

Bibliometric trend analysis in a decade of European Orthopaedic literature

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Abstract. *Purpose:* The purpose of this bibliometric study was to summarize European orthopedic literature produced by EFORT memberships between 2009 and 2019 and to identify the 100 most cited articles, analyzing the characteristics that made them so interesting for the orthopedic scientific world. *Method:* A search of the literature was conducted using Clarivate Analytics Web of Science in the subject category “orthopaedics”; then the results were summarized using Web of Science tools. *Results:* A total of 160.375 articles were found: most of these were produced by England. In particular the most prolific institution was the University of London. Analyzing in detail the 100 most cited publications emerged that most of them were review published in journal with high impact factor (Q1). The University of Oxford was the institution with the greatest number of contributions (13%). The most cited topics were osteoarthritis (24%), followed by orthopedic basic science (22%). Bio-materials was the most common topic by ordering the 100 analyzed articles according to “usage count”, a recent indicator of the level of interest in a specific item. *Conclusion:* This bibliometric study can be useful to identify topics of interest for future scientific research and to outline the features that make some publications more interesting than others. (www.actabiomedica.it)

Keywords: Orthopaedics, Bibliometrics, Europe, Most Cited Article, EFFORT, Topic Trend

Background and aim of the work

Bibliometric research is a statistical analysis of publications to measure the scientific output in a specific field in order to highlight medical developments or knowledge gaps and to direct the future scientific research. The amount of orthopedic publications available on the Internet is remarkable and thanks to the new medical and technological achievements their number is gradually increasing. Hence the necessity to make a selection of information.

The number of times an article has been cited is one of the bibliometric parameters used to quantify its scientific impact. Although it is not synonymous with quality, it certainly indicates the level of interest and the influence of an article in a specific field.

Recently, many authors have reviewed the most frequently cited articles in general orthopedics (1–7) and in orthopedic sub-specialties, such as spine surgery (8), oncology (9) wrist surgery (3) hip and knee surgery (10) pediatric surgery (11), and other fields (12).

To our knowledge, no one analyzed general European orthopedic literature. Therefore, the aim of our work was to summarize the orthopedic literature produced by European Federation of National Associations of Orthopedics and Traumatology (EFORT) memberships between 2009 and 2019, to analyze in detail the 100 most cited publications and to identify research topic trend in order to direct future research.

Methods

A search of the literature was conducted using Clarivate Analytics Web of Science to identify all orthopedic publications by EFORT membership Countries from 2009 to 2019.

We conducted the search using the settings “advanced research”, choosing “orthopaedics” as subject.

Firstly, we selected Database (Web of Science Core collection, MEDLINE and SciELO Citation Index) and we have restricted results by language (English) and Timespan (2009–2019).

Secondly, we refined the result by excluding non-EFORT Countries. Countries included in our study were: England, Germany, France, Netherlands, Italy, Denmark, Scotland, Greece, Ireland, Wales, Croatia, Slovenia, Luxemburg, Turkey, Switzerland, Spain, Sweden, Belgium, Austria, Norway, Finland, Poland, Portugal, Czech Republic, North Ireland, Albania,

Bulgaria, Bosnia Herzegovina, Cyprus, Estonia, Hungary, Iceland, Lithuania, Malta, Montenegro, Republic of Kosovo, Republic of North Macedonia, Romania, Serbia, Slovakia, Ukraine. Finally, we excluded the following: document type “retracted publication” and “retraction”, “Russian Authors” and “Russian and Chinese Source Titles”.

Our search was conducted in January 2020 and a total of 160.375 publications matched our inclusion and exclusion criteria.

We summarized all the results using Web of Science tools. Considering all 160.375 articles selected, we analyzed the following results: 1) n° of publications per year 2) n° of publications per Countries/Region 3) most influential universities.

After listing all the results by “times cited”, senior author selected the first 100 most cited articles for their relevance to orthopedic field; these were included in the final list and were reviewed in full (Table 1).

