Faculty Use of Subscribed Journals in a Spanish Library Consortium: Downloads and Citations in the Field of Psychology

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We present a case study to analyze the bibliographic references used in the scientific production on psychology in Scopus of the four universities that make up a library consortium in Spain and compare this with downloads of journals included in the Springer, Elsevier, Wiley, and Emerald big deals subscribed to by this consortium. A majority use of journals subscribed through the big deals is observed, at the level of both downloads and citations, although with a weak correlation between the two variables.

Keywords: serials; Psychology; citations; big deals; downloads

1. Introduction

Measuring the impact and use of scientific publications is becoming increasingly relevant because of the growing demand for accountability in the use of public and private funds. Academic libraries must justify the value of the collection subscriptions in which they invest their budgets using quantitative data, which can be achieved using different methods ranging from measurements of the downloads of the contracted electronic resources to analyses of the bibliographic references of the scientific production of their researchers. It is also common for such methods to be combined with cost indicators (Kurtz & Bollen, 2010). Despite the usefulness of each of these methodologies, when used in isolation they present limitations and offer only a partial view of the use and usefulness of collections.

Download statistics enable a quantification of the number of times that library users download content from the subscribed collections. This approach has been used by many libraries to calculate the use and thus adequacy of their collections since the beginning of the century, when standards on reporting online journal statistics (COUNTER and SUSHI) were developed and scientific information providers began to supply this type of information (McDonald, 2007). These download data, a priori, are much more reliable than those that can be obtained from repositories, social networks, or altmetric sources. However, Bucknell (2012) pointed out various features that suggest that download statistics should not be used as the only measure to evaluate the usefulness of contracted journals, including the design of the platforms, the variety of the content included in the packages, the amount of journal content, associated changes in them (in title, platform, or publisher), and the difficulty in assigning prices to items, rightly indicating that such statistics must be reviewed carefully for particular anomalies before being considered valid. Furthermore, according to Wood-Doughty *et al.* (2019), there are differences in the ways in which different providers offer download data to libraries. For this reason, they indicate that "the currently available download statistics, which are supplied by publishers, are not sufficiently reliable to allow libraries to make subscription decisions based on price and reported downloads, at least without making an adjustment for publisher effects in download reports". Likewise, as emphasized by Nicholas (2009), downloads do not always correspond to the number of times an article is read or actually used. Medeiros (2007) also speaks out against evaluating collections based solely on usage statistics, because these do not capture the purpose for which a resource is used. Another difficulty when evaluating collections lies in the fact that the use of articles varies in purpose and intensity by discipline, thus without knowing the context of the data, it becomes not possible to attribute graded values. In this sense,

Luther (2000) points out the danger in assuming that a title that is popular because it is used by students is more valuable than a specialized journal used by a few researchers in a specific discipline.

Citation analysis has been used since the 1920s in the management of collections and is a robust method for obtaining information on their usefulness. It can be applied in two modalities: (1) global citation analysis, which studies the impact of publications regardless of the author affiliations and is generally based on indexes such as the SJR or JCR, and (2) analysis of local citations, which only considers publications by researchers who are users of a given library. The former is easier to calculate but its usefulness is more limited than the latter since generic metrics cannot represent campus-level data to make informed decisions regarding collections. On the contrary, local analyses provide specific information on how users use the library but are much more difficult to calculate (Gao, 2016; White, 2019). Moreover, their main limitations include the coverage of the citation databases and the differences in citation practices between researchers from different disciplines (Martin et al., 2016a). On the other hand, these data also refer only to the use of the collection in research while not considering other possible relevant uses, such as teaching. In addition, this type of analysis is complex and requires a lot of time, and there is much heterogeneity in the procedures applied, frequently hindering their replication (White, 2019). This is evident in the review of 34 studies on reference analysis published between 2005 and 2010 carried out by Hoffman and Doucette (2012). In that work, they found that most of the analyzed studies did not provide enough details on their methods and results to allow a comparison with other investigations, or their replication.

Martin *et al.* (2016a) mention that the scientific literature is replete with studies analyzing the use of library collections, based on either download data or the references

used in the scientific production of researchers served by those libraries, but there are far fewer studies that have combined both types of data. Although less common, perhaps due to the time required involved and the complexity of combining data from different information sources, this type of analysis is relevant because it provides a more complete view of the usefulness of collections in libraries while minimizing the limitations and biases of using citation or download data alone. Examples of such combined use of data include the study by Wical and Vandenbark (2015) at the University of Wisconsin – Eau Claire, Faulkner (2021) in the Psychology Department at California State University, or Feyereisen and Spoiden (2009) in the Department of Psychology and Education Sciences at the University of Louvain. In the cited works, the authors indicate that the results would be used to make decisions regarding journal subscriptions.

On the other hand, joint analysis of download and citation data also enables us to determine whether, in the context of a library or group thereof, a relationship can be identified between these two variables such that one can be used to predict the other. The specialized literature includes studies that have analyzed this relationship, reporting mixed results. In this regard, Wood-Doughty *et al.* (2019) analyzed such an association in the ten universities composing the University of California system, considering the scientific production of their researchers between 2010 and 2016. A positive correlation was observed between the two variables ($R^2 = 0.78$), albeit with minor differences by subject area. Other studies in which positive correlations were found include the work of Feyereisen and Spoiden (2009), in the scope of the Department of Psychology and Education Science of the University of Louvain, Rodríguez Bravo *et al.* (Rodríguez-Bravo et al., 2021), focused on the scientific production on library and information science in the Universities of Castille and Leon, or Groote *et al.* (2013), in which the

scientific production in the field of medicine was analyzed at the University of Illinois at Chicago. In contrast, in the works of Gao (2016), in the School of Communication at the University of Houston, or Ke and Bronicki (2015), also in the University of Houston but in the field of psychology, no correlation was found between citations and downloads.

This discrepancy in the results of studies analyzing the relationship between citations and downloads is due to the characteristics of each library and its users, with very different citation guidelines by discipline, as well as the methodology used in each study. Although in general the same technique has been used to measure such relationships, all downloads and citations are not always included, while the sampling techniques also varied. Thus, for example, in the work of Pastva *et al.* (2018), focused on dermatology publications between 2007 and 2016 in The Galter Health Sciences Library in Chicago, different results were obtained when analyzing the correlation between downloads and citations if all the most cited journals were included (Pearson correlation coefficient, $r = 0.46$) or if journals from other disciplines were excluded (Pearson correlation coefficient, $r = 0.81$). A similar effect is observed in the study by Rodríguez Bravo *et al.* (Rodríguez-Bravo et al., 2021), where the correlation coefficient increased significantly when considering only journals specific to the analyzed discipline.

