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Impact and structural features of meta-analytical studies, standard articles and reviews in psychology: Similarities and differences

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ABSTRACT

Meta-analysis refers to the statistical methods used in research synthesis for combining and integrating results from individual studies. In this regard meta-analytical studies share with narrative reviews the goal of synthesizing the scientific literature on a particular topic, while as in the case of standard articles they present new results. This study aims to identify the potential similarities and differences between meta-analytical studies, reviews and standard articles as regards their impact and structural features in the field of psychology. To this end a random sample of 335 examples of each type of document were selected from the Thomson Reuters Web of Science database. The results showed that meta-analytical studies receive more citations than do both reviews and standard articles. All three types of documents showed a similar pattern in terms of institutional collaboration, while reviews and meta-analytical studies had a similar number of authors per document. However, reviews had a greater number of references and pages than did meta-analytical studies. The implications of these results for the scientific community are discussed.

1. Introduction

For many decades narrative reviews were the preferred way for researchers to combine the results of different articles about a specific topic. The aim of such reviews was to gather together a set of studies on a given subject, summarizing their results and drawing conclusions regarding the question of interest. This approach had a number of limitations, notably the lack of transparency or subjective nature of many of the decisions made when preparing the review (Cooper & Hedges, 1994). For example, the criteria for including studies or the level of confidence assigned to each one of them might vary from one set of reviewers to another, and in some cases this could mean that two reviews reached substantially different conclusions (Borenstein, Hedges, Higgins, & Rothstein, 2009). Furthermore, the number of scientific publications now being produced is so great that any attempt to synthesize research by means of narrative reviews is likely to prove ineffective due to the unmanageable amount of information, unless, that is, the process can be made more systematic. It is in this context

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that systematic reviews and meta-analyses have emerged as a way of making more rigorous the process of document localization and the definition of inclusion/exclusion criteria, among other aspects of the review procedure. While these approaches do not completely eliminate the subjectivity that is characteristic of narrative reviews, they at least ensure a more transparent synthesis, since they make explicit all the decisions made during the process. In a systematic review the statistical synthesis of data is based on what is known as meta-analysis, an approach that includes a range of statistical methods and formulas designed to synthesize and compare the results of a set of studies (Littell, Corcoran, & Pillai, 2008). Meta-analysis has become a highly popular way of synthesizing research literature and it is now widely accepted within the scientific community (Cooper, 2010), to the extent that when a team of scientists plans a new study it is highly likely that they will first seek to locate a meta-analysis in order to design their own investigation. In this regard the field of psychology is no exception, not least because the first study to be regarded as a meta-analysis examined the effectiveness of psychotherapy (Smith & Glass, 1977). The considerable influence of the meta-analytic procedures that were being used in psychology and education led to them being transferred to many other areas of knowledge.

Despite the importance attached to meta-analysis in the scientific community it is not clear how best to classify this kind of study. In fact, its bibliometric characteristics have yet to be properly described. On the one hand, meta-analyses have some clear similarities with reviews. However, meta-analytical studies not only synthesize the results of previous studies but also present new results, a feature they share with standard articles. Some databases (e.g., MEDLINE) treat meta-analyses as a different category, recognizing the distinctive features of this type of study as compared with other types of documents. However, the Thomson Reuters Web of Science, the most widely used database for carrying out bibliometric studies, ignores this distinction.

In science a common way to measure the relevance of a study is to count the number of citations it has received (Moed, 2005). When a scientific paper is published in a journal other scientists can use its findings to elaborate, corroborate or contrast their own research. They then indicate the use of that paper by means of a formal citation in their own research. The number of citations that a study receives has therefore been used as an objective quantitative indicator of its usefulness, importance and the interest it arouses in the scientific community. However, as Glänzel and Moed (2002) point out, the citations that a paper receives are themselves influenced by at least five factors: (i) the type of document (e.g., articles, reviews, notes or proceedings papers, among others); (ii) the discipline, since not all scientific fields have the same citation habits; (iii) the paper's age, since older papers have a greater chance of being cited; (iv) the paper's 'social status', for example, the impact factor of the journal in which it was published or the standing of its author(s); and (v) the observation period, due to the influence of aspects such as obsolescence or the citation curve of the literature. Moreover, other authors have shown that a high number of citations are associated with a higher number of co-authors (Beaver, 2004; Glänzel, Rinia, & Brocken, 1995; Lawani, 1986; Vieira & Gomes, 2010), a greater number of both pages (Bornmann & Daniel, 2007) and references (Haslam et al., 2008; Bornmann, Mutz, Neuhaus, & Daniel, 2008; Peters & van Raan, 1994; Vieira & Gomes, 2010), English language publication (van Raan, 2005) and a greater international collaboration (Aksnes, 2003; Glänzel et al., 1995).

