Reading Between the Lines: A Computational Bibliometric Analysis on Emotion Regulation

Javier Fernández-Álvarez[1(✉)], Pietro Cipresso[1,2], Desirèe Colombo[3], Cristina Botella[3], and Giuseppe Riva[1,2]

[1] Department of Psychology of the Catholic University, Largo Gemelli 1, 20100 Milan, Italy
{javier.fernandezkirszman, giuseppe.riva}@unicatt.it
[2] Applied Technology for Neuro-Psychology Lab at IRCCS Istituto Auxologico Italiano, Milan, Italy
p.cipresso@auxologico.it
[3] Department of Basic Psychology, Clinic and Psychobiology, Universitat Jaume I, Castellón, Spain
{dcolombo, botella}@uji.es

Abstract. Emotion regulation (ER) is defined as the processes deployed by an individual or group of individuals to explicitly or implicitly influence the experienced emotions in order achieve desirable states or goals. The available literature within this domain has grown exponentially in the last years. Nevertheless, to the best of our knowledge no scientometric analysis has been carried out yet. This kind of analysis allows to grasp how the scientific production within this field is configured, by establishing patterns and connections between the main authorities of the community. In the current analysis, descriptive data of the citation counts of main authors, institutions, journals, categories and countries are presented. Overall, the description shows the prominent role some authors as the principal authorities within the field, the predominance of United States in the citation counts as well as the high-impact journals in which the articles of this discipline are published. The most relevant implications of the findings are discussed in terms of future lines regarding the field of emotion regulation.

Keywords: Emotion regulation · Scientometric · Network analysis
Citation analysis

1 Introduction

Emotion regulation (ER) emerged in the last 15 years as one of the most studied constructs within the psychological realm. Although existing constructs aimed to address convergent domains (e.g. coping, mental control or emotional reactivity), the operationalization developed throughout the 90's constituted a turning point to examine how people seek to manage their emotional states. Indeed, ER is conceptualized as the processes deployed by a person or group of persons to explicitly or implicitly influence the experienced emotions to achieve desirable states or goals. Every person is at all times aiming at some extent to exert influence (implicit or explicit, automatic or

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controlled) the experienced emotions, as well as when and how are elicited and expressed [1–3].

The proliferation of ER has been observed in a wide range of psychological branches, including experimental and applied research domains [4]. ER became a niche of interest due to diverse reasons, like the transversal and dimensional nature of the process, from clinical to non-clinical population [5] or being a cross-cultural construct [6]. Besides, it is of paramount importance to highlight the accurate but parsimonious operationalizations [7] that allow studying the construct at a research level with multiple psychophysiological, behavioral and subjective methods [8].

It is undoubtedly the case that ER has grown as a research field and some studies have yielded objective evidence on this issue. Illustrative examples are the increase of publications and citations [9], the presence of published papers in journals with the highest impact factor of each sub-discipline (e.g. in clinical psychology; [6, 9]) or the publication of several handbooks and books gathering the available evidence on the topic [4, 10, 11].

However, to better determine the real impact of ER on the psychological field, other indicators should be taken into account. In particular, bibliographic network analysis constitutes a paradigm that allows examining patterns and connections through the identification of authorities (authors, topics, journals, institutions, etc.) in a given scientific community [12]. Although there are different indicators that may show the scientific productivity of a research domain, unraveling which researchers are more cited in the field, with whom are they publishing (co-authorships) or in which journals are published these studies, may represent objective indicators to better weight and determine the current status of a specific field. Besides, it is a pristine platform to outline future challenges that the specific field of ER should face. Hence, the present study aims to present a computational bibliometric analysis to establish some of the defining features of the scientific proliferation of ER.

2 Methods

The input data for the analyses were retrieved from the scientific database Web of Science Core Collection, based on a topic search for Emotion Regulation ("emotion* regulation*") papers published during the whole timespan covered. The data were lastly updated on November 30, 2017. All the indexes that compose the Web of Science Core Collection were considered for the analysis. That is, Citation Indexes, Science Citation Index Expanded (SCI-EXPANDED) –1970-present, Social Sciences Citation Index (SSCI) –1970-present, Arts & Humanities Citation Index (A&HCI) –1975-present, Conference Proceedings Citation Index- Science (CPCI-S) –1990- present, Conference Proceedings Citation Index- Social Science & Humanities (CPCI-SSH) –1990-present, Book Citation Index– Science (BKCI-S) –2009-present, Book Citation Index– Social Sciences & Humanities (BKCI-SSH) –2009-present, Emerging Sources Citation Index (ESCI) –2015-present, Chemical Indexes, Current Chemical Reactions (CCR-EXPANDED) –2009-present (Includes Institut National de la Propriete Industrielle structure data back to 1840), Index Chemicus (IC) –2009- present.