The current study follows this line of work of combining both types of data on the use of collections, with the aim of revealing the relationship between downloads and citations of electronic journals in the universities of the region of Castille and Leon (Spain) that form part of a library consortium called BUCLE, based on a case study in the thematic field of psychology. A recent analysis of downloads of the journals included in the main big deals subscribed to by these universities with *Elsevier*,

Emerald, *Springer*, and *Wiley* identified that downloads of the contracted journals had increased in recent years (2012–2018) (Fernández-Ramos et al., 2019), even though the number of faculty members and students declined in the studied interval and despite the proliferation of open-access journals, repositories, and platforms such as *Sci-Hub*, which are generating new ways of accessing scientific information and becoming increasingly important for the academic community (Himmelstein et al., 2018). We believe that this result is related to the convenient (transparent and direct) access to subscribed resources by researchers, being so simple that many are not even aware that such access has a high cost to their university.

Psychology is a discipline that is usually classified within the social sciences, although due to its interdisciplinary nature, it also has an important presence in other areas of research, such as science, technology, engineering and mathematics (STEM), medicine, public health, social work, education, and other disciplines (Faulkner, 2021). Spain is among the most productive countries in the field of psychology, in terms of both researchers (López-López et al., 2015) and journals (Osca-Lluch et al., 2019), particularly regarding production in WoS in the areas of multidisciplinary psychology, experimental psychology, and clinical psychology (Barrios et al., 2013). A co-citation analysis of psychology in the Spanish scientific domain (García Martínez et al., 2009) highlighted that the basis of scientific production in psychology in Spain is mainly in the social field, although the predominant themes are educational and environmental studies. The analysis of the cited authors was based on WoS data, where psychology is classified among the social sciences, but their results show that this discipline also tends to approach the sciences, thereby gaining a hybrid nature.

2. Objectives

The general aim of this work is to determine the relationship between downloads from journals subscribed to by the consortium of libraries of the public universities of the Spanish region of Castille and Leon (*Bibliotecas Universitarias de Castilla y León*, BUCLE) and the citations to these journals in the scientific production of researchers from the universities that make up this consortium. Specifically, we present a case study restricted to the scientific production in the journals included in the *Scopus* psychology category during the period 2015–2019 by the four universities that make up the consortium.

To specify the relevant aspects of the analyzed scientific production, the citation patterns, and the relationship between citations and downloads, this general aim is articulated according to the following specific objectives:

- To analyze this scientific production, identifying where researchers included in the study tend to publish their work.
- To analyze the bibliographic citations used in this scientific production and identify those corresponding to journal articles.
- To identify the most cited journals and their characteristics, focusing mainly on the subjects and the form of access to content (open access, hybrid, or paid) as well as the impact metrics of the journal.
- To determine whether the journals most cited by researchers in these universities belong to the main contracted providers or if, on the contrary, the researchers focus on journals outside the studied providers.
- To study the possible correlation between the number of citations and the number of downloads of subscribed journals; That is, to determine whether the

most cited journals are also the most downloaded or, on the contrary, there is no relationship between these two variables.

3. Methodology

The methodology applied in this work is observational and quantitative, being based mainly on the identification in *Scopus* of the analyzed scientific production, obtaining and standardizing bibliographic records, the extraction, normalization, and analysis of the citations used in this scientific production, and an analysis of the relationship between these references and the download data of the journals subscribed to by the included universities, according to the steps outlined below:

3.1. Obtaining and standardizing scientific production records

In the first place, the scientific production of the public universities of Castille and Leon included in the psychology category of *Scopus* during the period of 2015–2019 was identified. As in the work of Gao (2016), this database was chosen over the *Web of Science* because of its greater coverage in global terms and in particular the social sciences. Searches for the scientific production of each university were carried out in September 2020 using the name of each of the four public universities of Castille and Leon in the affiliation field. Subsequently, records corresponding to sources included in the psychology category were selected. This process resulted in the recovery of 310 from the Universidad de Salamanca (USAL), 125 from the Universidad de Valladolid (UVA), 88 from the Universidad de León (ULE), and 78 from the Universidad de Burgos (UBU). The academic community of psychology scientists at the Universidad de Salamanca is far larger than that of the other universities, hence its predominance in the recovered scientific production. The total number of documents was 601, of which

564 were unique, because some articles were written in collaboration between researchers from several of the universities included in the study. The bibliographic records were downloaded from *Scopus* in csv format and imported into an Excel file.

3.2. Analysis of bibliographic references

The bibliographic references contained in the scientific production of each university were extracted and analyzed manually to identify the type of document cited in each case. Subsequently, the references corresponding to journal articles were selected, the names of these journals were extracted and normalized, and the following information was obtained from each of the cited journals:

- Whether or not they were indexed in *Scopus*
- The subject categories of the journals indexed in *Scopus*
- If they were paid, open-access, or hybrid journals
- The number of times they were cited, broken down by year and university

3.3. Provider download statistics

The libraries of the public universities of Castille and Leon provided us with download data for *Elsevier*, *Emerald*, *Springer*, and *Wiley* for the period 2014–2018. These data come from the COUNTER *Journal Report 1 (JR1 - Number of Successful Full-Text Article Requests by Month and Journal*) reports provided by the vendors. These are annual Excel files that include detailed data on monthly downloads of full-text articles, broken down by journal title.

These four providers were contracted by the BUCLE consortium as early as the first decade of the century, and these subscriptions have continued without interruption. *ScienceDirect*, a product from the publisher *Elsevier*, as well as the big deals from the

publishers *Springer* and *Wiley*, are multidisciplinary electronic content packages and supply a considerable number of more than 2000 electronic journals. In contrast, Emerald is a much smaller, specialized social science distributor.

3.4. Analysis of the relationship between citations and downloads

Once the journal citation data had been obtained, and having the download data for the big deals contracted with the four providers included in this study, we proceeded to determine whether there was a relationship between the citation and download data. To achieve this, we first confirmed whether the cited journals were included in these big deals. Subsequently, the citation and download data of the journals included in the subscribed big deals were compared. As a procedure to establish the relationship between downloads and citations, we used the download data for the year prior to the publication of the source document; That is, if a researcher from the Universidad de Salamanca published document X citing journal Y in 2019, we used the download data from that journal Y for Salamanca in 2018. These data were analyzed descriptively, and the Pearson linear correlation between citations and downloads was determined to illustrate the strength of the relationship between these two variables. This was done for the most cited journals (more than 20 citations), and also separately for the most cited journals belonging to the thematic category on psychology.

