

Scientific networks and research groups development. Educational Psychology case in Spain during the five-year periods 2004-2008 and 2009-2013

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Título: Evolución de las redes científicas y grupos de investigación. El caso de la psicología educativa en España durante los quinquenios 2004-2008 y 2009-2013.

Resumen: El objetivo de este estudio ha sido identificar y conocer los cambios experimentados en los grupos de la comunidad científica de autores que trabajan en instituciones españolas y que publican artículos en las revistas científicas incluidas en la categoría "Psychology Educational" en la Web of Science durante el período 2004 hasta el 2013 y su pertenencia y permanencia en los diferentes grupos de investigación. Se realizó un estudio comparativo de los grupos y su composición a lo largo de los quinquenios 2004-2008 y 2009-2013. Los resultados indicaron que existe un incremento en el número de investigadores y de los grupos de investigación en el ámbito de la psicología educativa, que viene acompañado de un aumento en el número de artículos, aunque, en algunos casos, el aumento en el número de integrantes en el grupo no se corresponde con un aumento significativo de su producción científica. Cabe destacar el papel que ha tenido la incorporación de un mayor número de revistas españolas en la Web of Science, ya que son las que concentran la mayor parte de la producción científica en esta disciplina.

Palabras clave: Grupos de investigación; Redes sociales; Psicología educativa; España; Colaboración científica; Web of Science.

Abstract: The aim of this study was to identify and understand the changes experienced in the scientific community groups of authors working in Spanish institutions and publishing articles in scientific journals included in the "Educational Psychology" in the Web of Science during the period 2004 till 2013 and its membership and permanence in different research groups. A comparative study of groups and their composition over the five-year periods 2004-2008 and 2009-2013 was performed. The results indicated that there is an increase in the number of researchers and research groups working in the field of educational psychology, which is accompanied by an increase in the number of items, although in some cases the increase in the number of members in the group does not correspond to a significant increase in scientific production. It is noticeable the incorporation of a greater number of Spanish journals in the Web of Science, as are those that concentrate most of the scientific production in this discipline and are responsible to influence growth in the foundation data from the Web of Science of the Spanish scientific production in educational psychology.

Key words: Scientific groups; Social networks; Educational Psychology; Spain; Scientific collaboration; Web of Science.

Introduction

Scientific research collaboration has seen a considerable increase in recent years as disciplines have developed, especially in terms of a growing focus on issues whose solution requires an inter- and multidisciplinary approach. Scientific collaboration plays an essential role in the professional activity of researchers (González-Alcaide and Gómez-Ferri, 2014). Although research by 'solo scientists' still predominates in some science areas such as humanities, individual activity is generally guided by membership or inclusion in research teams or research organisations, whether academic or a different type. This is largely the outcome of increased science complexity, a greater presence of interdisciplinary studies, and rapid and effective communication between scientists. Furthermore, the creation of multidisciplinary teams and sharing expensive material resources are some of the advantages of collaboration (Subramanyam, 1983; Glanzel, Schubert and Czerwon, 1999); in addition, co-authored papers are often more cited and for longer periods (Lassi and Sonnenwald, 2010).

But cooperation also has some negative aspects and can give way to conflict as regards the contribution of each individual author to the publication of collaborative research results (Fonseca-Mora, Tur-Viñes and Gutiérrez-San Miguel,

2014). And the umbrella of the group or presumed collaboration might be used to hide mediocre and arriviste researchers, student promotion, or favour exchanges; collaboration might also be a merely utilitarian means to an end, e.g. access to funding, which has nothing to do with genuine, knowledge-boosting cooperation (González-Alcaide and Gómez-Ferri, 2014).

Bibliometric analysis delves into the study of the outcomes of science using data usually included in scientific literature which are in turn collected in the information sources used for this type of studies, helping us to understand scientists' working and publishing styles in different areas.