The fact that reviews receive more citations than do standard articles is widely known (Amin & Mabe, 2000; Braun, Glänzel & Schubert, 1989; Dong, Loh, & Mondry, 2005; Glänzel & Moed, 2002; Seglen, 1997; Sigogneau, 2000; Vieira & Gomes, 2011). Although the Thomson Reuters Web of Science does not provide a clear description of how papers are classified into the different document types (e.g., articles, reviews or proceedings papers) it is accepted in social sciences, and in psychology in particular, that review articles do not normally contain original data but simply collect, review and synthesize earlier research, without including substantial theoretical or conceptual development (Harzing, 2013). In this regard, meta-analytical studies fall halfway between the original articles and reviews. They share with narrative reviews the goal of synthesizing the scientific literature on a particular topic, while as in the case of original articles they present new results, which in the case of meta-analyses is done by combining the results of the set of articles they consider. Thus, meta-analytical studies would be expected to arouse considerable interest in the scientific community, and consequently they receive as many citations as do review articles.

It should be noted that Thomson Reuters Web of Knowledge classifies each document into a particular document category. As regards the 'review' category Thomson Reuters Web of Knowledge uses a wide criterion and a paper may be classified as a review either when it is published in the 'review' section of a journal or when the words 'review' or 'overview' appear in the title of the document (Thomson Reuters, 1994). When it comes to meta-analytical studies, Thomson Reuters Web of Knowledge does not have a consistent way of classifying them. Although most meta-analytical studies are classified as standard articles, some are classified as reviews. In a previous study (Guilera, Barrios & Gómez-Benito, 2013), in which we examined a whole set of meta-analytical studies in the field of psychology, we found that 68.0% were classified as standard articles and just 32.0% as reviews (unshown data). One of the reasons for this ambiguous classification is likely to be that Thomson Reuters proposed that any article containing more than 100 references should also be coded as a review (Thomson Reuters, 1994). However, as some authors point out (Seglen, 1997; Sigogneau, 2000) this criterion is open to criticism because the number of references in a paper is discipline-dependent, which means that one should be wary of using it as an indicator of the level of originality of a study (Harzing, 2013). Nonetheless, since the number of citations which a paper can receive in a specific research field is directly proportional to the mean number of references per article (Seglen, 1997), and given that some authors (Bornmann et al., 2008; Haslam et al., 2008; Peters & van Raan, 1994; Vieira & Gomes, 2010) have found that citation counts are associated with a higher number of references, then meta-analytical studies classified as reviews would be expected to be cited more often than would those classified as standard articles. The logic behind this is that, on average, the number of references would be higher in meta-analytical studies classified as reviews than in those

categorized as standard articles, and this increases the probability of their being cited. One would also expect that structural features such as the number of co-authors, references and pages, as well as the pattern of institutional collaboration would be similar between meta-analytical studies and reviews. As mentioned above, a relationship between citation counts and these structural features has been found in various studies (Aksnes, 2003; Beaver, 2004; Bornmann et al., 2008; Bornmann & Daniel, 2007; Glänzel et al., 1995; Haslam et al., 2008; Lawani, 1986; Peters & van Raan, 1994; Vieira & Gomes, 2010), although these structural features have also been associated with a study's comprehensiveness and the scholarly effort involved (McVeigh & Mann, 2009). Meta-analytical studies and reviews in general must integrate the results of a large number of studies, and therefore both need to include a higher number of references in order to cover previous research. Consequently, they take up more pages, due not only to the number of references used but also to greater scholarly effort.

