysed the impact of peer (Villamil & De Guerrero, 1998; Yang, 2011) and teacher feedback (Álvarez et al., 2012), and collaborative dialogues (Yeh, 2014a) on text improvement, whereas another assessed the effect of an online writing system on writers' metacognitive processes (Yeh, 2014b). Again, all the studies were observational, conducted in authentic settings and used disciplinary tasks, either with undergraduate or master's students. Data collected included peers' conversations, questionnaires, writing logs and activity in the online system, and interviews, and all analysed the evolution of drafts.

In the sociocultural perspective, only three studies were found which focused on writers' *perceptions and beliefs* about their regulation processes, problems and strategies (Morrison, 2014;

Guzmán-Simon & García-Jiménez, 2015; Wisker, 2015). They were also observational studies, conducted in real settings. Two of them explored undergraduate students' writing processes (practices, problems and strategies) by means of interviews (Morrison, 2014; Guzmán-Simon & García-Jiménez, 2015), while the other also used interviews to explore the role of literature reviews in PhD students' writing processes (Wisker, 2015). Texts were not included in the analyses, and only the former study explored the emotions involved.

4. DISCUSSION

The aim of this paper was to build a comprehensive picture of the state of writing regulation research in the context of HE in order to gain a better understanding of the relationships between objectives and theoretical and methodological options of research on this area and identifying gaps for further research development on writing regulation in HE.

Regarding objective 1, to describe the characteristics of research on writing regulation in HE, results showed a great increase in the number of studies in the last few years, especially within the sociocognitive and sociocultural perspectives, in line with the rise experienced in HE research in other fields (Roth, et al., 2016). In the whole sample, the three perspectives were equally represented, although differences were observed among studies in regards to their identification with a specific theoretical perspective. While many studies were explicit about their framework, differentiation among perspectives was in some cases challenging either because studies lacked a clear theoretical definition or because they presented theoretical developments that soften the limits among theoretical perspectives.

Within the whole sample, three broad objectives were identified. A greater number of studies focused on the analysis of the writing regulation processes, arguably the core of the topic and a necessary objective for an emerging field such as this one; followed by studies assessing the effects of interventions aimed at helping students develop and improve their writing regulation abilities, as it is a primary concern of sociocognitive and sociocultural perspectives (Graham & Harris, 2000; Prior, 2006).

We also sought to identify and analyse relationships between objectives and theoretical and methodological options (objective 2) and to explain groups within each theoretical perspective on the basis of their objectives (objective 3). As expected, the choice of perspective was related to some studies' characteristics (Castelló, et al., 2010), while other features depended on studies' objectives or on both.

On the one hand, the theoretical perspective was related to the level of participants and the context of the study, as well as the analysis of emotions. Regarding the level of participants, sociocultural studies were more frequently focused on experienced writers, probably due to their interest in the role genres play in specific communities of practice, such as the relationship between PhD and master's students' participation in the community by means of writing scientific articles (Caffarella & Barnett, 2000). Regarding the context, more cognitive studies were conducted in lab settings, whereas sociocultural studies were all conducted in natural contexts, what seems to indicate that the decision on the setting might depend on the importance attributed to the situated dimension of writing. The analysis also showed that cognitive studies did not include emotions in their analysis, while some studies in the other perspectives did. However, like in other education fields (Pekrun & Linnenbrink-García, 2014; Schutz & DeCuir, 2002), emotions were neglected by most of the studies of our sample, despite being an essential factor in most theoretical models of writing regulation (Graham & Harris, 2000; Roth et al., 2016; Zimmerman & Risemberg, 1997). Therefore, this is a clear gap for future research. All the perspectives should either reconsider or explore the role emotions play in the writing regulation processes and the learning of writing regulation abilities.

On the other hand, the selection of instruments was related to studies' objectives rather than to their theoretical perspective, suggesting that while all instruments are available to any perspective, some might be better than others to explore certain issues (the only exception being concurrent tasks instruments, used by cognitive studies to explore writers' working memory). Retrospective self-reports, such as interviews and questionnaires, were the most used instruments because they allow researchers to access important writing regulation components which are not accessible otherwise, such as metacognition, strategy use, objectives and perceptions (Roth et al., 2016). Moreover, they are suitable

instruments to preserve the natural conditions and development of the writing process. Nevertheless, it has been argued that these instruments may not give information about the actual behaviour (Roth et al., 2016), particularly in relation to the micro-processes involved in writing regulation, since they are highly recursive (Zimmerman & Risemberg, 1997) and partially implicit (Iñesta & Castelló, 2012), especially when writing complex and authentic tasks.