The resultant dataset contained a total of 11927. The bibliographic records consisted in diverse fields, such as author, title, abstract, and all the references (needed for the citation analysis). The research tool to visualize the networks was Cite space v.4.0. R5 SE (32 bit) 32 under Java Runtime v.8 update 91 (build 1.8.0_91-b15). One of the figures was done with Microsoft Excel.

3 Results

3.1 Number of Publications

First, an update of the number of publications in the field is presented. From the 90's on, when the term emotion regulation was popularized, an increasing number of articles are published yearly. While in the last years more than 1000 articles come out, previously to 2013 no year reached this threshold. In order to see that this growth is not a mere effect of the general increase of scientific publications [13], 3 other constructs that are convergent to emotion regulation, such as emotional intelligence, emotional reactivity and mental control were also included in the chart (Fig. 1).

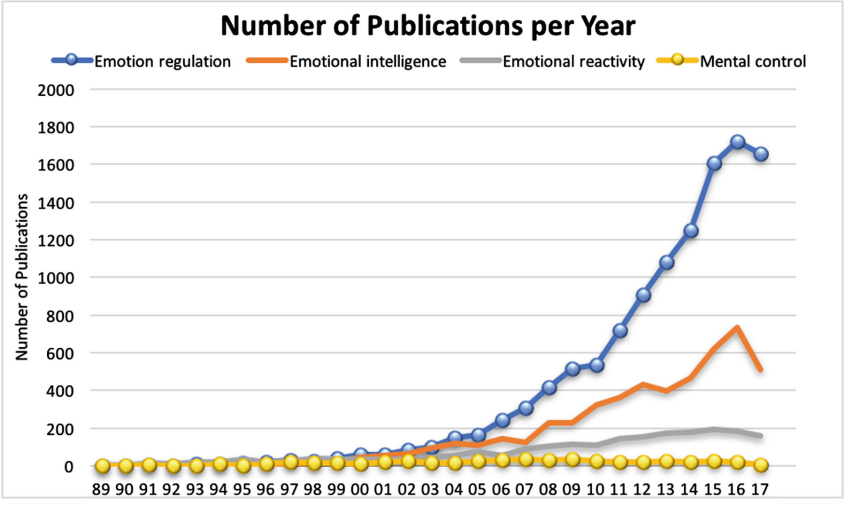

Fig. 1. Number of publications per year for Emotion regulation, emotional intelligence, emotional reactivity and mental control.

3.2 Country

In line with the predominance of the scientific production of the United States in many disciplines [14], the field of emotion regulation is not the exception to the rule. The total number of citations from the United States (5896) is more than the sum of the rest first 9 countries with most citation counts (4707).

Besides, as depicted in Table 1 and Fig. 2, almost all the citation counts belong to western countries. China is the only eastern country that appears among the first 10 and taking into consideration aggregated citations of the first 10 countries, it represents 4.01% of the total amount of citation counts.

Table 1. Citations for countries.

Heading level	Country
5896	United States
1082	Germany
703	Canada
595	England
548	Australia
511	The Netherlands
426	China
300	Spain
291	Italy
251	Switzerland

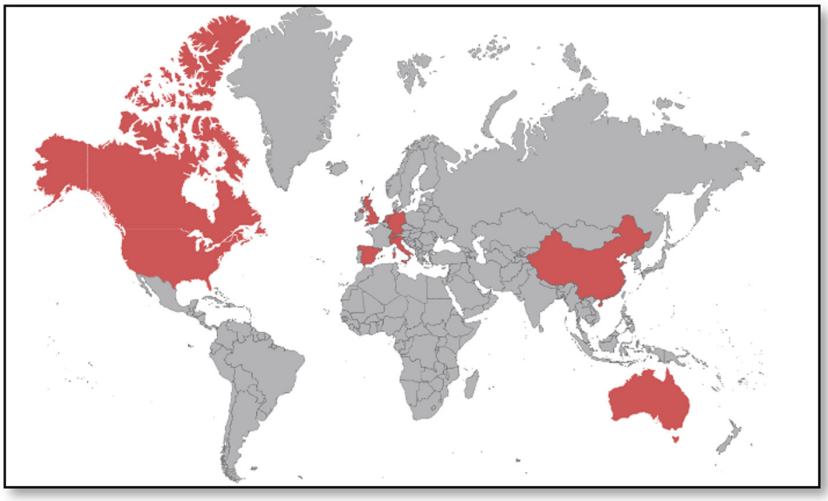

Fig. 2. Countries with more citations.