In light of the above the aim of the current paper is to conduct a comparative analysis of meta-analytical studies, reviews[1] and standard articles[2] in order to explore potential differences and similarities as regards their impact, considering both the citation pattern and their structural features (number of co-authors, pattern of institutional collaboration, and number of references and pages). The specific focus is on the field of psychology, where we compare these three types of documents while controlling for the paper's age and journal. We hypothesized that (i) meta-analytical studies would be cited as often as reviews; (ii) those meta-analytical studies classified as reviews would receive more citations than would those classified as standard articles; and (iii) the structural features of meta-analytical studies would make them more similar to reviews than to standard journal articles.

2. Methods

2.1. Data collection and sample

The meta-analytical studies included in the present analysis corresponded to a subsample of the articles which Guilera et al. (2013) identified as being empirical meta-analytical studies in the field of psychology ($n = 2605$). Three hundred and thirty-five papers were selected from that whole sample so as to work with an accuracy of 5% and a confidence level of 95%. A stratified sampling approach was used to ensure the new sample was proportionately representative of the general data set. Year of publication and Bradford zone were used as stratification variables. The sample was proportionally and randomly selected from among the journals classified in the different Bradford zones because in the general sample (Guilera et al., 2013) the results showed a relationship between Bradford zone and the number of citations per article, such that those articles classified in the core and first zones presented a higher number of citations.

In accordance with the document type classification used by Thomson Reuters Web of Knowledge, 335 standard articles and 335 reviews were selected using the Thomson Reuters Web of Science database. In order to select this set of standard articles and reviews, methodological and empirical meta-analytic studies were excluded. The studies included were randomly selected from among those published in the same journal and year as the meta-analytical studies under study. In the event that no standard article or review was published in a specific journal in the same year, previous years were checked in succession in order to find a matched standard article and/or review. If this procedure failed to identify a standard article or review that had been published relatively close to the date of publication of the meta-analytical paper we then examined, with the same purpose, the years subsequent to the year of publication of the meta-analytic paper.

Thus, the three types of documents (meta-analytical studies, standard articles and reviews) were matched for the following variables: year of publication and journal. The sample selection was conducted between 26 April and 31 May 2012.

2.2. Variables and data analysis

Descriptive statistics were used to study citations by document, the number of authors, the pattern of institutional collaborations, and the number of references and pages by document. The number of citations for each article, from its year of publication until the date of its downloading, was obtained from the Web of Science database in order to study the impact of the research. As expected, citations were highly positively skewed. Given that many statistical procedures assume that the variables are normally distributed, we applied log transformation to the data in order to improve the normality of this variable.[3] The non-parametric Kolmogorov–Smirnov goodness-of-fit test was used to assess the normality of the data after log transformation.

The pattern of institutional collaboration was evaluated on the basis of the number of authors and their country. Thus, documents were classified as 'no collaboration' when a paper had just one author, as 'national' when the collaboration

[1] Throughout the article, the term 'review' is used to refer to documents classified as 'Review' in the Thomson Reuters Web of Knowledge, excluding meta-analyses that have been classified as such in this study.

[2] Throughout the article, the term 'original article' is used to refer to documents classified as 'Article' in the Thomson Reuters Web of Knowledge, excluding meta-analyses that have been classified as such in this study.

[3] In order to deal with uncited documents, linear transformation was applied, adding 1 to each value.

Table 1
Characteristics of the sample of meta-analytical studies according to Bradford zones.

Bradford's area (number of journals)	Articles *n* (%)	Citations Mean (SD) CI	Years Mean (SD)
Core (*n* = 1)	26 (7.76)	176.62 (228.09) 84.49–268.74	9.23 (7.62)
Zone 1 (*n* = 2)	29 (8.66)	118.21 (121.05) 72.16–164.25	8.86 (7.20)
Zone 2 (*n* = 4)	29 (8.66)	80.79 (86.84) 47.76–113.82	8.41 (6.28)
Zone 3 (*n* = 6)	31 (9.25)	72.32 (91.38) 38.81–105.84	8.42 (7.13)
Zone 4 (*n* = 12)	36 (10.75)	62.86 (72.51) 38.33–87.39	8.86 (7.70)
Zone 5 (*n* = 25)	46 (13.73)	42.37 (43.45) 29.47–55.27	9.13 (6.96)
Zone 6 (*n* = 36)	52 (15.52)	42.42 (56.40) 26.72–58.12	8.73 (7.11)
Zone 7 (*n* = 38)	48 (14.33)	49.15 (91.46) 22.59–75.70	9.33 (7.11)
Zone 8 (*n* = 37)	38 (11.34)	22.89 (25.10) 14.65–31.14	8.55 (6.99)

SD, standard deviation; CI, confidence interval at 95%; years, years since publication.

involved two or more co-authors from the same country, and as 'international' when the co-authors were from different countries.