Determining knowledge flows and relationships between scientists can not only give an insight into essential aspects for the understanding of problem development or research lines but also inform on dynamism in Science and Technology systems (Sancho, 2001). By visualizing links between scientific authorship elements, their positions can be better understood, this facilitating a better interpretation and understanding of existing ties in scientific collaboration. In bibliometrics -understood as a set of methods for studying or measuring texts and information- scientific paper co-authorship is considered to be a quantifiable demonstration of collaboration between researchers, institutions and countries. The analysis of bibliographic elements in the authorship of articles -consisting of names and institutional affiliations- identifies networks in science collaboration from its different levels: local, regional, or international.

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Bibliometric collaboration indicators inform about existing links between scientific producers or agents in the process which ends with the joint publication of scientific results. At the basis of such indicators we find data on authorship and authors' organisations. In general terms, the number of co-authored papers and the number of authors per paper has markedly increased over the past four decades, although indicators vary across scientific areas. Likewise, the information that can be drawn from statistical inquiry into co-authorships can be valuable in identifying research groups or finding and studying relationships between institutions. Greater availability of international programmes and structures for scientific collaboration and scientist movement -an essential part of training and professional development- has resulted in a significant growth of international cooperation (Marmolejo-Leyva, Pérez-Angón and Russell, 2015).

The number of papers on scientific collaboration has considerably risen in recent years with the boost of Social Network Analysis (SNA) techniques. SNA is increasingly used as a tool to find ties between the different bibliographic elements behind a scientific paper. Authorship-based approaches have been implemented to analyse scientist networks; for example, it is fairly common to resort to citations as a main basis for the determination of the structure of links in a network. Bibliometric studies and social network analyses have been conducted studying data from PhD dissertations (Delgado López-Cózar, Torres-Salinas, Jiménez-Contreras and Ruiz-Pérez Delgado, 2006; Maz-Machado et al. 2012), scientific areas and their interdisciplinarity (Bracho-López et al. 2012; Meyer et al. 2014; Peñaranda-Ortega, Osca-Lluch and Quiñones Vidal, 2011), collaboration between institutions and countries (Russell, Ainsworth and Narváez-Berthelebot, 2006), between authors or journals (Ávila-Toscano, Marengo-Escuderos and Madariaga, 2014; González-Alcaide et al. 2010), and bibliographic links in papers (González-Alcaide and Gómez-Ferri, 2014).

The way scientific collaboration is defined varies across organisations, scientific disciplines and countries, and it possibly changes over time too. The intensification of science collaboration could be explained by different factors: complex problems whose solution requires an inter- and multi-disciplinary approach; growing discipline specialisation; funding policies that encourage the creation of working groups; policies to foster inter-sector collaboration; regional cooperation agreements; information technologies that facilitate teleworking; science globalisation, etc. Participants expect incentives or benefits such as: access to financing and infrastructure; update of theoretical or tactical knowledge; exchange of ideas; greater visibility and productivity; membership in scientist networks. The meeting previous to a collaboration proposal can be the result of different scenarios such as informal contact in conferences and congresses, geographical proximity, and tutor-student links. This is why changes in a network have drawn the attention of network analysis.

This paper aims to identify Spanish research groups and institutions in the field of educational psychology during the periods 2004-2008 and 2009-2013, based on the papers published in scientific journals included in the Web of Science, *Psychology Educational* category, and to detect changes in research groups over time as a result of new ties between authors.

Method

Procedure

To find the scientific publications of researchers working in Spain in the educational psychology area, a bibliographic search was conducted in the *Social Science Citation Index* (SSCI) database of the Web of Science (WoS), Thomson Reuters. The search was carried out using a search profile with all the papers published in the 54 journals in the *Psychology Educational* subject category of the Journal Citation Report (JCR) throughout the period 2004-2014; additionally, the place name "Spain" was entered into the "Address" field, and the search equation was limited to the chronological period 2004-2013. The search was performed in July 2014. A relational database was created with the bibliographic data of the records retrieved in order to organise and standardize the information. Authors' signatures provided by the authors of the papers were standardised, since several signatures of a single author are sometimes unfolded into two or more variants, for several reasons: because they include one or two surnames, both, an initial or two initials in case of double names; because first names are sometimes extended, or punctuation (hyphens) is used to separate surnames, etc. The opposite case can also be found, i.e. the same signature corresponds to two or three authors. Once bibliographic data was processed and standardised, the following aspects were studied:

1. Number of authors working in Spanish institutions in educational psychology during the periods 2003-2008 and 2009-2013.
2. Identification of educational psychology research groups during the period studied.
3. Comparative analysis of the evolution of educational psychology research groups over time.