Table 1: List of top 100 cited publications by EFORT memberships

Rank	Top 100 publications	Count	Citation density (cites per year)
(1)	Bijlsma, Johannes W. J.; Berenbaum, Francis; Lafeber, Foris P. J. G. (2011) Osteoarthritis: an update with relevance for clinical practice–LANCET. doi:10.1016/S0140-6736(11)60243-2	843	84,3
(2)	Kanis, J. A.; McCloskey, E. V.; Johansson, H.; Cooper, C.; Rizzoli, R.; Reginster, J. -Y. (2013) European guidance for the diagnosis and management of osteoporosis in postmenopausal women–OSTEOPOROSIS INTERNATIONAL. doi:10.1007/s00198-012-2074-y	719	89,88
(3)	Biddle, Stuart J. H.; Asare, Mavis (2011) Physical activity and mental health in children and adolescents: a review of reviews–BRITISH JOURNAL OF SPORTS MEDICINE. doi:10.1136/bjsports-2011-090185	652	65,2
(4)	Hernlund, E.; Svedbom, A.; Ivergard, M.; Compston, J.; Cooper, C.; Stenmark, J.; McCloskey, E. V.; Jonsson, B.; Kanis, J. A. (2013) Osteoporosis in the European Union: medical management, epidemiology and economic burden–ARCHIVES OF OSTEOPOROSIS. doi:10.1007/s11657-013-0136-1	590	73,75
(5)	Dimitriou, Rozalia; Jones, Elena; McGonagle, Dennis; Giannoudis, Peter V. (2011) Bone regeneration: current concepts and future directions–BMC MEDICINE. doi:10.1186/1741-7015-9-66	576	57,6
(6)	Russell, R. Graham G. (2011) Bisphosphonates: The first 40 years–BONE. doi:10.1016/j.bone.2011.04.022	553	55,3
(7)	Berenbaum, F. (2013) Osteoarthritis as an inflammatory disease (osteoarthritis is not osteoarthrosis!)–OSTEOARTHRITIS AND CARTILAGE. doi:10.1016/j.joca.2012.11.012	550	68,75
(8)	Blagojevic, M.; Jinks, C.; Jeffery, A.; Jordan, K. P. (2010) Risk factors for onset of osteoarthritis of the knee in older adults: a systematic review and meta-analysis–OSTEOARTHRITIS AND CARTILAGE. doi:10.1016/j.joca.2009.08.010	539	49
(9)	Kanis, J. A.; Oden, A.; McCloskey, E. V.; Johansson, H.; Wahl, D. A.; Cooper, C. (2012) A systematic review of hip fracture incidence and probability of fracture worldwide–OSTEOPOROSIS INTERNATIONAL. doi:10.1007/s00198-012-1964-3	492	54,67
(10)	Arendt-Nielsen, Lars; Nie, Hongling; Laursen, Mogens B.; Laursen, Birgitte S.; Madeleine, Pascal; Simonsen, Ole H.; Graven-Nielsen, Thomas (2010) Sensitization in patients with painful knee osteoarthritis–PAIN. doi:10.1016/j.pain.2010.04.003	489	44,45