Analysis of variance (ANOVA) was applied in order to determine whether there were any differences between the meta-analytical studies, reviews and standard articles in terms of the number of citations. In addition, analysis of covariance (ANCOVA) was used to study any differences in the number of citations corresponding to the three types of documents while controlling for the effects of extraneous variables. Thus, the number of authors, pages per document and references were analysed as covariates, as suggested by Bornmann et al. (2008). In order to study differences between meta-analytical review studies and meta-analytical standard articles, impact factor and years since publication were also added as covariates. ANOVA and Student's *t*-test were used to study differences in structural features.

Finally, the chi-square test was applied to examine the pattern of collaboration among meta-analytical papers, standard articles and reviews, while Cramér's phi coefficient was used to determine the strength of the association. Standardized residuals were computed in order to determine which cells contained the major contributors to the significant chi-square value. Thus, any residual with a value greater than $z_{0.025} = 1.96$ was considered significant at the .05 level.

3. Results

Of the 335 meta-analytical studies selected the majority were classified as standard articles by the Thomson Reuters database (*n* = 226, 67.5%), with only 32.5% (*n* = 109) being classified as reviews. The main characteristics of this sample are shown in Table 1 (i.e., number of journals, number of articles, mean years since publication, and number of citations received by the articles classified in each Bradford zone). Note that the mean number of citations is higher in the areas closer to the core.

3.1. Impact

After logarithmic transformation the citation data followed a normal distribution (Kolmogorov–Smirnov $Z = 0.655$, $p = .784$). The ANOVA revealed statistically significant differences in the number of citations received depending on the type of document (Table 2). Specifically, meta-analytical studies received a significantly higher number of citations compared to both review and standard articles. As expected, reviews were cited more often than were standard articles. Covariance analysis showed that after controlling for possible extraneous variables (number of co-authors, references and pages) the statistically significant differences between the three document types were maintained ($F(2, 992) = 28.190$, $p < .001$). Fig. 1 illustrates the mean number of citations and 95% confidence intervals corresponding to the different types of documents.

Additionally, an ANCOVA was carried out in order to study if meta-analytical studies were significantly cited independently of whether they are classified as standard articles or reviews. This analysis showed that meta-analytical studies classified as standard articles received a significantly higher number of citations than did standard articles ($F(1, 553) = 32.769$,

Table 2
Citation differences between meta-analytical studies, reviews and standard articles.

Document types	Mean (SD)	Median (IQR)	*F* (d.f.)	*p*-Value	Groups[a]
Meta-analysis	66.42 (203.30)	29.0 (68)			MA vs R**
Reviews	44.77 (74.55)	18.0 (41)	35.951 (2, 1002)	<.001	MA vs SA**
Standard articles	24.32 (45.42)	11.0 (21)			R vs SA **
Meta-analysis-Review	84.86 (135.186)	39.0 (70)	1.077 (1, 328)	.300	
Meta-analysis-Article	57.53 (82.61)	25.5 (68)			

[a] Only significant group differences are shown. SD, standard deviation; IQR, interquartile range; *F*, Snedecor's *F*-test, d.f., degrees of freedom; MA, meta-analytical studies; SA, standard articles; R, reviews

** $p < .001$.

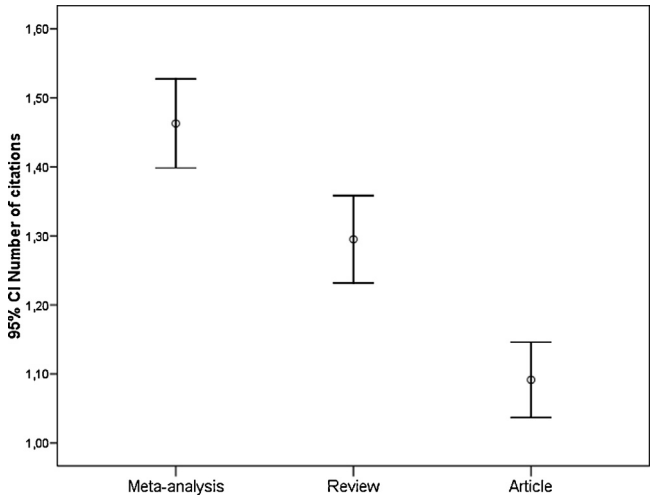

Fig. 1. Mean number of citations and 95% confidence intervals for meta-analytical studies, reviews and standard articles.