Results

A total of 593 documents published in 2004-2013 in journals in the "*Psychology Educational*" category of the Web of Science (WoS) were retrieved. They were signed by at least one researcher working in a Spanish institution. Paper distribution based on document type was as follows: 532 articles (89.71%), 43 conference proceedings (7.25%), 12 editorial materials (2.02%) and 6 other document types (1.01%) such as reviews, biographic materials, and book reviews. Given the relevance of scientific articles, and the fact that they best

reflect the characterization of science production in a discipline, they were selected for the study.

The number of educational psychology articles published per year shows a clear upward trend (see Figure 1), 2011 and 2013 being the years with more published papers, 73 and 82, respectively. In the comparison of the two five-year periods, 2004-2008 and 2009-2013, Spain's growth rate of educational psychology papers in the WoS database is over 100 per cent (100.56%).

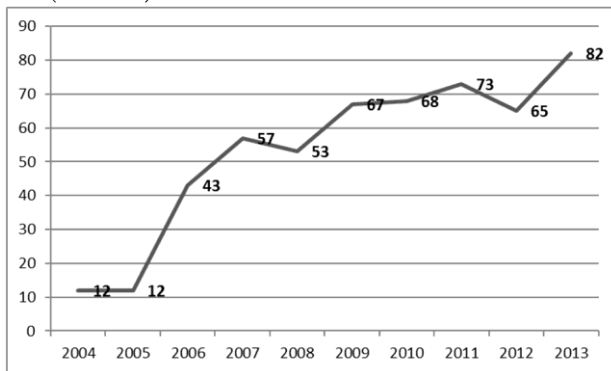


Figure 1. Evolution of educational psychology articles per publishing year.

Table 1. Distribution of the number of authors and articles by gender and period.

PERIODS	AUTHORS				ARTICLE			
	Men	Women	Unidentified	Total	Men	Women	Unidentified	Total
2004-2008	191	196	13	400	256	218	13	487
2009-2013	378	464	5	847	573	587	6	1166

In order to establish authorship features, the total number of authors publishing papers and the number of papers per author must be determined. Table 2 shows the authors' distribution by sex and number of published educational psychology articles indexed in the WoS. In the period 2004-2008, 82.75% of authors published just one paper, and only 2 authors (50%) published 5 or more. During the period 2009-2013, occasional or casual authors, i.e. those who published one paper only, decreased compared to the previous five years (76.27%), while the number of authors publishing 5 or more articles grew (9 authors, 1.07%). During the same period, 3 women ranked among top authors with 5 or more papers, and 24 women with 3 or more. These data confirm a

In the same comparison, the growth in the number of papers in 2009-2013 compared to 2004-2008 is paralleled by an increase in the number of authors per paper. The average number of authors per paper during 2004-2008 was 2.75 (177 articles and 487 signatures), while in 2009-2013, this average came to 3.28 (355 articles and 847 signatures).

The total number of authors collaborating in the papers in period 2004-2008 is 400, while in period 2009-2013, the number of authors is 847, a clear increase when both periods are compared. When the number of authors participating in the papers is analysed from a gender perspective, women outnumber men in the two periods studied, as shown in Table 1. In 2004-2008, men participated in a greater number of papers than women, however, during the period 2009-2013, the opposite trend can be seen, as the number of publications by women exceeds that of male authors. Throughout the period analysed, 18 authors could not be identified; they collaborated in a total of 19 articles. It must also be noted that the number of unidentified authors decreased in 2009-2013 compared to the previous five years.

change and point to an increase in women's scientific production in the period 2009-2013 compared to 2004-2008.

A relevant authorship indicator is the authors/paper rate, as it measures the level of collaboration between authors. Table 3 shows the authors' distribution according to the number of articles published in educational psychology journals by period. In 2004-2008, papers signed mainly by 1, 2 or 3 authors predominate, while in the period 2009-2013 papers are mostly produced by 2, 3 or 4 authors. When periods are compared, the number of papers signed by a single author is largely reduced, from 22.03% in 2004-2008 to 5.63% in 2009-2013.