Figure 3 shows a highly centralized disposition as a whole since it is structured around a main focal point. United States constitutes undoubtedly the most important authority since it has clearly a central position, or in other words, shows higher degrees of connection. Additionally, it displays a bigger relative size in comparison to the rest of the countries. This centrality may also suggest that USA is cited by all countries, whereas other authorities, such as Germany, are mostly cited by a restricted community of countries.

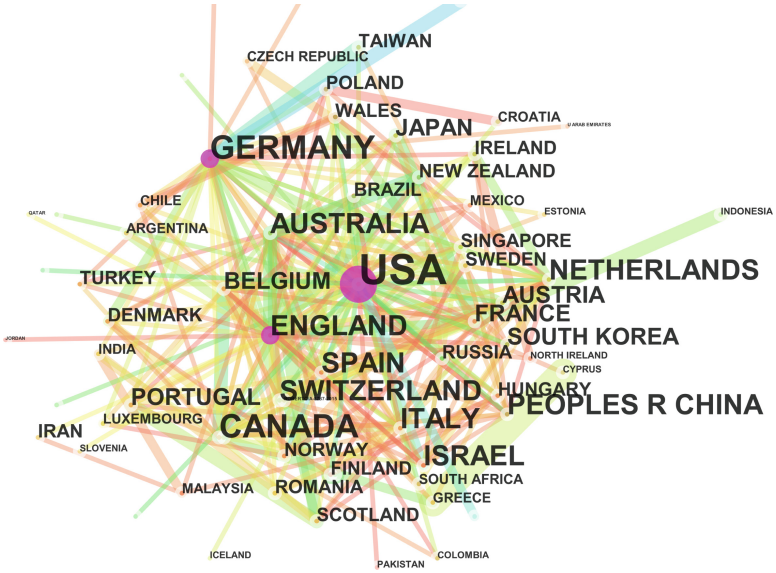

Fig. 3. Network of countries. It indicates the countries with more citations.

3.3 Institutions

In the same vein, United States shows a clear predominance regarding the most influential universities in terms of citation counts. Stanford University is the university with the highest number of citations, followed by University of Pittsburgh, Yale University and Harvard University, respectively. As Fig. 4 depicts, there are very few non-American universities placed in a central position (Table 2).

Table 2. Citation counts for institution.

Citation counts	Institution
284	Stanford University
208	University of Pittsburgh
190	Yale University
174	Harvard University
147	University of California Los Angeles
142	University of Illinois
141	Penn State University
141	University of Michigan
134	University of North Carolina
125	University of Toronto