$p < .001$), and also that meta-analytical studies classified as reviews were cited significantly more often than were review papers ($F(1, 435) = 23.492$, $p < .001$).

The data show that the number of references was not the only criterion used by Thomson Reuters to classify an article as a review, since 32.1% ($n = 35$) of the meta-analytical studies classified as reviews contained fewer than 100 references, while conversely, 5.8% ($n = 13$) of the meta-analytical studies classified as standard articles included more than 100 references. Table 3 shows for each type of document the percentage of documents with 100 references or fewer and the percentage with more than 100 references.

Covariance analysis was then performed to determine any differences between meta-analytical studies, according to the classification of Thomson Reuters Web of Science (i.e., standard articles and reviews) and taking as covariates the number of years since publication, the journal impact factor and the number of pages, references and co-authors. The analysis revealed no statistically significant differences between meta-analytical studies classified as reviews and those classified as standard articles (Table 2).

3.2. Structural features

As shown in Table 4 meta-analytical studies and reviews have fewer authors per document than do standard articles. Reviews contain a higher number of references and pages than do meta-analytical studies and standard articles, although meta-analytical studies include more references and pages than do standard articles. Regarding the pattern of institutional collaboration, international collaboration accounted for a similar proportion of the three types of documents, but the number of articles with a single author was higher for reviews than for both meta-analytical studies and standard articles. As a whole, meta-analytical and standard articles showed a very similar pattern of collaboration (Table 5). Fig. 2 illustrates the mean values for the structural features of the three document types.

A number of other statistically significant differences were detected when taking into account the classification of meta-analytical studies into standard articles and reviews, in accordance with the criteria of Thomson Reuters (Table 6). The data show that meta-analytical studies classified as articles have fewer references and pages than do meta-analytical review studies. No differences were found between these two types of documents as regards the number of authors. Neither were any significant differences found when comparing review papers and meta-analytical studies classified as reviews with respect to the number of authors, references and pages. However, the data did reveal that standard articles have a higher number of authors ($t(559) = 3.073$, $p = .002$) and a lower number of references ($t(559) = 3.161$, $p = .002$) and pages ($t(559) = 3.796$, $p = .002$) compared to meta-analytical studies categorized as standard articles. There were no differences in the pattern of

Table 3
Percentage of documents with 100 references or fewer and the percentage with more than 100 references for each type of document.

Document types	Equal or less than 100 references Percentage (*n*)	More than 100 references Percentage (*n*)
Meta-analysis	74.0 (248)	26.0 (87)
Meta-analysis-Review	32.1 (35)	67.9 (74)
Meta-analysis-Article	94.2 (213)	5.8 (13)
Reviews	29.6 (99)	70.4 (236)
Standard articles	95.2 (319)	4.8 (16)

Table 4
Structural features of meta-analytical studies, reviews and standard articles.

	Mean (SD)	Median (IQR)	*F* (d.f.)	*p*-Value	Groups[a]
Number of authors					
Meta-analysis	2.80 (1.56)	3.0 (1)			MA–SA*
Reviews	2.81 (2.12)	2.0 (2)	4.486 (2, 1002)	.011	R–SA*
Standard articles	3.19 (2.15)	3.0 (2)			
Number of references					
Meta-analysis	80.64 (52.88)	69.0 (57)			MA–R**
Reviews	116.61 (67.76)	109.0 (45)	124.118 (2, 1002)	<.001	MA–SA**
Standard articles	51.09 (36.48)	44.0 (36)			R–SA**
Number of pages					
Meta-analysis	16.59 (8.82)	15.0 (11)			MA–R*
Reviews	18.67 (9.44)	17.0 (12)	40.888 (2, 995)	<.001	MA–SA**
Standard articles	12.77 (7.17)	11.0 (8)			R–SA**

[a] Only significant group differences are shown. SD, standard deviation; IQR, interquartile range; *F*, Snedecor's *F*-test; d.f., degrees of freedom; MA, meta-analytical studies; SA, standard articles; R, reviews.
* $p < .005$.
** $p < .001$.