Clearly, a cited article may have been downloaded the previous year, two years or even longer before, and even the same year as the published article, thanks to the "Early View" system that some journals have implemented in recent years. Furthermore, the download date may be uncertain since researchers may decide to reuse citations from their previous publications. Overall, we consider that, in the studied

period, publication delays have shortened and that the download data from the previous year would be the most accurate.

4. Findings and Discussion

4.1. Scientific production

The set of documents comprising 564 different articles was distributed among 205 journals, among which a main group of 11 serials could be identified, containing a third of the articles. Of these, more than half are open access while only two (*Computers in Human Behavior* and *Social Indicators Research*) are subscribed to by the studied universities, in the *Elsevier* and *Springer* package, respectively.

Table 1 presents the data for the journals with at least four articles. This list of 36 journals represents only 7% of the total but includes more than half (57.1%) of the published works, indicating a considerable level of concentration in this literature. Among these journals, 33% correspond to titles subscribed to through one of the four providers included in the study, 47.2% are open access, while 19.8% are paid journals that are not included in the subscribed packages, in most cases also including open-access articles (hybrid journals). On the other hand, the importance of the mother tongue in the analyzed scientific production is remarkable, with 17 of these 36 journals being Spanish or publishing articles in Spanish.

This trend in the distribution of the access modality of the journals was also generally maintained when taking the articles produced by the four universities as the unit of analysis, albeit with a slightly smaller percentage of the papers (29.2%) being offered by the included providers. The largest of these was *Elsevier*, followed by

Springer and *Wiley*, with the latter only including the *Journal of Applied Research in Intellectual Disabilities*, with five articles published.

Table 1. Distribution of scientific production in the most used journals

Journal	**Frequency**	**Access modality**
Frontiers in Psychology	41	OA
Computers in Human Behavior	29	*Elsevier*
Anales de Psicología	19	OA
Psychology, Society and Education	16	OA
Social Indicators Research	15	*Springer*
Bordon	14	H
Journal of Alzheimer's Disease	12	H
Psicothema	12	OA
Siglo Cero	10	H
Cuadernos de Psicología del Deporte	8	OA
Papeles del Psicólogo	8	OA
Revista de Psicodidáctica	8	OA
Revista Iberoamericana de Diagnóstico y Evaluación Psicológica	8	OA
Universitas Psychologica	8	OA
Behavior Research Methods	7	*Springer*
Education Sciences	7	OA
Research in Developmental Disabilities	7	*Elsevier*
The Spanish Journal of Psychology	7	H
Journal of Autism and Developmental Disorders	6	*Springer*
Journal of Interpersonal Violence	6	P
OCNOS	6	OA

Revista Argentina de Clínica Psicológica	6	OA
Revista de Psicología del Deporte	6	OA
Journal of Applied Research in Intellectual Disabilities	5	*Wiley*
Personality and Individual Differences	5	*Elsevier*
Publicaciones de la Facultad de Educación y Humanidades del Campus de Melilla	5	OA
Revista Española de Orientación y Psicopedagogía	5	OA
Behavioral Psychology/Psicología Conductual	4	OA
Evaluation and Program Planning	4	*Elsevier*
Health and Addictions/Salud y Drogas	4	OA
Infancia y Aprendizaje	4	H
Intellectual and Developmental Disabilities	4	H
International Journal of Clinical and Health Psychology	4	*Elsevier*
Mathematical Social Sciences	4	*Elsevier*
Technological Forecasting and Social Change	4	*Elsevier*
Theory and Decision	4	*Springer*
Access: Elsevier, Wiley, and Springer = subscribed; OA = open access; H = hybrid; P = paid (not subscribed)		

4.2. Citation patterns

Regarding the analysis for the bibliographic references included in the works, it was first found that the average number of references included in the articles was 49.1. This figure agrees with the findings of Krampen (2010) for serials in this subject area. Using data from 2005, he estimated that articles on psychology cited on average 50.3 prior works. The number of references has been found to be one of the most decisive article

features when it comes to receiving citations in the area of psychology (Haslam et al., 2008).

The results presented in Table 2 reveal that, among all the bibliographic references, the vast majority (74.2%) corresponded to journal articles. Again, these data are in line with the findings of a study by Larivière *et al.* (2006), who observed that the number of references to journal articles in works published by researchers in the psychology area during the period between 1981 and 2000 ranged between 74% and 79%, respectively, showing values similar to those found in areas such as physics, biology, earth and space, and chemistry. In the study by Ke and Bronicki (2015), in contrast, a much higher percentage of citations to journals in the field of psychology was found, close to 90%.

Table 2. Distribution of articles and citations by university

	USAL	**UVA**	**ULE**	**UBU**	**TOTAL**
Number of documents	310	125	88	78	601
Total citations	15958	5675	4168	3732	29533
Citations to journals	12085	3888	3237	2718	21928
Percentage of citations to journals	75.73%	68.51%	77.66%	72.83%	74.25%

Regarding the analyzed journals with the highest numbers of citations (listed in the Appendix), note that they are reputed journals, with 99% being included in the SCImago Journal Rank (SJR) and 83.33% being found in Q1 in some of the categories. When only considering journals subscribed to by the studied universities, 100% are included in the first three quartiles of SJR and 90.72% in Q1. Regarding the distributors, the most cited journals are concentrated in six publishers, representing 75.39% of the

total, specifically *Elsevier* (28.14%), *Wiley* (13.07%), *Springer* (9.55%), *Taylor & Francis* (9.05%), the *American Psychological Association* (APA) (8.54%), and *Sage* (7.04%). The first four of these supply their journals through packages or big deals, while the fifth and sixth are prestigious publishers, in the case of APA specialized in the field in question herein. Note that the vast majority of the most cited journals are paid, although many of them are hybrid in nature and allow open-access contributions.