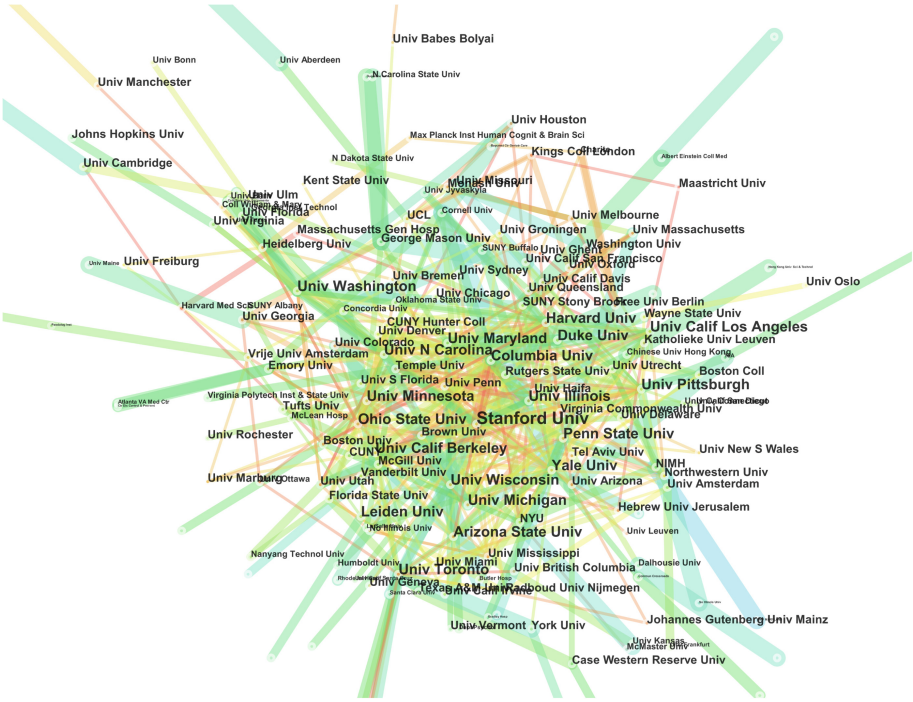

Fig. 4. Network of institutions.

3.4 Authors

The principal researcher in the topic in terms of citations is James Gross with 196 citation counts, followed by Kim Gratz and Matthew Tull with 65 and 62 citation counts, respectively. As long as 2003 constitutes the year of publication of the first and most used questionnaire of Emotion Regulation, the Emotion Regulation Questionnaire [15], a comparison of the authors up to 2003 and throughout all the years is presented. It is suggested that measuring the construct constitutes the cornerstone in order to study it at an applied level.

Whereas previous to 2003 almost all the authors are related to experimental psychology (Fig. 5), the network comprising all the years, depicts the central role played by more applied branches, particularly Clinical Psychology. Authors like Berking, Gratz, Tull, Hofmann or Joormann only appear in the last years. Moreover, the comparison of the two networks allows establishing the growing role of Gross as the main authority in the ER community (Fig. 6).

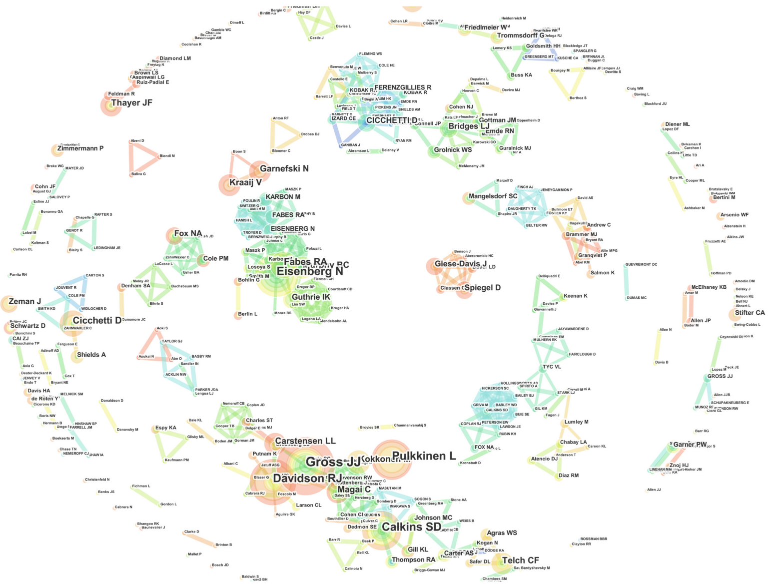

Fig. 5. Authors up to 2003.

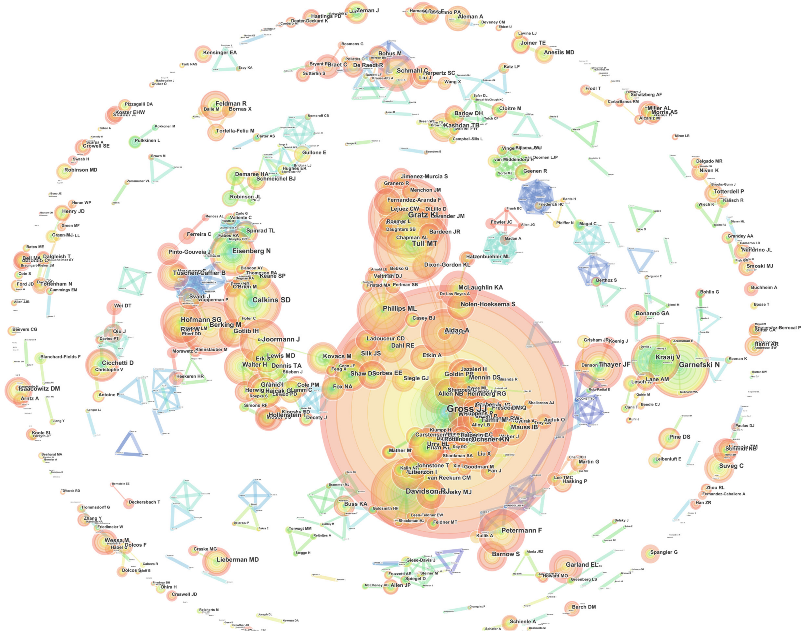

Fig. 6. Authors all years.