Table 5
Pattern of institutional collaboration corresponding to meta-analytical studies, reviews and standard articles.

Document types	No collaboration	National	International	χ^2 (d.f.)	*p*-Value	φ_c (*p*)
Meta-analysis	57 (18.0%) (SR: −1.2)	222 (70.0%) (SR: −1.4)	38 (12.0%) (SR: 0.4)	16.755 (4)	.002	.130 (.002)
Reviews	91 (27.2%) (SR: 3.9)	200 (57.7%) (SR: −3.5)	44 (13.1%) (SR: 0.3)			
Standard articles	52 (15.5%) (SR: −2.7)	240 (71.6%) (SR: 2.2)	43 (12.8%) (SR: 0.1)			
Total	200 (23.3%)	662 (64.1%)	125 (12.7%)			

SR, standardized residuals; χ^2, chi-square test; d.f., degrees of freedom; φ_c, Cramér's phi coefficient.

collaboration shown by meta-analytical studies according to whether they were classified as standard articles or reviews ($\chi^2(2) = 4.141$, $p = .126$).

4. Discussion

This paper compares the impact and structural features of a randomly selected sample of meta-analytical studies, reviews and standard articles in the field of psychology. To the best of our knowledge this is the first study to compare the characteristics of these three types of documents. In terms of impact, reviews have been conclusively identified as the type of document which receives more citations in comparison with standard articles, notes, proceedings, etc. (Amin & Mabe, 2000; Braun et al., 1989; Dong et al., 2005; Glänzel & Moed, 2002; Seglen, 1997; Sigogneau, 2000; Vieira & Gomes, 2011). Our first hypothesis, based on the fact that the purpose of meta-analytical studies is to synthesize results from empirical literature, was that they would be cited as often as reviews. However, a notable finding of the present study is that the citation rate for meta-analytical studies was, on average, higher than that of both standard articles and reviews. This result was independent of the number of authors and the number of references and pages in the document, and neither did it depend on whether the meta-analytic study was classified by Thomson Reuters Web of Science as a review or a standard article. One explanation for the high citation rate of meta-analytical studies is the considerable importance ascribed to them by the scientific

Table 6
Structural features of meta-analytical studies classified as reviews and as standard articles.

Document type	Mean (SD)	Median (IQR)	*t*-Student (d.f.)	*p*-Value
Number of authors				
Meta-analysis-Review	3.03 (1.61)	3.0 (2)	1.884 (333)	.060
Meta-analysis-Article	2.69 (1.53)	2.0 (1)		
Number of references				
Meta-analysis-Review	123.09 (65.59)	116.0 (80)	12.282 (333)	<.001
Meta-analysis-Article	60.17 (28.14)	60.0 (68)		
Number of pages				
Meta-analysis-Review	19.55 (10.47)	18.0 (11)	4.385 (333)	<.001
Meta-analysis-Article	15.16 (7.51)	14.0 (9)		

SD, standard deviation; IQR, interquartile range; d.f., degrees of freedom.