Table 3 offers a limited selection of the most cited journals in the analyzed scientific production, presenting those that received at least 50 citations from the four universities. A balanced distribution is observed between subscribed journals (46.6%), which are shaded in Table 3, and unsubscribed (53.4%), highlighting in this case the scarcity of open-access journals among those most cited. Except for *Frontiers in Psychology* and *Plos One*, the other journals are published by official Spanish institutions. Common patterns are seen among the four universities studied. Thus, *Psicothema* is found to be a useful journal for research at all four universities. Note that this is one of the main Spanish journals in the area, being the only social sciences journal in Spanish with an impact factor in the JCR up until 2009 (González-Alcaide et al., 2010). Note also that this journal is open access, which may facilitate its reading and subsequent citation. Likewise, the journals occupying the third and fourth positions in Table 3 of the most cited journals, i.e., *Computers in Human Behavior* and *Personality and Individual Differences*, are prioritized by researchers at three of the four universities. However, different preferences are observed among the universities. This is the case, for example, of *Social Indicators Research* for UVA, *Journal of Educational Psychology* for ULE, *Emotion* for UBU, and the *Journal of Personality and Social Psychology* for both UBU and USAL. In the case of the academic community of USAL, the usefulness of titles such as the *Journal of Autism and Developmental Disorders* and

Behavior Research Methods also stands out, with more than 100 citations. Likewise, note that two of the journals included in this group of most cited journals (*Applied Cognitive Psychology* and *Neurology*) nearly only receive citations from USAL. As mentioned above, USAL is the university with the highest scientific production among the four universities studied.

The results presented in Table 3 indicate that more foreign-language journals are cited than Spanish-language journals. In addition to *Psicothema*, there are only five titles in Spanish among the journals that received more than 50 citations: *Siglo Cero*, *Anales de Psicología*, *Revista de Educación*, *Revista de Psicodidactica*, and *Ansiedad y Estrés*. Among the most cited journals listed in Table 3, note the presence of journals with a general scope, such as *Psicothema* or *Psychological Bulletin*, interdisciplinary journals such as *Computers in Human Behavior* or *Computers and Education*, as well as multidisciplinary mega-journals such as *Plos One*, accompanied by other titles in the clinical field.

García-Martínez *et al.* (2009) indicate that core journals are those with a more general nature within their specialty, and, as a result, they show a marked tendency to be cited more. This effect was also confirmed by Osca-Lluch *et al.* (2019), who highlight the increase in multidisciplinary journals because they can more easily reach the upper quartiles. Ruiz-Pérez and Jiménez-Contreras (2019) also state that Spanish psychology journals obtain more citations when they lie in an area bordering other disciplines, and in some cases this effect is stronger regarding citations from journals from other disciplines than from psychology itself. The well-known *Plos One* is the most cited OA journal in the study by Faulkner (2021), while in the current work it occupies the fourth position after *Psicothema*, *Frontiers in Psychology*, and *Anales de Psicología*.

Table 3. Most cited journals

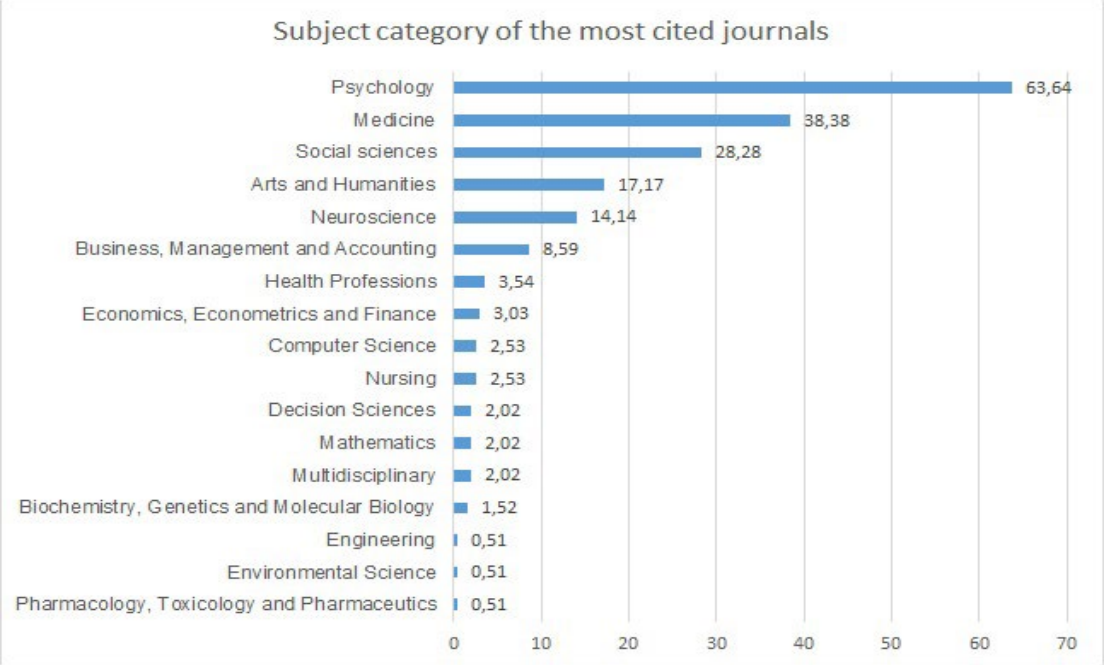
Journal	USAL	UVA	ULE	UBU	TOTAL	Access modality
Psicothema	143	55	51	47	296	OA
Journal of Personality and Social Psychology	119	15	21	57	212	H
Computers in Human Behavior	107	40	31	11	189	*Elsevier*
Personality and Individual Differences	64	59	46	16	185	*Elsevier*
Journal of Educational Psychology	73	9	88	7	177	P
Journal of Autism and Developmental Disorders	101	29		12	142	*Springer*
Psychological Bulletin	87	10	14	19	130	H
*Structural Equation Modeling**	66	56	2	5	129	H
Siglo Cero	92	25	3	7	127	H
*Journal of Intellectual Disability Research**	96	14		17	127	*Wiley*
Frontiers in Psychology	58	23	23	22	126	OA
*Computers and Education**	82	5	26	13	126	*Elsevier*
Anales de Psicología	49	18	32	27	126	OA
Behavior Research Methods	103	7		10	120	*Springer*
Research in Developmental Disabilities	82	22	1	7	112	*Elsevier*
*PLoS ONE**	62	17	12	11	102	OA
International Journal of Clinical and Health Psychology	54	14	6	14	88	*Elsevier*
Evaluation and Program Planning	75	10		1	86	*Elsevier*
Applied Cognitive Psychology	84		2		86	*Wiley*
Psychometrika	50	30	3	2	85	*Springer*
Intellectual and Developmental Disabilities	70	9		1	80	P
*Revista de Educación**	32	19	26	1	78	OA
Social Indicators Research	29	43	4	2	78	*Springer*