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(11)	Langton, D. J.; Jameson, S. S.; Joyce, T. J.; Hallab, N. J.; Natu, S.; Nargol, A. V. F. (2010) Early failure of metal-on-metal bearings in hip resurfacing and large-diameter total hip replacement A CONSEQUENCE OF EXCESS WEAR–JOURNAL OF BONE AND JOINT SURGERY-BRITISH VOLUME. doi:10.1302/0301-620X.92B1.22770	484	44
(12)	Sellam, Jeremie; Berenbaum, Francis (2010) The role of synovitis in pathophysiology and clinical symptoms of osteoarthritis–NATURE REVIEWS RHEUMATOLOGY. doi:10.1038/nrrheum.2010.159	473	43
(13)	Amary, M. Fernanda; Bacsí, Krisztian; Maggiani, Francesca; Damato, Stephen; Halai, Dina; Berisha, Fitim; Pollock, Robin; O'Donnell, Paul; Grigoriadis, Anita; Diss, Tim; Eskandarpour, Malihe; Presneau, Nadege; Hogen-doorn, Pancras C. W.; Futreal, Andrew; Tirabosco, Roberto; Flanagan, Adrienne M. (2011) IDH1 and IDH2 mutations are frequent events in central chondrosarcoma and central and periosteal chondromas but not in other mesenchymal tumours–JOURNAL OF PATHOLOGY. doi:10.1002/path.2913	472	47,2
(14)	Klazen, Caroline A. H.; Lohle, Paul N. M.; de Vries, Jolanda; Jansen, Frits H.; Tielbeek, Alexander V.; Blonk, Marion C.; Venmans, Alexander; van Rooij, Willem Jan J.; Schoemaker, Marinus C.; Juttmann, Job R.; Lo, Tjoen H.; Verhaar, Harald J. J.; van der Graaf, Yolanda; van Everdingen, Kaspar J.; Muller, Alex F.; Elgersma, Otto E. H.; Halkema, Dirk R.; Fransen, Hendrik; Janssens, Xavier; Buskens, Erik; Mali, Willem P. Th M. (2010) Vertebroplasty versus conservative treatment in acute osteoporotic vertebral compression fractures (Vertos II): an open-label randomised trial–LANCET. doi:10.1016/S0140-6736(10)60954-3	456	41,45
(15)	Rudwaleit, M.; Jurik, A. G.; Hermann, K-G A.; Landewe, R.; van der Heijde, D.; Baraliakos, X.; Marzo-Ortega, H.; Ostergaard, M.; Braun, J.; Sieper, J. (2009) Defining active sacroiliitis on magnetic resonance imaging (MRI) for classification of axial spondyloarthritis: a consensual approach by the ASAS/OMERACT MRI group–ANNALS OF THE RHEUMATIC DISEASES. doi:10.1136/ard.2009.110767	453	37,75
(16)	Ekstrand, J.; Hagglund, M.; Walden, M. (2011) Injury incidence and injury patterns in professional football: the UEFA injury study–BRITISH JOURNAL OF SPORTS MEDICINE. doi:10.1136/bjism.2009.060582	451	45,1
(17)	Glyn-Jones, S.; Palmer, A. J. R.; Agricola, R.; Price, A. J.; Vincent, T. L.; Weinans, H.; Carr, A. J. (2015) Osteoarthritis–LANCET. doi:10.1016/S0140-6736(14)60802-3	450	75
(18)	Ginsberg, Jeffrey S.; Davidson, Bruce L.; Comp, Philip C.; Francis, Charles W.; Friedman, Richard J.; Hue, Michael H.; Lieberman, Jay R.; Muntz, James E.; Raskob, Gary E.; Clements, Mary L.; Hentel, Stefan; Schnee, Janet M.; Caprini, Joseph A. (2009) Oral Thrombin Inhibitor Dabigatran Etxilate vs North American Enoxaparin Regimen for Prevention of Venous Thromboembolism After Knee Arthroplasty Surgery–JOURNAL OF ARTHROPLASTY. doi:10.1016/j.arth.2008.01.132	449	37,42
(19)	Fernandes, Linda; Hagen, Kare B.; Bijlsma, Johannes W. J.; Andreassen, Oyvor; Christensen, Pia; Conaghan, Philip G.; Doherty, Michael; Geenen, Rinie; Hammond, Alison; Kjekken, Ingvild; Lohmander, L. Stefan; Lund, Hans; Mallen, Christian D.; Nava, Tiziana; Oliver, Susan; Pavelka, Karel; Pitsillidou, Irene; da Silva, Jose Antonio; de la Torre, Jenny; Zanolli, Gustavo; Vlieland, Theodora P. M. Vliet (2013) EULAR recommendations for the non-pharmacological core management of hip and knee osteoarthritis–ANNALS OF THE RHEUMATIC DISEASES. doi:10.1136/annrheumdis-2012-202745	444	55,5
(20)	de Vos, Robert J.; Weir, Adam; van Schie, Hans T. M.; Bierma-Zeinstra, Sita M. A.; Verhaar, Jan A. N.; Weinans, Harrie; Tol, Johannes L. (2010) Platelet-Rich Plasma Injection for Chronic Achilles Tendinopathy A Randomized Controlled Trial–JAMA–JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION. doi:10.1001/jama.2009.1986	435	39,55
(21)	Oiestad, Britt Elin; Engebretsen, Lars; Storheim, Kjersti; Risberg, May Arna (2009) Knee Osteoarthritis After Anterior Cruciate Ligament Injury A Systematic Review–AMERICAN JOURNAL OF SPORTS MEDICINE. doi:10.1177/0363546509338827	428	35,67
(22)	Schilcher, Jorg; Michaelsson, Karl; Aspenberg, Per (2011) Bisphosphonate Use and Atypical Fractures of the Femoral Shaft–NEW ENGLAND JOURNAL OF MEDICINE. doi:10.1056/NEJMoa1010650	407	40,7