Table 2. Author distribution according to number of published papers, by period and sex.

Nº. Papers/author	2004-2008					2009-2013				
	M	W	UN	Total	% authors	M	W	UN	Total	% authors
1	143	175	13	331	82.75	264	377	5	646	76.27
2	37	20		57	14.25	75	63		138	16.29
3	8	1		9	2.25	16	16		32	3.78
4	1			1	0.25	17	5		22	2.60
5	1			1	0.25	1	2		3	0.35
6	1			1	0.25	1	1		2	0.24
7					0.00	2			2	0.24
8					0.00	1			1	0.12
9					0.00					0.00
10					0.00	1			1	0.12
Total	191	196	13	400	100	378	464	5	847	100

Note: M=Men, W= Women, UN= Unidentified.

Table 3. Author distribution by paper and period (2004-2008 and 2009-2013).

Authors/Paper	1	2	3	4	5	6	7	8	9	10	Total articles
2004-2008	39	55	37	23	12	6	2	2	1	0	177
%	22.03	31.07	20.90	12.99	6.77	3.38	1.12	1.12	.56	0	100
2009-2013	20	97	114	63	33	15	6	3	3	1	355
%	5.63	27.32	32.11	17.74	9.29	4.22	1.69	.84	.84	.28	100
Total articles	59	152	151	86	45	21	8	5	4	1	532

Scientific collaboration was analysed identifying all combinations of pairs of authors in each individual paper (co-authorships) and finding groups of authors who usually write their papers in collaboration. Collaboration networks for the most productive authors were plotted. Nodes represent authors and lines connecting nodes represent collaboration. The thickness of the nodes indicates the higher or lower number of works completed by an author. To illustrate it graphically, authors publishing 5 or more papers in each period were selected. All authors collaborating with the selected authors were also included, even if their productivity was lower.

Figure 2 shows the collaboration network of ‘top producers’ for period 2004-2008. Two research groups participating in the publication of 11 articles were identified. Consisting of 8 researchers and with a total of 5 papers, the largest group is headed by Eduardo Vidal-Abarca. The second group includes 6 researchers. They published a total of 6 articles and were headed by Francisco Cano, Professor at the University of Granada. He is the author with the highest production level in this period.

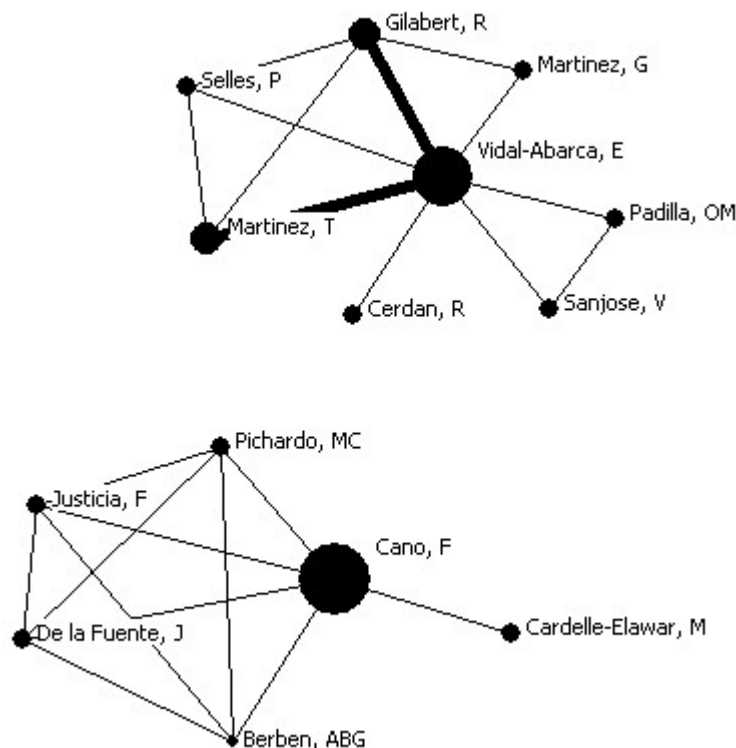


Figure 2. Network of top-producing authors in the *Psychology Educational* category of the Web of Science (2004-2008).