Memory and Cognition	69	2	5	1	77	*Springer*
*Neurology**	72			3	75	H
Psychological Assessment	35	31	1	7	74	H
Neuropsychologia	60		1	12	73	*Elsevier*
Journal of Applied Research in Intellectual Disabilities	54	13		6	73	*Wiley*
The Spanish Journal of Psychology	25	17	17	11	70	H
Emotion	29	1	2	38	70	P
Journal of Experimental Psychology: Learning	65	1	1		67	P
Annual Review of Psychology	38	9	11	9	67	P
Psychological Review	37	7	12	8	64	H
Child Development	25	15	10	14	64	*Wiley*
The American Psychologist	35	9	9	10	63	H
Journal of Applied Psychology	37	12	11	3	63	P
Cognition and Emotion	32	5		25	62	H
*The American Journal of Psychiatry**	37	9	2	10	58	H
Journal of Vocational Behavior	6	29	23		58	*Elsevier*
Cognition	39	10	3	6	58	*Elsevier*
Revista de Psicodidáctica	7	21	23	6	57	H
*Journal of Business Venturing**	19	2	31	3	55	*Elsevier*
Journal of Interpersonal Violence	32	8		14	54	H
*Entrepreneurship Theory and Practice**	25	4	19	6	54	*Wiley*
Autism	42	5	1	5	53	H
Ansiedad y Estrés	25	4	15	9	53	*Elsevier*
Journal of Memory and Language	41	10	1		52	*Elsevier*
Psychological Methods	32	13	1	6	52	H
Procedia - Social and Behavioral Sciences	28	10	9	3	50	*Elsevier*

Access: Elsevier, Wiley, and Springer = subscribed; OA= open access; H= hybrid; P = paid (not subscribed)
** Journals not classified in psychology according to Scopus*

Figure 1 shows the distribution by subject of the 200 most cited journals according to the Scopus classification. In this database, journals may be included in several categories simultaneously. As can be seen, 36.4% of the journals are not included in any of the specific psychology categories. The most common subject (psychology, with 63.64%) is followed by medicine and social science with 38.38% and 28.28%, respectively. This finding highlights the above-mentioned hybrid character of psychology and the importance of evolutionary and educational psychology and clinical psychology (Gallegos et al., 2020). The observed categories include other fields related to health and social sciences that highlight the role of psychology in the fields of public health, social work, organizations, etc. Some journals in the psychology category are also classified in the arts and humanities category, with a connection formed through the linguistic domain. Few of the journals relate to the computer field, although it is observed that these are among the most cited.

Figure 1. Thematic classification of the most cited journals according to Scopus subject category



4.3. Relationship between downloads and citations

A comparison of the data regarding citations to the subscribed journals and the number of downloads from these journals among the four universities included in the study reveals that the most cited journals also generally receive a high number of downloads. This can be seen from Table 4, which presents the journals with more than 50 citations and the number of downloads from them in the year prior to being cited (broken down by year in the Appendix).

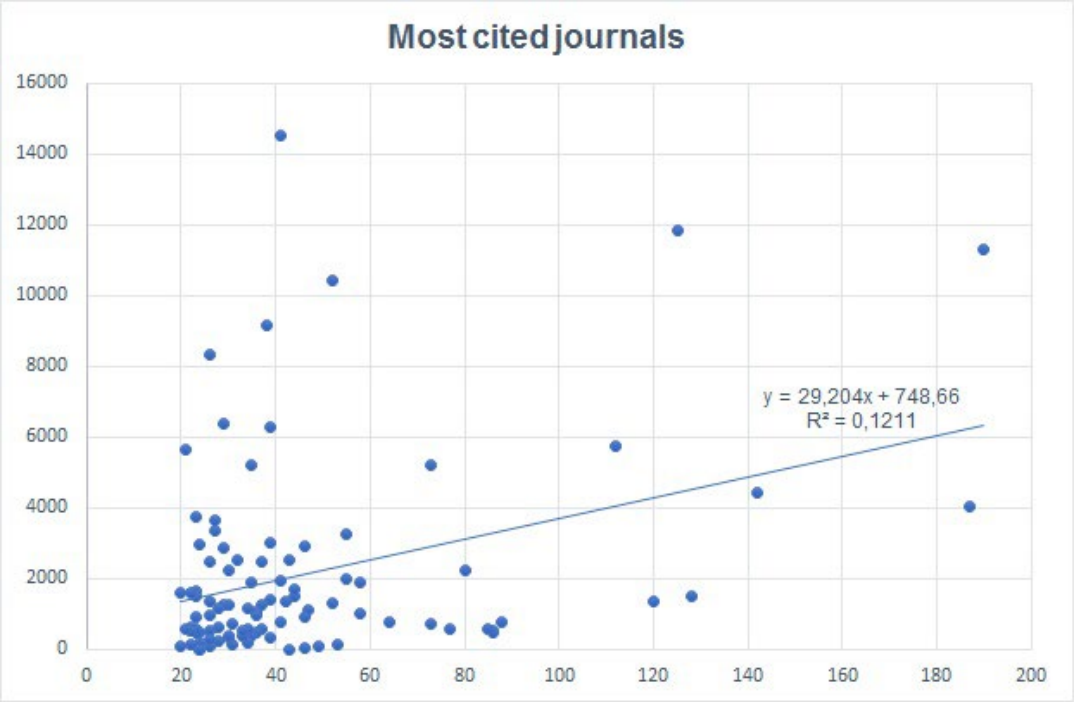
Table 4. Citations and downloads of the most cited subscribed journals

	TOTAL	
	Citations	**Downloads**
Computers in Human Behavior	190	11314
Personality and Individual Differences	187	4043
Journal of Autism and Developmental Disorders	142	4435
Journal of Intellectual Disability Research	128	1497
Computers and Education	125	11833
Behavior Research Methods	120	1349
Research in Developmental Disabilities	112	5759
International Journal of Clinical and Health Psychology	88	741
Evaluation and Program Planning	86	530
Applied Cognitive Psychology	86	464
Psychometrika	85	570
Social Indicators Research	80	2219

Memory and Cognition	77	572
Neuropsychologia	73	5180
Journal of Applied Research in Intellectual Disabilities	73	729
Child Development	64	784
Journal of Vocational Behavior	58	1015
Cognition	58	1866
Journal of Business Venturing	55	3227
Entrepreneurship Theory and Practice	55	1982
Ansiedad y Estrés	53	115
Journal of Memory and Language	52	1308
Procedia - Social and Behavioral Sciences	52	10414