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Rank	Top 100 publications	Count	Citation density (cites per year)
(23)	Midwood, Kim; Sacre, Sandra; Piccinini, Anna M.; Inglis, Julia; Trebault, Annette; Chan, Emma; Drexler, Stefan; Sofat, Nidhi; Kashiwagi, Masahide; Orend, Gertraud; Brennan, Fionula; Foxwell, Brian (2009) Tenascin-C is an endogenous activator of Toll-like receptor 4 that is essential for maintaining inflammation in arthritic joint disease–NATURE MEDICINE. doi:10.1038/nm.1987	397	33,08
(24)	Kanis, John A.; Oden, Anders; Johansson, Helena; Borgstrom, Fredrik; Strom, Oskar; McCloskey, Eugene (2009) FRAX (R) and its applications to clinical practice–BONE. doi:10.1016/j.bone.2009.01.373	395	32,92
(25)	Ekstrand, Jan; Hagglund, Martin; Walden, Markus (2011) Epidemiology of Muscle Injuries in Professional Football (Soccer)–AMERICAN JOURNAL OF SPORTS MEDICINE. doi:10.1177/0363546510395879	387	38,7
(26)	Peterson, Lars; Vasiladis, Haris S.; Brittberg, Mats; Lindahl, Anders (2010) Autologous Chondrocyte Implantation A Long-term Follow-up–AMERICAN JOURNAL OF SPORTS MEDICINE. doi:10.1177/0363546509357915	379	34,45
(27)	Ruiz, J. R.; Castro-Pinero, J.; Artero, E. G.; Ortega, F. B.; Sjostrom, M.; Suni, J.; Castillo, M. J. (2009) Predictive validity of health-related fitness in youth: a systematic review–BRITISH JOURNAL OF SPORTS MEDICINE. doi:10.1136/bjsm.2008.056499	379	31,58
(28)	Wo jdasiewicz, Piotr; Poniatowski, Lukasz A.; Szukiewicz, Dariusz (2014) The Role of Inflammatory and Anti-Inflammatory Cytokines in the Pathogenesis of Osteoarthritis–MEDIATORS OF INFLAMMATION. doi:10.1155/2014/561459	360	51,43
(29)	Peerbooms, Joost C.; Sluimer, Jordi; Bruijn, Daniel J.; Gosens, Taco (2010) Positive Effect of an Autologous Platelet Concentrate in Lateral Epicondylitis in a Double-Blind Randomized Controlled Trial Platelet-Rich Plasma Versus Corticosteroid Injection With a 1-Year Follow-up–AMERICAN JOURNAL OF SPORTS MEDICINE. doi:10.1177/0363546509355445	358	32,55
(30)	Claes, Lutz; Recknagel, Stefan; Ignatius, Anita (2012) Fracture healing under healthy and inflammatory conditions–NATURE REVIEWS RHEUMATOLOGY. doi:10.1038/nrrheum.2012.1	356	39,56
(31)	Raspopovic, Stanisa; Capogrosso, Marco; Petrini, Francesco Maria; Bonizzato, Marco; Rigosa, Jacopo; Di Pino, Giovanni; Carpaneto, Jacopo; Controzzi, Marco; Boretius, Tim; Fernandez, Eduardo; Granata, Giuseppe; Oddo, Calogero Maria; Citi, Luca; Ciancio, Anna Lisa; Cipriani, Christian; Carrozza, Maria Chiara; Jensen, Winnie; Guglielmelli, Eugenio; Stieglitz, Thomas; Rossini, Paolo Maria; Micera, Silvestro (2014) Restoring Natural Sensory Feedback in Real-Time Bidirectional Hand Prostheses–SCIENCE TRANSLATIONAL MEDICINE. doi:10.1126/scitranslmed.3006820	355	50,71
(32)	Sihvonen, Raine; Paavola, Mika; Malmivaara, Antti; Itala, Ari; Joukainen, Antti; Nurmi, Heikki; Kalske, Juha; Jarvinen, Teppo L. N. (2013) Arthroscopic Partial Meniscectomy versus Sham Surgery for a Degenerative Meniscal Tear–NEW ENGLAND JOURNAL OF MEDICINE. doi:10.1056/NEJMoa1305189	355	44,38
(33)	Vlaeyen, Johan W. S.; Linton, Steven J. (2012) Fear-avoidance model of chronic musculoskeletal pain: 12 years on–PAIN. doi:10.1016/j.pain.2011.12.009	350	38,89
(34)	Knaepen, Kristel; Goekint, Maaike; Heyman, Elsa Marie; Meeusen, Romain (2010) Neuroplasticity Exercise Induced Response of Peripheral Brain-Derived Neurotrophic Factor A Systematic Review of Experimental Studies in Human Subjects–SPORTS MEDICINE. doi:10.2165/11534530-000000000-00000	349	31,73
(35)	Scott, C. E. H.; Howie, C. R.; MacDonald, D.; Biant, L. C. (2010) Predicting dissatisfaction following total knee replacement A PROSPECTIVE STUDY OF 1217 PATIENTS–JOURNAL OF BONE AND JOINT SURGERY BRITISH VOLUME. doi:10.1302/0301-620X.92B9.24394	345	31,36
(36)	Frobell, Richard B.; Roos, Ewa M.; Roos, Harald P.; Ranstam, Jonas; Lohmander, L. Stefan (2010) A Randomized Trial of Treatment for Acute Anterior Cruciate Ligament Tears–NEW ENGLAND JOURNAL OF MEDICINE. doi:10.1056/NEJMoa0907797	341	31
(37)	van Middelkoop, Marienke; Rubinstein, Sidney M.; Kuijpers, Ton; Verhagen, Arianne P.; Ostelo, Raymond; Koes, Bart W.; van Tulder, Maurits W. (2011) A systematic review on the effectiveness of physical and rehabilitation interventions for chronic non-specific low back pain–EUROPEAN SPINE JOURNAL. doi:10.1007/s00586-010-1518-3	340	34