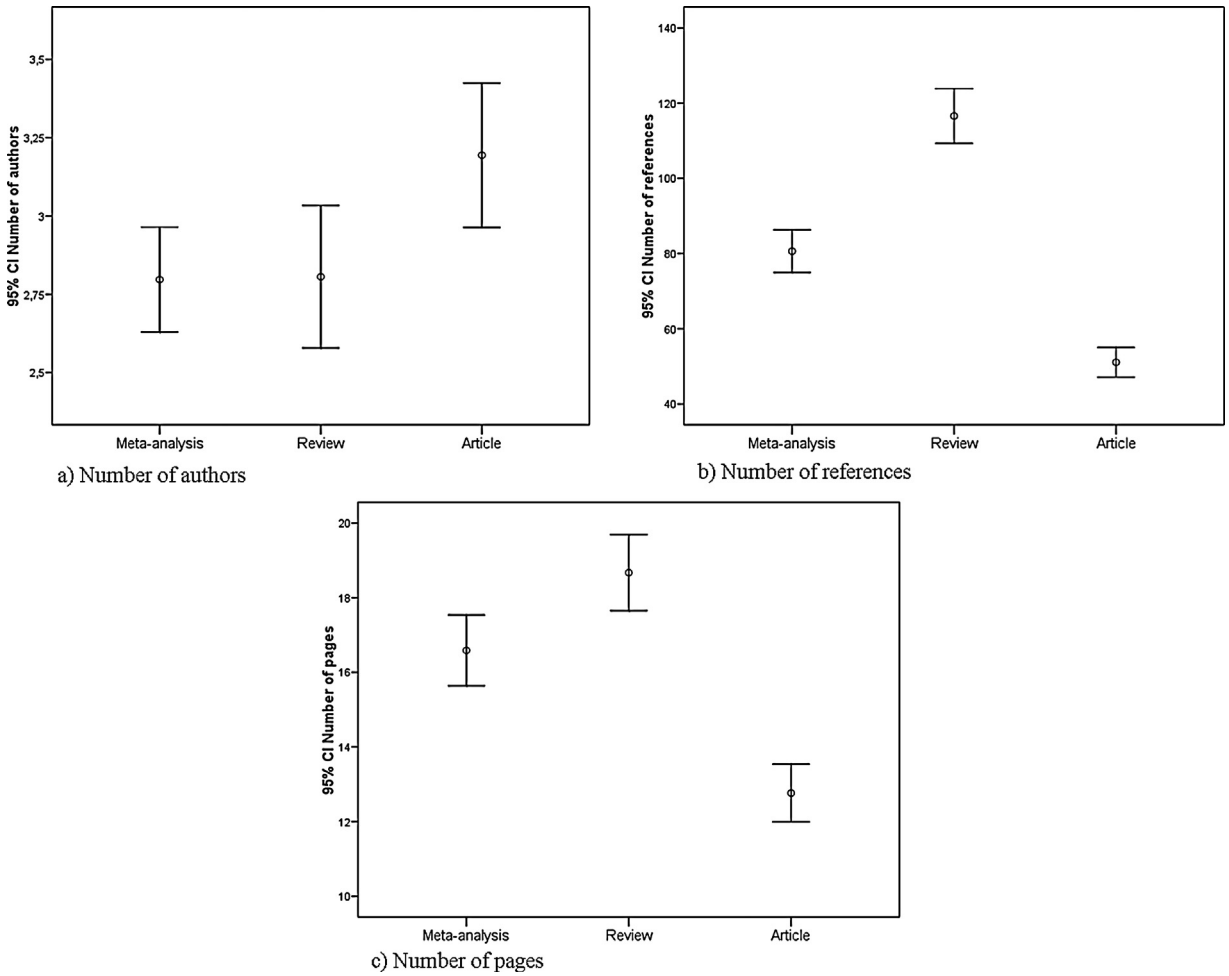

Fig. 2. Mean values and 95% confidence intervals for number of authors (a), references (b) and pages (c) by type of document.

community, such that meta-analytical studies may be used both to remain up to date on a particular topic and to guide the design of new studies based on meta-analytical results.

We also hypothesized that meta-analytical studies classified as reviews by Thomson Reuters Web of Science would receive more citations than those classified as standard articles. However, after controlling for the number of authors, references and pages, as well as the years since publication and the journal impact factor, the data revealed no significant differences between these two types of documents. This means that after controlling for extraneous variables the interest shown by the scientific community in meta-analytical studies is similar, regardless of how Thomson Reuters classifies the type of document. A likely explanation for this result is that meta-analytical studies usually incorporate the term meta-analysis in their title (Guilera et al., 2013) and also as a keyword. Thus, when researchers are looking for a meta-analytical study they probably use 'meta-analysis' as a search term rather than filtering by type of document.

Another notable result of the present study concerns the criterion used by Thomson Reuters to classify review and standard articles. Although the vast majority of meta-analytical studies classified as reviews contain more than 100 references, whereas those classified as articles have fewer than 100 references, our data show that this cut-off was not always applied, thereby suggesting that Thomson Reuters must apply other parameters when making this classification. In fact, in their discussion of journal impact factor, Thomson Reuters (1994) state that articles in 'Review' sections of research or clinical journals are also coded as reviews, along with articles whose titles contain the word *review* or *overview*.