3.5 Categories

Psychology constitutes the truncal field within ER research with 7524 citation counts. However, psychiatry, neuroscience and neurology also have a predominant place. Interest in medical, educational and technological domains is also identifiable (Table 3).

Table 3. Citation counts for fields.

Citation counts	Field[a]
7524	Psychology
2691	Psychiatry
2426	Neurosciences & Neurology
2011	Neurosciences
591	Clinical Neurology
503	Behavioral sciences
361	Family studies
344	Physiology
292	Education and Educational research
271	Science & Technology

[a]The fields may be overlapped (e.g. Neurosciences & Psychiatry and Neurosciences), but they are maintained as long as these are the categories yielded by Web of Science.

3.6 Journals

Finally, regarding the journals, it is not possible to identify particular authorities in the specific field of ER. However, it is worth mentioning that the articles within the research domain are being published in the top ranked journals (Table 4).

Table 4. Citation counts, impact factor and quartile for journals.

Citation counts	Journals	Impact factor[b]	Quartile
6025	J. Pers Soc Psychol	5.017	Q1
4676	Psychol Bull	16.79	Q1
3581	J Abnormal Psychol	4.13	Q1
3502	Emotion	3.25	Q1
3363	J Consulting Clin Psychol	4.59	Q1
3294	Biol Psych	11.41	Q1
3214	Am J Psych	14.17	Q1
3194	Child Development	4.19	Q1
3144	Clin Psychol Rev	8.89	Q1
3065	Beh Res Ther	4.06	Q1

[b]Journal of Citation Report 2016

4 Discussion

Emotion Regulation shows to be a topic of great interest in the psychological realm. Although previous studies already described the exponential growth of publications in ER (e.g. [8]), two additional features can be identified within this new data. First, this exponential growth is maintained given that in the last 3 years the tendency of exponential growth continues. Furthermore, to our knowledge, this is the first data extracted from the Web Science Core Collection, which differently from Google Scholar does not include gray literature or other less exhaustively peer-reviewed evidence. Finally, another indicator of the proliferation of emotion regulation, not particularly in terms of quantity but of quality, is regarding the top ranked institutions and high impact factor journals in which the articles on the topic are published.

The fact that the total number of citations among the most productive countries are conducted in western countries, with a predominance of USA, Germany, England, Canada, The Netherlands and Australia is essential to grasp the bias that could be present in the scientific production within the ER field. Given the fact that emotion regulation has shown to be a highly culturally modulated construct, this is something important to be taken into account when generalizing the available results. Nevertheless, this predominance of USA and northern European countries is not specific of the field of emotion regulation, but of the scientific production in general [16].

In particular, United States has shown to be the most prominent authority, not only as a country but also due to the universities, authors and journals that are most cited. Undoubtedly, in terms of citation counts, James Gross is the main authority within the field. The publication of the first integrated review with an operationalized definition of the construct [1] constitutes a cornerstone of his contribution on the field. Besides, this author has contributed in a wide range of branches.

The fact that psychology is the central category within ER is rather logical as long as the construct of emotion is historically derived from philosophical studies but first scientifically addressed by the psychological science [17]. However, given that ER has shown to be particularly relevant as a transdiagnostic process in psychological and psychiatric disorders [5], branches like psychiatry, neurology and neuroscience account for an important percentage of the total citation counts.

Many aspects remain to be further studied within the field of ER and a more developed analysis of the current scientometrics may allow elucidating them. An illustrative example is to provide a conceptual distinction within the category *Emotion Regulation*. As long as it constitutes a construct that many researchers are willing to examine, both for real interest and for the attractiveness of studying burning issues, it is rather reasonable to ascertain that despite the initial consensus, the field is experiencing now a conceptual stretching. As a consequence, there is a lack of clarity regarding what does precisely constitute ER and what does not.

In this vein, through the identification of some key turning points (e.g. highly cited papers, new research categories or new research groups studying the construct), it may be possible to understand the evolution of the scientific production of ER as a field and thus to more specifically outline how to address the unexplored domains. Hence, apart from citation counts, other indicators (bursts, sigma or centrality) should be taken into account as well as more complex analysis should be carried out.

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