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Rank	Top 100 publications	Count	Citation density (cites per year)
(38)	Mann, Christopher J.; Perdiguero, Eusebio; Kharraz, Yacine; Aguilar, Susana; Pessina, Patrizia; Serrano, Antonio L.; Munoz-Canoves, Pura (2011) Aberrant repair and fibrosis development in skeletal muscle–SKELETAL MUSCLE. doi:10.1186/2044-5040-1-21	339	33,9
(39)	Gonzalez, Manuel A.; Gonzalez-Rey, Elena; Rico, Laura; Buescher, Dirk; Delgado, Mario (2009) Treatment of Experimental Arthritis by Inducing Immune Tolerance With Human Adipose-Derived Mesenchymal Stem Cells–ARTHRITIS AND RHEUMATISM. doi:10.1002/art.24405	331	27,58
(40)	Smith, Alison J.; Dieppe, Paul; Vernon, Kelly; Porter, Martyn; Blom, Ashley W. (2012) Failure rates of stemmed metal-on-metal hip replacements: analysis of data from the National Joint Registry of England and Wales–LANCET. doi:10.1016/S0140-6736(12)60353-5	318	35,33
(41)	Consolaro, Alessandro; Ruperto, Nicolino; Bazso, Anna; Pistorio, Angela; Magni-Manzoni, Silvia; Filocamo, Giovanni; Malattia, Clara; Viola, Stefania; Martini, Alberto; Ravelli, Angelo (2009) Development and Validation of a Composite Disease Activity Score for Juvenile Idiopathic Arthritis–ARTHRITIS RHEUMATISM CARE RESEARCH. doi:10.1002/art.24516	315	26,25
(42)	Dimitriou, Rozalia; Mataliotakis, George I.; Angoules, Antonios G.; Kanakaris, Nikolaos K.; Giannoudis, Peter V. (2011) Complications following autologous bone graft harvesting from the iliac crest and using the RIA: A systematic review–INJURY-INTERNATIONAL JOURNAL OF THE CARE OF THE INJURED. doi:10.1016/j.injury.2011.06.015	313	31,3
(43)	Priemel, Matthias; von Domarus, Christoph; Klatte, Till Orla; Kessler, Steffen; Schlie, Julia; Meier, Simon; Proksch, Nils; Pastor, Frederic; Netter, Clemens; Streichert, Thomas; Pueschel, Klaus; Amling, Michael (2010) Bone Mineralization Defects and Vitamin D Deficiency: Histomorphometric Analysis of Iliac Crest Bone Biopsies and Circulating 25-Hydroxyvitamin D in 675 Patients–JOURNAL OF BONE AND MINERAL RESEARCH. doi:10.1359/jbmr.090728	313	28,45
(44)	Pedersen, Bente K. (2009) The disease of physical inactivity and the role of myokines in muscle-fat cross talk–JOURNAL OF PHYSIOLOGY-LONDON. doi:10.1113/jphysiol.2009.179515	313	26,08
(45)	Litwic, Anna; Edwards, Mark H.; Dennison, Elaine M.; Cooper, Cyrus (2013) Epidemiology and burden of osteoarthritis–BRITISH MEDICAL BULLETIN. doi:10.1093/bmb/lds038	312	39
(46)	Nueesch, Eveline; Dieppe, Paul; Reichenbach, Stephan; Williams, Susan; Iff, Samuel; Jueni, Peter (2011) All cause and disease specific mortality in patients with knee or hip osteoarthritis: population based cohort study–BMJ BRITISH MEDICAL JOURNAL. doi:10.1136/bmj.d1165	311	31,1
(47)	Saris, Daniel B. F.; Vanlauwe, Johan; Victor, Jan; Almqvist, Karl Fredrik; Verdonk, Rene; Bellemans, Johan; Luyten, Frank P. (2009) Treatment of Symptomatic Cartilage Defects of the Knee: Characterized Chondrocyte Implantation Results in Better Clinical Outcome at 36 Months in a Randomized Trial Compared to Microfracture–AMERICAN JOURNAL OF SPORTS MEDICINE. doi:10.1177/0363546509350694	306	25,5
(48)	Narici, Marco V.; Maffulli, Nicola (2010) Sarcopenia: characteristics, mechanisms and functional significance– BRITISH MEDICAL BULLETIN. doi:10.1093/bmb/ldq008	305	27,73
(49)	Alsousou, J.; Thompson, M.; Hulley, P.; Noble, A.; Willett, K. (2009) The biology of platelet-rich plasma and its application in trauma and orthopaedic surgery A REVIEW OF THE LITERATURE–JOURNAL OF BONE AND JOINT SURGERY-BRITISH VOLUME. doi:10.1302/0301-620X.91B8.22546	305	25,42
(50)	van Poppel, Mireille N. M.; Chinapaw, Mai J. M.; Mokkink, Lidwine B.; van Mechelen, Willem; Terwee, Caroline B. (2010) Physical Activity Questionnaires for Adults A Systematic Review of Measurement Properties–SPORTS MEDICINE. doi:10.2165/11531930-000000000-00000	301	27,36
(51)	Redlich, Kurt; Smolen, Josef S. (2012) Inflammatory bone loss: pathogenesis and therapeutic intervention– NATURE REVIEWS DRUG DISCOVERY. doi:10.1038/nrd3669	300	33,33
(52)	Pereira, D.; Peleteiro, B.; Araujo, J.; Branco, J.; Santos, R. A.; Ramos, E. (2011) The effect of osteoarthritis definition on prevalence and incidence estimates: a systematic review–OSTEOARTHRITIS AND CARTILAGE. doi:10.1016/j.joca.2011.08.009	299	29,9