Figure 3 shows the collaborative network of top producers, including all their contributors, of articles published in journals in the *Psychology Educational* category of the Web of Science during 2009-2013. In this case, 5 research groups who collaborated in a total of 34 papers were identified. The largest group consists of 31 researchers, including 3 top-producing authors: José Carlos Núñez (Universidad de Oviedo), Antonio Valle (Universidad a Coruña) and Pedro

Rosario (Universidade do Minho), who participated in 10 articles. The second largest group is comprised of 23 researchers, and includes 3 top producers: Eduardo Vidal-Abarca (Universidad de Valencia), Laura Gil (Universidad de Valencia) and Raquel Cerdán (Universidad de Valencia), who published 7 papers during this period. It should be noted that the number of members in the group led by Eduardo Vidal-Abarca was 8 researchers in 2004-2008; they published a to-

tal of 5 articles in the category *Psychology Educational* of the WoS while, during 2009-2013, the group had a higher number of articles published in this category (7 papers) and more researchers. According to the composition of this research group throughout the period, only 6 researchers stayed in the group over time, and some members who were in the group in the first period, like Pilar Selles (Selles, P) and Olga

M. Padilla (Padilla, OM), did not participate in any of the papers during 2009-2013. The remaining research groups have fewer members, and they are headed by Gualberto Buela-Casal (Universidad de Granada), Teresa Mauri (Universidad de Barcelona) and Emilio Sánchez (Universidad de Salamanca), with 9, 8 and 7 researchers respectively.