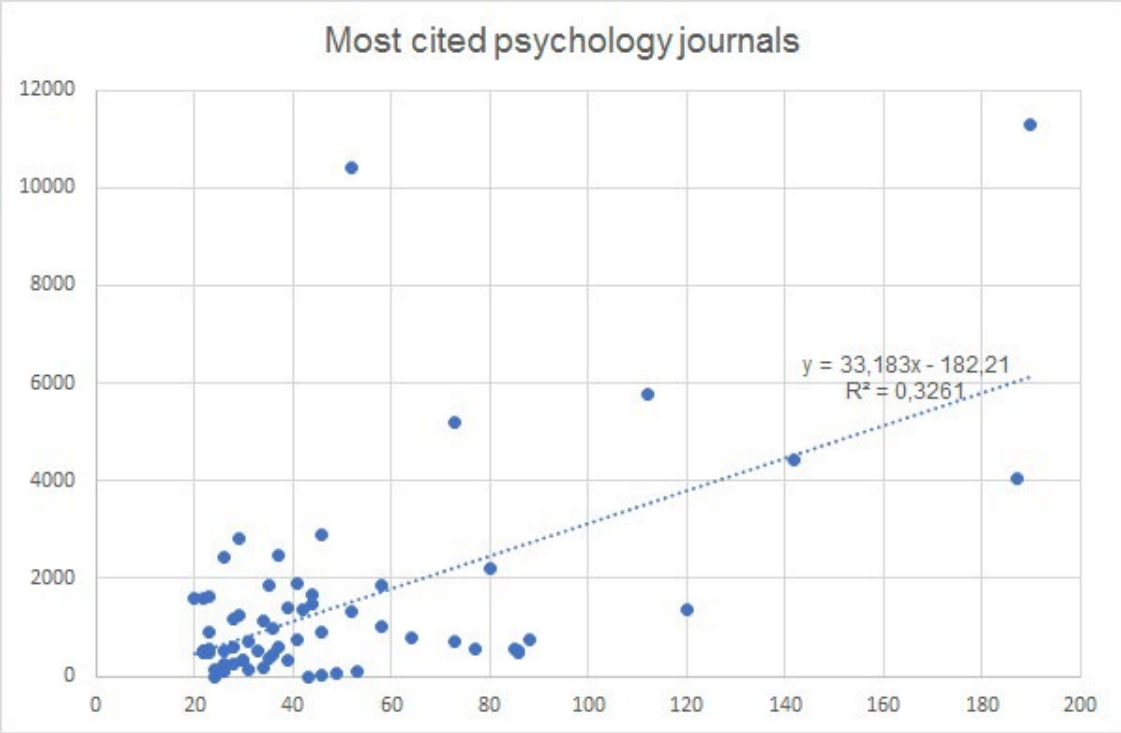
However, a more detailed analysis of these data reveals that there is not a high correlation between the two variables. Figure 2 shows the citations and downloads of the 100 most cited journals, revealing a fairly marked dispersion of the data. In this case, the Spearman correlation coefficient is low (0.35), indicating that there is no significant relationship between the two variables. This finding can be explained based on the fact that the journals most cited by psychology journal articles include some that are very specific to the field of psychology and that are probably downloaded only or mainly by specialists in this discipline, as well as other journals that are more interdisciplinary or with more potential readers that are consulted by many more researchers, such as the *Journal of Business Venturing* or *Computers and Education*.

Figure 2. Distribution of citations and downloads of the 100 most cited subscribed journals



This explanation is consistent with the results obtained when analyzing the relationship between citations and downloads of the most cited journals classified in *Scopus* as belonging to the psychology category. When considering only these journals, the Spearman correlation between the two variables is higher, with a modest but still acceptable value of 0.57, thus already indicating a certain relationship between citations and downloads. This can be seen in Fig. 3, which shows fewer points away from the trend line. Such a stronger correlation between citations and downloads when considering only citations to journals from the same discipline was already observed by Rodríguez Bravo *et al*. (Rodríguez-Bravo et al., 2021) in a study on the scientific production of four universities in the field of Library and Information Science and by Pastva *et al.* (2018) in another similar study in the field of dermatology.

Figure 3. Distribution of citations and downloads of the most cited subscribed psychology journals



5. Conclusions

One of the main findings of this work is the confirmation of the importance that scientific journals still have as a fundamental vehicle for transmitting knowledge, as confirmed by the fact that almost 75% of the references analyzed in this study corresponded to this type of publication. This validity of scientific journals was also recently highlighted by Kim *et al.* (2020) and Herman *et al.* (2020). The latter authors point out that journals are the only product that still consistently fulfills all the functions traditionally attributed to them (recording, curation, evaluation, distribution, and archiving) and that they are necessary to institutionalize and confidently add academic contributions to the knowledge base. Furthermore, in the case of Spanish researchers, the evaluation system itself conditions the type of document by marginalizing monographs or book chapters in preference for the publication of journal articles (Osca-Lluch et al., 2019).

The data obtained in this work regarding which journals are the most cited indicate that the content accessible through big deals is useful and relevant for the researchers included in this study. The ease of access and the visibility they provide to the journals they distribute promote their reading and subsequent citation. The results of this study indicate that *Elsevier*, *Wiley*, and *Springer*, three of the distributors contracted by the studied universities, as well as *Taylor & Francis* account for a high percentage of citations. Apart from these large providers, only *APA* and *Sage* have some importance as publishers. The case of APA is remarkable given that the role of institutional and specialized publishers is usually reduced as they cannot compete with the power of the large publishers that distribute most of the indexed publications (Osca-Lluch et al., 2019). The journals distributed by Emerald, the other provider included in this study, have practically not been used for downloading, citation, or publication by the researchers from the public universities of Castille and Leon in the field of psychology. Despite being specialized in the social sciences, Emerald's journal package is much smaller than that of the other providers, and it offers very few psychology journals.

On the other hand, it is observed that, in addition to the subscribed content, journals distributed by other publishers or in open access have been cited considerably, many of them being well-ranked Spanish or international publications. The increase in open-access journals is a growing trend that has also led many paid journals to become hybrid, a formula for the transition to open access that has a target date set in Plan S. The ease of accessing articles in these journals makes them easy to read and cite.