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(53)	Sieber, Christina; Kopf, Jessica; Hiepen, Christian; Knaus, Petra (2009) Recent advances in BMP receptor signaling–CYTOKINE GROWTH FACTOR REVIEWS. doi:10.1016/j.cytogfr.2009.10.007	297	24,75
(54)	Kraus, Tanja; Fischerauer, Stefan F.; Haenzi, Anja C.; Uggowitz, Peter J.; Loeffler, Joerg F.; Weinberg, Annelie M. (2012) Magnesium alloys for temporary implants in osteosynthesis: In vivo studies of their degradation and interaction with bone–ACTA BIOMATERIALIA. doi:10.1016/j.actbio.2011.11.008	290	32,22
(55)	Faude, Oliver; Kindermann, Wilfried; Meyer, Tim (2009) Lactate Threshold Concepts How Valid are They?–SPORTS MEDICINE. doi:10.2165/00007256-200939060-00003	288	24
(56)	Suedkamp, N.; Bayer, J.; Hepp, P.; Voigt, C.; Oestern, H.; Kaeae, M.; Luo, C.; Plecko, M.; Wendt, K.; Koestler, W.; Konrad, G. (2009) Open Reduction and Internal Fixation of Proximal Humeral Fractures with Use of the Locking Proximal Humerus Plate Results of a Prospective, Multicenter, Observational Study–JOURNAL OF BONE AND JOINT SURGERY-AMERICAN VOLUME. doi:10.2106/JBJS.H.00006	285	23,75
(57)	Rutjes, Anne W. S.; Jueni, Peter; da Costa, Bruno R.; Trelle, Sven; Nuesch, Eveline; Reichenbach, Stephan (2012) Viscosupplementation for Osteoarthritis of the Knee A Systematic Review and Meta-analysis–ANNALS OF INTERNAL MEDICINE. doi:10.7326/0003-4819-157-3-201208070-00473	283	31,44
(58)	Spahn, Donat R. (2010) Anemia and Patient Blood Management in Hip and Knee Surgery A Systematic Review of the Literature–ANESTHESIOLOGY. doi:10.1097/ALN.0b013e3181e08e97	283	25,73
(59)	van der Kraan, P. M.; van den Berg, W. B. (2012) Chondrocyte hypertrophy and osteoarthritis: role in initiation and progression of cartilage degeneration?–OSTEOARTHRITIS AND CARTILAGE. doi:10.1016/j.joca.2011.12.003	278	30,89
(60)	Ginebra, Maria-Pau; Canal, Cristina; Espanol, Montserrat; Pastorino, David; Montufar, Edgar B. (2012) Calcium phosphate cements as drug delivery materials–ADVANCED DRUG DELIVERY REVIEWS. doi:10.1016/j.addr.2012.01.008	273	30,33
(61)	Pfeifer, M.; Begerow, B.; Minne, H. W.; Suppan, K.; Fahrleitner-Pammer, A.; Dobnig, H. (2009) Effects of a long term vitamin D and calcium supplementation on falls and parameters of muscle function in community-dwelling older individuals–OSTEOPOROSIS INTERNATIONAL. doi:10.1007/s00198-008-0662-7	273	22,75
(62)	Freemont, A. J. (2009) The cellular pathobiology of the degenerate intervertebral disc and discogenic back pain–RHEUMATOLOGY. doi:10.1093/rheumatology/ken396	273	22,75
(63)	Vinatier, Claire; Mrugala, Dorninique; Jorgensen, Christian; Guicheux, Jerome; Noel, Daniele (2009) Cartilage engineering: a crucial combination of cells, biomaterials and biofactors–TRENDS IN BIOTECHNOLOGY. doi:10.1016/j.tibtech.2009.02.005	272	22,67
(64)	Wandel, Simon; Jueni, Peter; Tendal, Britta; Nuesch, Eveline; Villiger, Peter M.; Welton, Nicky J.; Reichenbach, Stephan; Trelle, Sven (2010) Effects of glucosamine, chondroitin, or placebo in patients with osteoarthritis of hip or knee: network meta-analysis–BMJ-BRITISH MEDICAL JOURNAL. doi:10.1136/bmj.c4675	268	24,36
(65)	Masquelet, Alain C.; Begue, Thierry (2010) The Concept of Induced Membrane for Reconstruction of Long Bone Defects–ORTHOPEDIC CLINICS OF NORTH AMERICA. doi:10.1016/j.ocl.2009.07.011	268	24,36
(66)	Langton, D. J.; Jameson, S. S.; Joyce, T. J.; Gandhi, J. N.; Sidaginamale, R.; Mereddy, P.; Lord, J.; Nargol, A. V. F. (2011) Accelerating failure rate of the ASR total hip replacement–JOURNAL OF BONE AND JOINT SURGERY-BRITISH VOLUME. doi:10.1302/0301-620X.93B8.26040	267	26,7
(67)	Castricini, Roberto; Longo, Umile Giuseppe; De Benedetto, Massimo; Panfoli, Nicola; Pirani, Piergiorgio; Zini, Raul; Maffulli, Nicola; Denaro, Vincenzo (2011) Platelet-Rich Plasma Augmentation for Arthroscopic Rotator Cuff Repair A Randomized Controlled Trial–AMERICAN JOURNAL OF SPORTS MEDICINE. doi:10.1177/0363546510390780	266	26,6
(68)	Harvey, Nicholas; Dennison, Elaine; Cooper, Cyrus (2010) Osteoporosis: impact on health and economics–NATURE REVIEWS RHEUMATOLOGY. doi:10.1038/nrrheum.2009.260	266	24,18
(69)	Lories, Rik J.; Luyten, Frank P. (2011) The bone-cartilage unit in osteoarthritis–NATURE REVIEWS RHEUMATOLOGY. doi:10.1038/nrrheum.2010.197	265	26,5