Other studies, mostly focused on the analysis of the writing processes, used instruments aimed at capturing the unfolding of the processes as they occurred (e.g. think-aloud protocols, RTs tasks, keystroke logging and video recordings) in order to avoid the limitations mentioned above and to design specific tools to approach the object of analysis. However, some of these instruments set artificial conditions that may alter the natural development of writing regulation in HE thus informing about processes different than those happening in authentic contexts (Hadwin & Oshige, 2011). Studies based on perspectives that highlight the social nature of writing regulation processes collected information about writers' interactions as part of those processes, which in some cases result in alternative units of analysis and methods, such as *episode* (Álvarez et al., 2012), *transaction* (Cumming & So, 1996) and *troublesources* (Villamil & Guerrero, 1998).

The combination of different types of instruments has been frequently aimed at helping researchers address the complexity of writing (Hyland, 2016), and enriching the analysis by taking into account the thoughts and actions, goals, emotions, as well as writers' interpretation and the relationship with significant others (Allal, 2000; Bereiter & Scardamalia 1987; Flower & Hayes 1981; Graham & Harris, 2000; McCaslin & Hickey, 2001; Zimmerman & Risemberg, 1997). However, only a few studies in our review employed more than one type of instruments, in most cases combining retrospective self-reports with measures of time devoted to writing phases. Despite that, it is worth mentioning that the analysis of the instruments revealed some attempts to overcome the limits among perspectives. Think-aloud and activity recording instruments, which have most typically been employed in cognitive studies (MacArthur & Graham, 2016), were also used in our sample by some sociocognitive and sociocultural studies, in some cases after adapting the procedure to the theoretical assumptions of the study (Ferrari et

al., 1998; Franklin & Hermsen, 2014; Kumar & Kumar, 2012; Lee & Schallert, 2008; Zhao & Hirvela, 2015; Zanotto et al., 2011). This also emerges as a challenge for future research, which might want to combine these and other types of instruments in order to provide a more comprehensive picture of writing regulation in line with the complex and multidimensional definitions provided by each perspective.

Both studies' perspective and objectives were also related to the choice of the design, and whether and how texts were included in the analysis. Cognitive studies were more concerned about the quality of the final text, which is consistent with their interest in how writing regulation processes impact the quality of the product (Hayes & Flower, 1980). Sociocultural studies included multiple drafts in the analysis, like those sociocognitive studies aimed at assessing the effects of peer-review and feedback interventions. However, many studies within these two perspectives did not analyse the text produced by participants, although the conceptualization of writing as a process, with texts being both epistemic processes and their final product, is also central to both theoretical perspectives (Castelló et al., 2010). If the ultimate purpose of writing interventions and research is to help students regulate their writing process and write better texts, understanding how the process is impacting the text at different moments seems crucial, since it could help increase our understanding on how and why texts unfold and evolve.

Interestingly, neither the theoretical perspective nor the objectives were related to the type of tasks used in the studies. In a surprisingly high number of cognitive but also sociocognitive and sociocultural studies, the tasks to be written by participants were not aligned to their discipline and needs for professional development: the tasks' genre, topic, length or time limits were different and, in most cases, easier and shorter than those that students write at university and will find in their professional career (Castelló & Mateos, 2015; Gardner & Nesi, 2012). It has been argued that easy and non-disciplinary tasks may not be a real challenge or a communicative problem for students (Eklundh & Kollberg, 2003), which may hinder the emergence of the recursivity of the writing regulation processes, also highlighted by all the theoretical perspectives.

The few studies addressing the affective dimension of writing were precisely studies that were conducted in natural contexts and used disciplinary tasks. It might be that studies concerned about

preserving the natural context of occurrence of the processes are also concerned about the effect of emotions, or that emotions are more likely to emerge in the context of meaningful, complex and open writing tasks because students have to face several challenges and problems and can relate these tasks to their personal goals (Järvelä et al., 2010). The question is whether writing regulation, which involves analysing how writers deal with cognitive and emotional challenges and difficulties, can be appropriately understood without considering disciplinary or at least challenging tasks, especially with advanced HE writers.

The qualitative analysis of the studies' characteristics also provided some insights on the interaction between perspectives and objectives. Both the general and the detailed analysis suggested a greater stability and similarity among all the sociocultural studies. In contrast, cognitive studies' methods seemed to depend more on their objectives, with lab settings and quasi-experimental designs used when exploring the writing processes and a tendency towards ecological methods when focused on the analysis of interventions. In turn, sociocognitive studies' methods were the most heterogeneous, also within the different objectives, with the only exception being the common use of retrospective self-reports, which suggests that studies in this perspective employ designs and methods typically used by either cognitive and sociocultural perspective depending on the specific aims of each study.