The importance of journals that are well positioned in the SCImago Journal Rank has also been observed. To some extent, this finding seems to be conditioned by the current evaluation system for Spanish researchers that encourages publication in journals that are included in large databases, such as *WOS* and *Scopus*, and which also

somehow influences the journals they will cite. To some extent, this fact explains why Spanish journals have been used more for reading and publishing than for citing, which we believe can be attributed to the fact that linguistic accessibility favors their use as an information source and communication vehicle. In contrast, the fact that more foreign journals are cited may be related to the current system of evaluation of scientists, which marginalizes local and national studies and relegates journals in local languages to a secondary position (Osca-Lluch et al., 2019).

Another clear conclusion is that the preferences of researchers from the four universities analyzed are not strictly homogeneous but largely conditioned by their different lines of research. However, the relevant role of journals that collect general and multidisciplinary research has been confirmed. The development of science is increasingly a cooperative activity, with multidisciplinary research being recognized and promoted by the bodies managing Spanish scientific policies (González-Alcaide et al., 2010). On the other hand, the evaluation system based on the impact factor is associated with the nonspecialization of researchers along with the growth of multidisciplinary journals in citation indexes (Osca-Lluch et al., 2019).

Regarding the use of downloads and citations to evaluate collections, Ivanov *et al.* (2020) consider these indicators to be complementary, capturing both the intellectual value of a journal (by identifying the frequency with which its articles are cited) and the usefulness of each publication (by identifying the frequency with which the articles of a journal are consulted or downloaded). However, Martin *et al.* (2016b) emphasize that these two metrics are not comparable. Downloading an article is different from citing it, requiring less effort. Thus, the number of downloads from a widely used title is likely to be much higher than the number of citations of a widely cited article. In addition, although these data change over time, their evolution will not necessarily be parallel,

since citations of an article are likely to be delayed with respect to its downloads because of the time elapsing between the consultation of material and the publication of the article that cites it. Likewise, Vogl, Scherndl, and Kühberfger (2018) indicate that citations increase over time, which can be the best indicator of the quality of an article. Downloads, as well as other alternative metrics, have a shorter half-life and tend to stagnate after publication, thus measuring the immediate influence. These circumstances thus condition the correlations, which will not always be high.

In the present case, only a modest correlation between downloads and citations was found. We believe that the hybrid nature of psychology and its interaction with various disciplines may lie at the origin of this result, indicating a significant percentage of downloads by researchers from other areas, a fact that cannot be discriminated in the current analysis. We consider that this modest correlation may also be a symptom of the fact that the topics investigated by the community of psychologists in Castille and Leon are interdisciplinary, which will be reflected in a high number of citations to journals linked to other disciplinary fields. This fact would explain why the correlation between citations and downloads is found to be higher when considering only journals from the field of psychology, as also observed in other similar studies reporting a greater correlation when considering journals from the same discipline as the researchers (Pastva et al., 2018; Rodríguez-Bravo et al., 2021).

The results obtained in this work must be interpreted in the light of a series of limitations, e.g., that the correlation was based on download data from the year before the citation. The scientific literature includes studies based on other data. However, considering that no measure can be exact and that all of them may suffer from biases, we consider that this approach would be the most accurate. On the other hand, we must consider that the downloads may have come from researchers from other areas, a fact

that cannot be discriminated in this analysis, and that researchers could have accessed articles through other channels, such as social networks or repositories, which of course is also not reflected in the download statistics.

As a future line of work, we would like to extend this analysis to include the preferences of researchers from different thematic areas in the choice of information resources to develop their research, using the journal article as the unit of analysis. It would be interesting to determine whether this expected difference in the use of open- and closed-access articles appears in the case of hybrid journals subscribed to by universities. To carry out larger studies, the option of automating the data normalization and filtering process would be desirable, albeit very expensive in terms of time and resources unless the relevant stakeholders (databases, publishers, journals, and even authors) decisively embark on the task of standardizing bibliographic information.

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7. Declaration of competing interest

The authors of this paper declare that they have no competing interests

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APPENDIX A. Citation and download data of subscribed journals by year and ordered according to total citations

Table 5. Citation and download data of subscribed journals by year

	2015	2016	2017	2018	2019	TOTAL
	Citations Downloads	Citations Downloads	Citations Downloads	Citations Downloads	Citations Downloads	Citations Downloads
Computers in Human Behavior	21 1528	36 1700	59 2398	59 2529	15 3159	190 11314
Personality and Individual Differences	24 720	28 705	34 847	52 723	49 1048	187 4043
Journal of Autism and Developmental Disorders	14 368	21 1014	4 1231	57 953	46 869	142 4435
Journal of Intellectual Disability Research	8 283	45 272	18 293	47 310	10 339	128 1497
Computers and Education	13 2429	17 2158	30 1911	26 2516	39 2819	125 11833
Behavior Research Methods	38 234	5 252	15 188	26 291	36 384	120 1349
Research in Developmental Disabilities	3 1390	44 1221	12 1215	22 913	31 1020	112 5759
International Journal of Clinical and Health Psychology	21 44	28 126	16 162	6 194	17 215	88 741
Evaluation and Program Planning	1 164	52 72	13 76	18 122	2 96	86 530
Applied Cognitive Psychology	48 88	1 134	1 125	0 39	0 69	86 464
Psychometrika	9 131	23 123	6 111	19 84	28 121	85 570
Social Indicators Research	8 411	23 263	22 324	5 578	22 643	80 2219
Memory and Cognition	18	9	33	6	11	77

	148	159	119	52	94	572
Neuropsychologia	29 1326	8 1124	28 913	6 1063	2 754	73 5180
Journal of Applied Research in Intellectual Disabilities	7 90	29 97	4 80	21 172	12 290	73 729
Child Development	1 196	13 208	16 128	21 98	13 154	64 784
Journal of Vocational Behavior	16 171	25 237	1 185	10 230	6 192	58 1015
Cognition	13 421	2 419	10 273	7 306	26 447	58 1866
Journal of Business Venturing	15 477	7 1038	1 310	12 716	20 686	55 3227
Entrepreneurship Theory and Practice	17 378	20 573	2 221	6 460	9 350	55 1982
Ansiedad Y Estrés	10 0	18 0	8 5	7 57	10 53	53 115
Journal of Memory and Language	12 230	2 179	25 188	2 188	11 523	52 1308
Procedia - Social and Behavioral Sciences	3 872	9 1894	13 1949	9 2958	18 2741	52 10414
Journal of the American Academy of Child and Adolescent Psychiatry	3 6	5 11	2 22	9 31	30 5	49 75
International Journal of Geriatric Psychiatry	13 368	20 140	5 176	2 265	7 132	47 1081
Law and Human Behavior	10 7	9 3	19 11	4 5	4 3	46 29
Trends in Cognitive Sciences	7 657	6 689	14 491	8 438	11 611	46 2886
Contemporary Educational Psychology	10 124	5 213	7 168	9 219	15 164	46 888