Table 1: List of top 100 cited publications by EFORT memberships

Rank	Top 100 publications	Count	Citation density (cites per year)
(70)	Campana, V.; Milano, G.; Pagano, E.; Barba, M.; Cicione, C.; Salonna, G.; Lattanzi, W.; Logroscino, G. (2014) Bone substitutes in orthopaedic surgery: from basic science to clinical practice–JOURNAL OF MATERIALS SCIENCE-MATERIALS IN MEDICINE. doi:10.1007/s10856-014-5240-2	264	37,71
(71)	Behjati, Sam; Tarpey, Patrick S.; Presneau, Nadege; Scheipl, Susanne; Pillay, Nischalan; Van Loo, Peter; Wedge, David C.; Cooke, Susanna L.; Gundem, Gunes; Davies, Helen; Nik-Zainal, Serena; Martin, Sancha; McLaren, Stuart; Goodie, Victoria; Robinson, Ben; Butler, Adam; Teague, Jon W.; Halai, Dina; Khatri, Bhavisha; Myklebost, Ola; Baumhoer, Daniel; Jundt, Gernot; Hamoudi, Rifat; Tirabosco, Roberto; Amary, M. Fernanda; Futreal, P. Andrew; Stratton, Michael R.; Campbell, Peter J.; Flanagan, Adrienne M. (2013) Distinct H3F3A and H3F3B driver mutations define chondroblastoma and giant cell tumor of bone–NATURE GENETICS. doi:10.1038/ng.2814	264	33
(72)	Kon, Elizaveta; Buda, Roberto; Filardo, Giuseppe; Di Martino, Alessandro; Timoncini, Antonio; Cenacchi, Annarita; Fornasari, Pier Maria; Giannini, Sandro; Marcacci, Maurizio (2010) Platelet-rich plasma: intra-articular knee injections produced favorable results on degenerative cartilage lesions–KNEE SURGERY SPORTS TRAUMATOLOGY ARTHROSCOPY. doi:10.1007/s00167-009-0940-8	264	24
(73)	Stolz, Martin; Gottardi, Riccardo; Raiteri, Roberto; Miot, Sylvie; Martin, Ivan; Imer, Raphael; Staufer, Urs; Raducanu, Aurelia; Dueggelin, Marcel; Baschong, Werner; Daniels, A. U.; Friederich, Niklaus F.; Aszodi, Attila; Aebi, Ueli (2009) Early detection of aging cartilage and osteoarthritis in mice and patient samples using atomic force microscopy–NATURE NANOTECHNOLOGY. doi:10.1038/NNANO.2008.410	260	21,67
(74)	Bellemans, Johan; Colyn, William; Vandenuecker, Hilde; Victor, Jan (2012) The Chitranjan Ranawat Award: Is Neutral Mechanical Alignment Normal for All Patients?: The Concept of Constitutional Varus–CLINICAL ORTHOPAEDICS AND RELATED RESEARCH. doi:10.1007/s11999-011-1936-5	259	28,78
(75)	Koga, Hideyuki; Nakamae, Atsuo; Shima, Yosuke; Iwasa, Junji; Myklebust, Grethe; Engebretsen, Lars; Bahr, Roald; Krosshaug, Tron (2010) Mechanisms for Noncontact Anterior Cruciate Ligament Injuries Knee Joint Kinematics in 10 Injury Situations From Female Team Handball and Basketball–AMERICAN JOURNAL OF SPORTS MEDICINE. doi:10.1177/0363546510373570	259	23,55
(76)	Zhang, Jingtao; Liu, Weizhen; Schnitzler, Verena; Tancret, Franck; Bouler, Jean-Michel (2014) Calcium phosphate cements for bone substitution: Chemistry, handling and mechanical properties–ACTA BIOMATERIALIA. doi:10.1016/j.actbio.2013.11.001	258	36,86
(77)	Gosens, Taco; Peerbooms, Joost C.; van Laar, Wilbert; den Oudsten, Brenda L. (2011) Ongoing Positive Effect of Platelet-Rich Plasma Versus Corticosteroid Injection in Lateral Epicondylitis A Double-Blind Randomized Controlled Trial With 2-year Follow-up–AMERICAN JOURNAL OF SPORTS MEDICINE. doi:10.1177/0363546510397173	258	25,8
(78)	Farina, Dario; Jiang, Ning; Rehbaum, Hubertus; Holobar, Ales; Graitmann, Bernhard; Dietl, Hans; Aszmann, Oskar C. (2014) The Extraction of Neural Information from the Surface EMG for the Control of Upper-Limb Prostheses: Emerging Avenues and Challenges–IEEE TRANSACTIONS ON NEURAL SYSTEMS AND REHABILITATION ENGINEERING. doi:10.1109/TNSRE.2014.2305111	257	36,71
(79)	Wylde, Vikki; Hewlett, Sarah; Learmonth, Ian D.; Dieppe, Paul (2011) Persistent pain after joint replacement: Prevalence, sensory qualities, and postoperative determinants–PAIN. doi:10.1016/j.pain.2010.11.023	257	25,7
(80)	Abrahamsen, Bo; Eiken, Pia; Eastell, Richard (2009) Subtrochanteric and Diaphyseal Femur Fractures in Patients Treated With Alendronate: A Register-Based National Cohort Study–JOURNAL OF BONE AND MINERAL RESEARCH. doi:10.1359/JBMR.081247	254	21,17
(81)	Zengerink, Maartje; Struijs, Peter A. A.; Tol, Johannes L.; van Dijk, Cornelis Niek (2010) Treatment of osteochondral lesions of the talus: a systematic review–KNEE SURGERY SPORTS TRAUMATOLOGY ARTHROSCOPY. doi:10.1007/s00167-009-0942-6	253	23
(82)	Gouliouris, Theodore; Aliyu, Sani H.; Brown, Nicholas M. (2010) Spondylodiscitis: update on diagnosis and management–JOURNAL OF ANTIMICROBIAL CHEMOTHERAPY. doi:10.1093/jac/dkq303	252	22,91
(83)	Squadrone, R.; Gallozzi, C. (2009) Biomechanical and physiological comparison of barefoot and two shod conditions in experienced barefoot runners–JOURNAL OF SPORTS MEDICINE AND PHYSICAL FITNESS. doi:	252	21