Finally, we want to acknowledge some limitations of this study. First, we only selected peer-reviewed articles and did not include other documents such as volume series of research or proceedings. Although most of the contributions in these publications do not usually include new empirical research, the selection criteria may not cover all the existing literature on writing regulation processes. Second, the complexity of the topic of study and our intention to include studies from different fields and perspectives, which use different terms and labels to refer to similar objects, makes the review especially challenging. For this reason, we opened the scope with a wide variety of keywords though, at the same time, we applied strict criteria for inclusion.

5. CONCLUSIONS

Writing regulation in HE is a growing field with a great variety of topics and objectives and large distribution of studies into different theoretical and methodological perspectives. However, it is quite a new research field and more dialogue among perspectives is needed in order to identify overlapping or underdeveloped issues and shared challenges. Integrating emotions in the analysis of writing regulation is one of them. Looking for more comprehensive methods that account for regulation in situated HE writing contexts is another challenge this review has identified. Moreover, there is still a need to clarify the conceptual underpinnings of the perspective on writing regulation adopted in each study since several studies lacked this definition. Ultimately, clarification and subsequent reflection on writing regulation theoretical approaches would help researchers to be more aware of the strengths and limitations of each perspective and to move towards integrated and more comprehensive ways to study writing regulation.

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SUPPLEMENTARY ON-LINE MATERIAL

Table 1. Studies with a cognitive background

Studies	Objectives			Level		Design		Context		Tasks		Instruments					Emotions	Texts		
	Processes	Intervention	Perceptions	Undergraduate	Graduate	Experimental	Observational	Lab	Natural	Disciplinary	Not disciplinary	Self-reports	Activity recordings	Self-reported on-line processes	Concurrent tasks	Interaction	Emotions	No	Final text	Evolution
Alamargot, Caporossi, Chesnet & Ros (2011)	1				1	1		1			1		1						1	
Alves, Castro & Olive (2008)	1			1		1		1			1			1	1				1	
He, Chang & Chen (2011)	1			1		1		1			1	1		1					1	
Mikulski & Elola (2011)	1			1		1			1		1		1						1	
Olive, Kellogg & Piolat (2008)	1			1		1		1			1				1				1	
Ransdell, Levy & Kellogg (2002)	1			1		1		1			1				1				1	
van Waes, van Weijen & Leijten (2014)	1			1		1		1		1		1	1						1	
Total subgroup	**7**	**0**	**0**	**6**	**1**	**7**	**0**	**6**	**1**	**1**	**6**	**2**	**3**	**2**	**3**	**0**	**0**	**0**	**7**	**0**
Butcher & Kintsch (2001)		1		1		1		1			1		1						1	
de Silva & Graham(2015)		1		1		1		1		1		1						1		
kolb, longest, jensen (2012)		1		1		1			1	1		1						1		

Nguyen & Gu (2013)		1		1		1		1		1	1								1	
Proske, Narciss &McNamara (2012)		1		1		1		1		1	1	1							1	
Reynolds & Bonk (1996)		1		1		1		1			1	1							1	
Total subgroup	**0**	**6**	**0**	**6**	**0**	**6**	**0**	**3**	**3**	**3**	**3**	**4**	**3**	**0**	**0**	**0**	**0**	**2**	**4**	**0**
Lavelle & Bushrow (2007)			1		1		1		1	1		1							1	
Torrance, Thomas & Robinson (1994)			1		1		1		1	1		1						1		
torrance, thomas & robinson (2000)			1	1			1		1	1		1							1	
Yang & Plakans (2012)			1		1		1	1			1	1							1	
Total subgroup	**0**	**0**	**4**	**1**	**3**	**0**	**4**	**1**	**3**	**3**	**1**	**4**	**0**	**0**	**0**	**0**	**0**	**1**	**3**	**0**
Total cognitive group	**7**	**6**	**4**	**13**	**4**	**13**	**4**	**10**	**7**	**7**	**10**	**10**	**6**	**2**	**3**	**0**	**0**	**3**	**14**	**0**