Regarding structural features we hypothesized that meta-analytical studies would be similar to reviews. The data show that these two types of documents do have a similar number of authors, although reviews contained a higher number of references and pages than did meta-analytical studies. The profile of number of references and pages therefore places meta-analytical studies between standard articles and reviews. In accordance with a point made by McVeigh and Mann (2009) about the relationship between structural features and a study's comprehensiveness and scholarly effort, this finding would suggest that reviews are the most comprehensive papers and seem to make a greater contribution to academic discourse and theoretical development of the subject. However, when comparisons were limited to meta-analytical studies classified

as reviews, no significant differences were found between these meta-analytical studies and reviews, showing that these differences are more structural than substantive. With regard to the pattern of institutional collaboration, the data showed that the degree of international collaboration was similar across the three types of documents, although reviews were more likely to have a single author. Overall, the pattern of collaboration for meta-analytical studies and standard articles was quite similar.

These results have a number of implications that should be of interest to the scientific community, not just scientists themselves but also research evaluators, journal editors and bibliometricians.

Firstly, meta-analytical studies receive a high number of citations, more than in the case of reviews and standard articles. This finding has important implications for scientists, who try to choose the best articles to read and to complement their research, and who are also aware that scholarly publishing is central to academic success because the quantity and impact of their publications can determine future performance evaluations, funding decisions, promotions and salaries (Borrego, Barrios, Villarroya, & Ollé, 2010). Consequently, publications that receive a high number of citations can be a good way of achieving funding, promotion or tenure. The point here is not that scientists should focus on reading or carrying out meta-analyses, but rather that it is necessary to acknowledge the differential features of meta-analytical studies. These features should be considered, for instance, when scientific publications are the main basis on which a decision will be made about granting promotion, funding or awards, or simply when assessing the relevance of a specific paper.

Secondly, although there is a need for future studies to investigate the citation patterns of meta-analytical studies, it is likely that those journals which are able to accumulate a high number of meta-analytical studies will be able to increase their impact factor. This is supported by a recent study (Guilera et al., 2013) in which we found that the citation of meta-analytic papers makes a strong contribution to a journal's impact factor. For instance, *Psychological Bulletin*, *The Journal of Applied Psychology* or *Clinical Psychology Review* publish the highest number of meta-analytical studies in the field of psychology and are ranked second in their corresponding subject categories (*Multidisciplinary Psychology*, *Applied Psychology* and *Clinical Psychology* respectively; JCR 2011). Consequently, journal editors may be especially interested in publishing quality meta-analytical studies, since they know that a paper of this kind is likely to receive a high number of citations, even higher than for other reviews. However, this can lead to journals having a highly skewed distribution of citation rates for its articles, and therefore, as Seglen (1997) advised, it is important to avoid judging a paper by its wrapping rather than by its contents. Consequently, research evaluators and scientists in general should avoid taking the journal impact factor as a measure of the quality of a piece of research, that is, using it, for instance, to assess a candidate's suitability for promotion or to choose the journal to which an article will be submitted or from which a paper will be selected to read.

Thirdly, the ambiguous criterion applied by Thomson Reuters Web of Science to classify meta-analytical studies into reviews or standard articles can lead to misunderstanding among the research community. For instance, the claim that reviews are, on average, more likely to be cited than are standard articles does not always hold true due to the mix of meta-analytical studies. This finding is also of interest for research evaluators, who may assess the papers of scientists differently according to document type (Gonzalez-Albo & Bordons, 2011). Therefore, if a document is classified as a review it may be interpreted as a piece of research of minimal originality and which does not include significant conceptual development. This result should also be taken into account by bibliometricians who, when selecting the most valuable studies on the basis of their impact or when analysing citation rates according to the type of document, may unwittingly introduce a source of bias. In this regard, a limitation of the present study that results from this criterion is that some of the reviews which were randomly selected for the sample were, in fact, standard articles with more than 100 references.

Finally, it should be noted that this study offers a broad overview of the behaviour of meta-analytical studies in the field of psychology, and therefore the results cannot be generalized to other disciplines. Further analyses focusing on other scientific fields are now needed to confirm the higher impact and differential structural features of meta-analytical studies compared with reviews and standard articles.

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