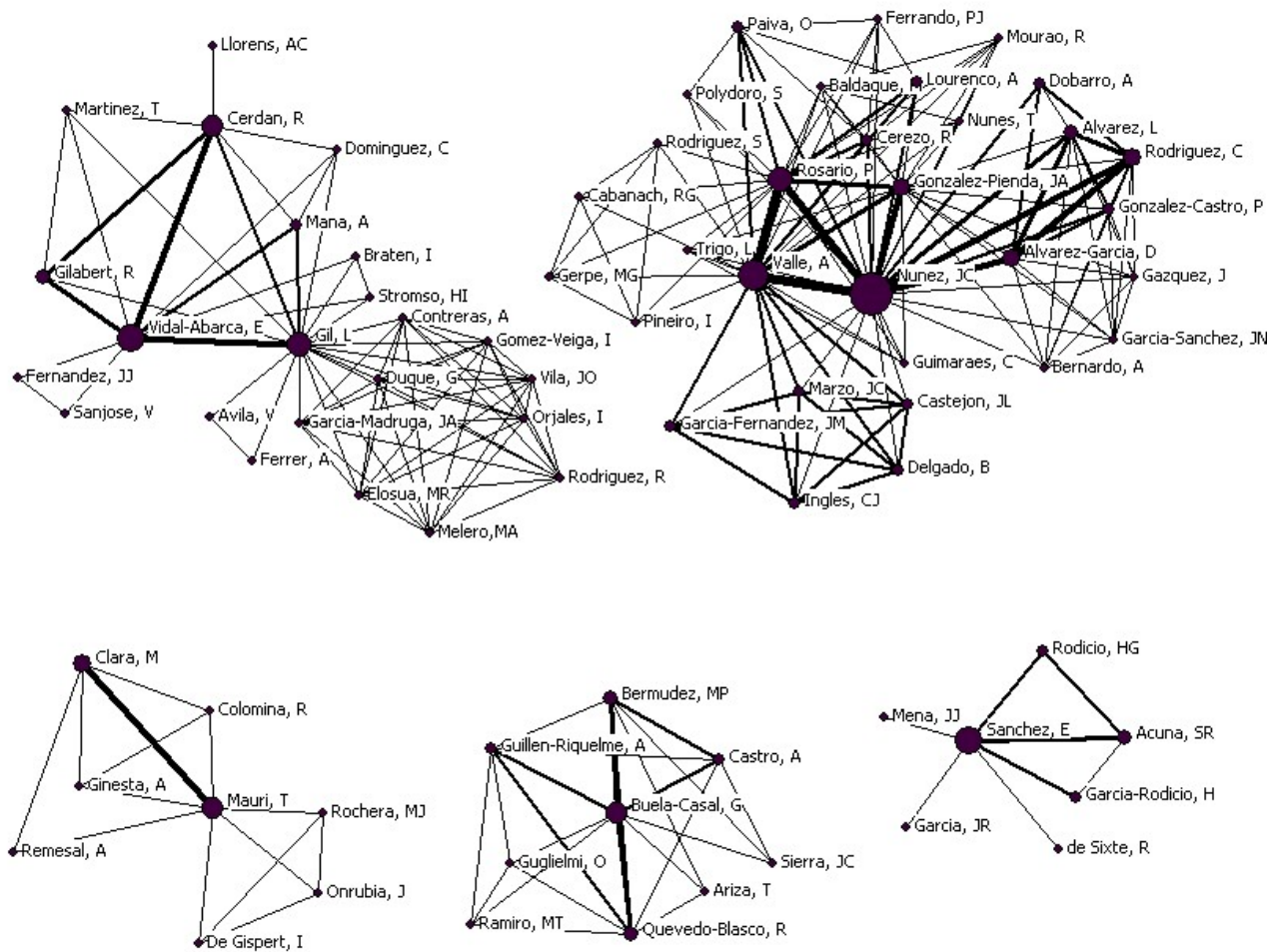


Figure 3. Network of top-producing authors, *Psychology Educational* category of the Web of Science (2009-2013).

The analysis of scientific collaboration by the most productive authors of the articles in the *Psychology Educational* category of the Web of Science in 2004-2013 identified 6 research groups. Their main characteristics are shown in Table 4. Each of these research groups wrote 5 or more articles during each period. Only one group managed to stay among the top producers in the educational psychology journals of the WoS in 2004-2013. A slight increase in the number of articles and a notable rise in the number of authors are ob-

served in the second five-year period (2009-2013). The increased number of researchers in research teams resulted in more papers, however, in some cases, the number of papers per author dropped. In general terms, in groups with a high number of researchers which include casual authors, not all group members participate in all papers, this condition being otherwise more common in groups with fewer researchers or in emerging teams.

Table 4. Main characteristics of research groups.

Period 2004-2008			
Main researcher	No. of authors/group	No. of articles	% articles/researcher
Cano, F	6	6	1.00
Vidal-Abarca, E	8	5	.63
Period 2009-2013			
Main researcher	No. of authors/group	No. of articles	% articles/researcher
Buela-Casal, G	9	5	.56
Mauri, T	8	5	.63
Núñez, JC	31	10	.32
Sánchez, E	7	7	1.00
Vidal-Abarca, E	23	7	.30

13 journals are used by the main research groups. Table 5 shows the list of journals used by each research group in the two periods, as well as the number of articles published in each of them and the quartile the journals have in the *Psychology Educational* subject category in the JCR of the year of publication of the paper. Two Spanish journals, *Infancia y Aprendizaje* (13 papers) and *Revista de Psicodidáctica* (10 papers)

are the most widely used journals throughout the period. Although an increase in paper production is observed when periods are compared, papers are increasingly published in higher-impact journals: in the first period the number of articles in quartile 1 journals was 3, while in the second period it was 7. The same applies to papers in quartile 2 journals.

Table 5. List of journals used by research groups.

Period 2004-2008			
Main researcher and no. of papers	n° articles	Journal	JCR quartile year of publication
Cano, F (6)	1	British Journal of Educational Psychology	Q3
	1	Educational and Psychological Measurement	Q2
	3	European Journal of Psychology of Education	Q4 y Q3
Vidal Abarca, E (5)	1	Learning and Instruction	Q1
	1	Discourse Processes	Q2
	2	Infancia y Aprendizaje	Q4
	1	Journal of Educational Psychology	Q1
	1	Learning and Instruction	Q1
Period 2009-2013			
Buela-Casal, G. (5)	5	Revista de Psicodidáctica	Q1, Q2, Q3, Q4,
	5	Infancia y Aprendizaje	Q4
Núñez, JC (10)	5	Revista de Psicodidáctica	Q1, Q2, Q3, Q4,
	1	Infancia y Aprendizaje	Q4
	2	European Journal of Psychology of Education	Q3, Q4
	1	Metacognition and Learning	Q2
	1	Learning and Individual Differences	Q2
Sánchez, E (7)	1	European Journal of Psychology of Education	Q4
	2	Infancia y Aprendizaje	Q4
	2	Instructional Science	Q1, Q2
	1	Learning and Instruction	Q1
	1	Reading and Writing	Q3
Vidal-Abarca, E (7)	1	Contemporary Educational Psychology	Q1
	3	Infancia y Aprendizaje	Q4
	1	Journal of Educational Psychology	Q1
	1	Learning and Individual Differences	Q2
	1	Learning and Instruction	Q1