Table 2. Studies with a sociocognitive background

Studies	Objectives			Level		Design		Context		Tasks		Instruments					Emotions	Texts		
	Processes	Intervention	Perceptions	Undergraduate	Graduate	Experimental	Observational	Lab	Natural	Disciplinary	Not disciplinary	Self-reports	Activity recordings	Self-reported on-line processes	Concurrent tasks	Interaction		No	Final text	Evolution
Ekholm, Zumbrunn & Conklin (2015)			1	1			1		1	1		1						1		
Escorcia (2010)			1	1			1		1	1		1						1		
Escorcia & Fenouillet (2011)			1	1			1	1			1	1							1	
Negretti (2012)			1	1			1		1	1		1					1	1		
Nicolás-Conesa, Roca de Larios & Coyle (2014)			1	1		1			1	1		1					1		1	
Prat-Sala & Redford (2012)			1	1			1		1	1		1							1	
Zimmerman & Bandura (1994)			1	1			1		1	No description provided		1						1		
Total subgroup	**0**	**0**	**7**	**7**	**0**	**1**	**6**	**1**	**6**	**5**	**1**	**7**	**0**	**0**	**0**	**0**	**2**	**4**	**3**	**0**
Cho & MacArthur (2010)		1		1		1			1	1						1				1
Cumming & So (1996)		1		1		1		1			1					1		1		

Ferris, Liu, Sinha & Senna (2013)		1		1		1		1			1	1					1			1
Ho (2015)		1		1		1	1		No description provided								1			1
MacArthur, Philippakos & Ianetta (2015)		1		1		Design based research	1		No description provided	1								1	1	
Total subgroup	**0**	**5**	**0**	**5**	**0**	**2**	**2**	**1**	**4**	**1**	**2**	**2**	**0**	**0**	**0**	**3**	**2**	**1**	**1**	**3**
Ferrari, Bouffard & Rainville (1998)	1			1		1		1			1	1	1						1	
Franklin & Hermsen (2014)	1			1		1		1			1		1							1
Stapleton (2010)	1				1		1		1	1		1						1		
Total subgroup	**3**	**0**	**0**	**2**	**1**	**2**	**1**	**2**	**1**	**1**	**2**	**2**	**2**	**0**	**0**	**0**	**0**	**1**	**1**	**1**
Total sociocognitive group	**3**	**5**	**7**	**14**	**1**	**5**	**9**	**4**	**11**	**7**	**5**	**11**	**2**	**0**	**0**	**3**	**4**	**6**	**5**	**4**

Table 3. Studies with a sociocultural background

Studies	Objectives			Level		Design		Context		Tasks		Instruments					Emotions	Texts		
	Processes	Intervention	Perceptions	Undergraduate	Graduate	Experimental	Observational	Lab	Natural	Disciplinary	Not disciplinary	Self-reports	Activity recordings	Self-reported on-line processes	Concurrent tasks	Interaction		No	Final text	Evolution
Castelló, González & Iñesta (2010)	1				1		1		1	1						1				1
Castelló, Iñesta & Corcelles (2013)	1				1		1		1	1		1					1			1
Castelló, Iñesta & Monereo (2009)	1				1		1		1	1		1					1			1
Eriksson & Makitalo (2015)	1				1		1		1	1						1		1		
Kumar & Kumar (2012)	1				1		1		1		1			1						1
Lai & Chen (2015)	1			1			1		1		1	1						1		
Lee & Schallert (2008)	1			1			1		1	1		1	1				1			1
Lei (2008)	1			1			1		1		1	1						1		
Li (2013)	1			1			1		1	1		1						1		
Zhao & Hirvela (2015)	1			1			1		1	1		1		1			1		1	
Zanotto, Monereo & Castelló (2011)	1				1		1		1	1		1		1				**1**		

Total subgroup	11	0	0	5	5	0	11	0	11	8	3	8	1	3	0	2	4	5	1	5
Alvarez, Espasa & Guasch (2012)		1			1		1		1	1		1				1				1
Villamil & de Guerrero (1998)		1		1			1		1			1				1				1
Yang (2011)		1		1			1		1	1		1	1							1
Yeh (2014a)		1		1			1		1		1					1			1	
Yeh (2014b)		1			1		1		1	1	1									1
Total subgroup	0	5	0	3	2	0	5	0	5	3	2	3	1	0	0	3	0	0	1	4
Guzmán-Simon & García-Jiménez (2015)			1	1			1		1			1						1		
Morrison (2014)			1	1			1		1	No description provided		1						1		
Wisker (2015)			1		1		1		1	No description provided		1					1	1		
Total subgroup	0	0	3	2	1	0	3	0	3	0	0	3	0	0	0	0	1	3	0	0
Total sociocultural group	11	5	3	10	8	0	19	0	19	11	5	14	2	3	0	5	5	8	2	9