Journal of Child Psychology and Psychiatry	5 212	7 406	7 320	12 339	13 215	44 1492
Clinical Psychology Review	4 360	3 356	12 437	9 273	16 262	44 1688
Psychiatry Research	1 387	9 494	8 500	4 563	21 581	43 2525
Psychological Science	2 0	4 0	15 0	8 0	14 0	43 0
Journal of Experimental Child Psychology	3 341	6 260	17 206	0 263	16 279	42 1349
The Lancet	4 2589	11 2613	7 3206	12 2849	7 3259	41 14516
Reading and Writing	4 131	13 149	2 108	14 153	8 195	41 736
Learning and Instruction	8 786	5 328	9 217	8 295	11 286	41 1912
Teaching and Teacher Education	1 520	0 399	11 527	2 783	25 779	39 3008
Biological Psychology	3 275	27 307	6 247	2 225	1 333	39 1387
Research Policy	0 1120	2 1537	0 887	10 1469	8 1259	39 6272
Journal of Applied Social Psychology	3 104	9 66	7 58	6 49	14 52	39 329
NeuroImage	13 1839	3 1940	9 1854	12 1879	1 1629	38 9141
Journal of Adolescent Health	0 275	8 238	6 293	13 213	9 217	37 1236
British Journal of Educational Psychology	4 95	13 113	7 119	7 145	6 112	37 584
Journal of Affective Disorders	4 300	3 533	4 594	7 488	19 560	37 2475

Journal of Psychiatric Research	11 191	6 221	7 235	7 224	5 196	36 1067
Journal of Youth and Adolescence	0 59	4 76	5 100	14 78	7 133	36 446
Journal of Adolescence	8 149	4 246	8 193	8 165	8 220	36 973
Tourism Management	1 836	4 643	0 984	0 1500	30 1222	35 5185
Cognitive Therapy and Research	3 34	10 40	7 47	6 32	9 204	35 357
Learning and Individual Differences	2 394	2 440	12 280	1 310	18 434	35 1858
Journal of Personality	5 42	3 23	6 38	13 37	7 46	34 186
Journal of Happiness Studies	8 186	9 53	7 95	5 115	5 114	34 563
Behaviour Research and Therapy	7 195	10 198	7 281	3 223	7 245	34 1142
Journal of Policy and Practice in Intellectual Disabilities	1 85	13 49	4 65	13 113	2 81	33 393
Journal of Research in Personality	6 112	4 82	5 86	9 124	9 125	33 529
Developmental Medicine and Child Neurology	0 448	12 487	13 559	1 571	6 438	32 2503
Legal and Criminological Psychology	5 22	2 35	14 24	3 20	7 36	31 137
Psychonomic Bulletin and Review	2 97	5 99	16 92	2 144	6 299	31 731
Reading Research Quarterly	7 44	4 66	10 31	2 79	7 96	30 316
Journal of Clinical Psychology	3 62	7 32	5 82	10 104	5 66	30 346

Alzheimer's and Dementia	5 485	6 394	6 451	9 303	4 589	30 2222
Journal of the American Geriatrics Society	10 275	11 243	5 186	1 326	3 230	30 1260
Cortex	5 576	2 572	12 493	3 610	7 586	29 2837
Brain Research	4 1661	13 1319	7 1313	1 1072	4 986	29 6351
Psychology of Sport and Exercise	1 295	6 381	5 216	13 205	4 168	29 1265
Journal of Experimental Social Psychology	8 148	5 121	8 99	1 108	6 140	28 616
Archives of Clinical Neuropsychology	5 423	5 376	10 198	6 120	2 43	28 1160
British Journal of Psychology	3 63	1 25	7 63	4 41	13 50	28 242
Strategic Management Journal	1 502	12 520	1 708	7 1032	6 900	27 3662
Schizophrenia Research	7 662	10 847	2 624	3 673	5 546	27 3352
Research in Autism Spectrum Disorders	1 462	3 651	3 458	7 472	12 408	26 2451
Journal of Nonverbal Behavior	2 2	3 33	4 25	13 11	4 27	26 98
Journal of Retailing	1 205	6 178	17 364	2 342	0 262	26 1351
Journal of Business Research	0 1180	10 1497	11 1759	0 1882	5 2012	26 8330
Journal of Abnormal Child Psychology	1 74	2 73	2 129	4 69	17 168	26 513
Scandinavian Journal of Psychology	4 49	4 56	8 52	4 56	6 50	26 263

Quality of Life Research	2 144	10 251	6 151	1 173	7 227	26 946
Journal of Cognitive Neuroscience	9 0	4 0	4 0	6 0	1 0	24 0
European Journal of Social Psychology	8 25	2 35	4 35	7 20	3 36	24 151
Biological Psychiatry	1 732	9 742	8 600	1 475	5 417	24 2966
Current Directions in Psychological Science	1 0	4 0	4 0	6 0	9 0	24 0
Acta Psychiatrica Scandinavica	6 134	5 77	3 80	1 74	9 99	24 464
Social Science and Medicine	2 596	9 914	8 665	1 799	5 751	23 3725
Acta Psychologica	4 237	5 194	7 177	1 149	6 142	23 899
Child Abuse and Neglect	0 277	11 298	7 369	1 248	4 434	23 1626
Drug and Alcohol Dependence	0 296	1 314	5 293	0 286	0 282	23 1471
Behavior Therapy	2 100	4 94	13 81	3 104	1 97	23 476
Revista Latinoamericana de Psicología	6 0	4 65	3 155	6 185	4 170	23 575
Psychophysiology	4 115	8 103	5 93	1 102	4 114	22 527
Journal of Management	2 30	6 19	3 35	6 31	5 29	22 144
Journal of Anxiety Disorders	2 94	13 87	0 84	0 94	7 133	22 492
Addiction	0 95	0 65	10 184	5 164	7 114	22 622

Educational Psychology Review	3 64	2 57	7 85	4 203	6 109	22 518
Brain and Cognition	5 386	1 410	9 307	5 282	2 215	22 1600
Journal of Communication	4 0	1 65	4 162	4 178	8 170	21 575
Gaceta Sanitaria	1 149	3 187	4 1522	10 1779	3 2011	21 5648
BMC Public Health	1 14	6 12	5 18	5 23	3 11	20 78
Brain and Language	8 567	6 372	2 190	4 139	0 324	20 1592