Although the number of articles grew substantially from one period to the next one -11 in the first period and 34 in the second one- this did not happen to the same extent with the journals used for publication: 7 journals were used in the

first period and 10 in the second one. This was mainly due to the inclusion of Spanish journals into the WoS, used by research groups to a greater extent, as reflected in Table 6.

Table 6. Distribution of the number of papers by large producers, per journal and year.

JOURNALS	País	Period 1					Period 2					Total
		2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
British Journal of Educational Psychology	ING		1									1
Contemporary Educational Psychology	USA							1				1
Discourse Processes	USA			1								1
Educational and Psychological Measurement	USA			1								1
European Journal of Psychology of Education	POR	1			1	1		1	1			6
Infancia y Aprendizaje	ESP					2	1	6	1	1		13
Instructional Science	PB						1					2
Journal of Educational Psychology	USA					1		1				2
Learning and Individual Differences	PB								2			2
Learning and Instruction	ING		2					1				4
Metacognition and Learning	USA										1	1
Reading and Writing	PB						1					1
Revista de Psicodidáctica	ESP						3	2	2	1	2	10
Total artículos		1	3	2	1	4	7	11	6	2	8	45

Note: ESP = España, USA = Estados Unidos, POR = Portugal, PB = Países Bajos, ING = Inglaterra.

Conclusions

The application of social network analysis to research on production in psychology journals facilitates the identification of emerging social structures when various actors are collaboratively associated. This study analyses the scientific production of Spanish researchers publishing their work in the journals included in the *Psychology Educational* category of the Web of Science in the period 2004-2013, as well as their belonging and permanence in different research groups.

The study underlines the usefulness of social network analysis as a complementary tool to traditional bibliometric techniques, as it helps to identify peripheral members or groups, their connectivity, and the emergence of central members and other agents who, without being members, operate as intermediaries in the network. This usefulness lies in its power to facilitate the structural analysis of social links and their evolution over time. The implementation of this tool allows us to see the role of some researchers in different research groups.

In small groups, it is the large producers who work as liaisons between all researchers in the group signing articles with all members, while in bigger groups, the main investigators do not author articles with all members despite operating as points of connection between group members. Some authors are part of a research group, but their participation in paper publication is scarce. We can also see that the growing size of research groups results in the emergence of sub-groups, but this increase in size is not always accompanied by a significant rise in scientific production.

The results obtained in this study show an increase in the number of researchers working in educational psychology in Spanish institutions, together with an increase in the number of articles published in educational psychology journals in the Web of Science (WoS) databases. This increase can be explained by investments in science in recent years in Spain, especially before the crisis, and by an increase in the number of Spanish journals in the Psychology area over the past ten

years (Osca-Lluch and others, 2013). When scientific production in educational psychology is compared between the period 2004-2008 and the period 2009-2013 from a gender perspective, women have a higher presence in both. Although during 2004-2008, men's scientific production in this discipline was higher, the trend was reversed between 2009-2013, women standing out production-wise, which can be explained by their later access to university education (Aksnes, Rorstad, Piro and Siversten, 2011; Sierra, Buena-Casal, Bermúdez and Santos-Iglesias, 2009; Torres-Salinas, Muñoz-Muñoz and Jiménez-Contreras, 2011), which would justify their lower production in the first period. On the other hand, as argued by Bordons, Morrillo, Fernández and Gómez (2003), women's production rises as they gain access to higher positions in university ranks, this being noticeable in the second five-year period, with an increasing presence of women in editorial teams and as large and medium-sized producers. These results fall into contradiction with studies that found men to be more productive versus women (Abramo, D'Angelo and Caprasecca, 2009; Aksnes et al. 2011; Larivière, Vignola Gagné, Villeneuve, Gelinas and Gingras, 2011; Maz-Machado et al. 2012; Torres-Salinas et al. 2011). It should be noted that in period 2009-2013, the number of women considered large producers (5 or more articles) is also higher than that in 2004-2008. Among the top producers, there are only 3 women, men still outnumbering women in this respect, a finding corroborated by studies showing a higher presence of men among the 100 professors with extensive production in educational psychology (Olivas-Avila, Musi-Lechuga, Guillén-Riquelme and Castro, 2012).

Another aspect to highlight is the increase in collaboration for article publication between periods and the rise in the average number of authors per paper. This has bearing on the increase in research groups, from two to five in 2009-2013, and on the higher number of group members, the groups with the largest, more productive groups also being the groups with top producers. In the second period, Eduardo Vidal-Abarca's group (University of Valencia) becomes

consolidated. His team includes two other large producers, Laura Gil and Raquel Cerdán, and is mainly comprised of researchers from Valencia University, a group which already had a high profile in the first period. New research groups appear in the second period, for instance the groups headed by José Carlos Núñez (Universidad de Oviedo), Antonio Valle (Universidad da Coruña), Pedro Rosario (Universidade do Minho) -these researchers are also relevant producers- and the groups of Gualberto Buena Casal (Universidad de Granada), Teresa Mauri (Universidad de Barcelona) and Emilio Sánchez (Universidad de Salamanca). Based on the trend observed from period 1 to period 2, these emerging groups could be expected to grow as regards researchers and production, although some of them may also lose prominence in the educational psychology field, as was the case with the group led by F. Cano (Universidad de Granada), no longer relevant in the period 2009-2013.

After analysing production and the number of members in each group, although the number of papers is higher, these are not signed by all group members, as the percentage of papers per author goes down, a trend that is indeed found in smaller groups. This finding illustrates what network analysis can offer: we can see that, in the largest groups, not all researchers work together, particularly casual authors, the principal researchers being the connecting nodes within the group. The importance of emerging figures within each group must also be underlined, as they can become researchers with a longer presence over time, as in the case with González-Piñeda, J.A. and L. Gil, and in the case of the latter, for the number of researchers who sign papers with her, which is very numerous.

An increase can be seen between periods in the number of journals used for publication, shifting from 7 in 2003-2008 to 10 in 2009-2013. This could be attributed to the

higher number of Spanish psychology journals in international databases (Osca-Lluch et al. 2013), the increase in publications in the *Psychology Educational* category of the WoS, which ranged from 42 journals in 2008 to 53 in 2013, and to the higher number of research teams and researchers in the discipline. In this regard, we must note the role played by the incorporation into the WoS of the Spanish journals *Infancia y Aprendizaje* and *Revista de Psicodidáctica*, which concentrated most of the production of large teams, with 21 papers out of the 34 published by the 5 research groups existing in 2009-2013. As already pointed out, production in educational psychology in Spain is mainly published in the country's journals, and confirms the need for a number of measures to improve Spanish journals (Abadal and Rius Alcaraz, 2008; Ruíz-Pérez, Martín-Martín and Delgado López-Cózar, 2015) contributing to their dissemination and impact and ensuring their continuity as, in some scientific areas -as argued by Purnell and Quevedo-Blasco (2013)- most Spanish research is published in foreign journals.

This study has some limitations, the most relevant one being the fact that not all of the educational psychology production has been considered, as there are journals in the WoS categories -particularly *Multidisciplinary*- which publish papers from the educational psychology area. Additionally, papers published in other databases have not been taken into consideration. In order to have a more global view of educational psychology and its evolution through research groups, the search for scientific articles should be extended to different databases. Finally, with a view to determining the relevance of research groups in educational psychology in Spain, other bibliometric indicators should be considered, such as number of citations, number of citations in foreign journals, funding, research projects, etc.

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