Table 1: List of top 100 cited publications by EFORT memberships

Rank	Top 100 publications	Count	Citation density (cites per year)
(84)	Kannegaard, Pia Nimann; van der Mark, Susanne; Eiken, Pia; Abrahamsen, Bo (2010) Excess mortality in men compared with women following a hip fracture. National analysis of comedications, comorbidity and survival–AGE AND AGEING. doi:10.1093/ageing/afp221	251	22,82
(85)	Langton, D. J.; Joyce, T. J.; Jameson, S. S.; Lord, J.; Van Orsouw, M.; Holland, J. P.; Nargol, A. V. F.; De Smet, K. A. (2011) Adverse reaction to metal debris following hip resurfacing THE INFLUENCE OF COMPONENT TYPE, ORIENTATION AND VOLUMETRIC WEAR–JOURNAL OF BONE AND JOINT SURGERY-BRITISH VOLUME. doi:10.1302/0301-620X.93B2.25099	250	25
(86)	Grammatopoulos, G.; Pandit, H.; Kwon, Y. -M.; Gundle, R.; McLardy-Smith, P.; Beard, D. J.; Murray, D. W.; Gill, H. S. (2009) Hip resurfacings revised for inflammatory pseudotumour have a poor outcome–JOURNAL OF BONE AND JOINT SURGERY-BRITISH VOLUME. doi:10.1302/0301-620X.91B8.22562	250	20,83
(87)	Muzzarelli, Riccardo A. A.; Greco, Francesco; Busilacchi, Alberto; Sollazzo, Vincenzo; Gigante, Antonio (2012) Chitosan, hyaluronan and chondroitin sulfate in tissue engineering for cartilage regeneration: A review– CARBOHYDRATE POLYMERS. doi:10.1016/j.carbpol.2012.04.057	249	27,67
(88)	Nueesch, Eveline; Trelle, Sven; Reichenbach, Stephan; Rutjes, Anne W. S.; Tschannen, Beatrice; Altman, Douglas G.; Egger, Matthias; Jueni, Peter (2010) Small study effects in meta-analyses of osteoarthritis trials: metaepidemiological study–BMJ-BRITISH MEDICAL JOURNAL. doi:10.1136/bmj.c3515	247	22,45
(89)	Gwilym, Stephen E.; Keltner, John R.; Warnaby, Catherine E.; Carr, Andrew J.; Chizh, Boris; Chessell, Iain; Tracey, Irene (2009) Psychophysical and Functional Imaging Evidence Supporting the Presence of Central Sensitization in a Cohort of Osteoarthritis Patients–ARTHRITIS RHEUMATISM CARE RESEARCH. doi:10.1002/art.24837	244	20,33
(90)	Eriksen, Erik Fink (2010) Cellular mechanisms of bone remodeling–REVIEWS IN ENDOCRINE METABOLIC DISORDERS. doi:10.1007/s11154-010-9153-1	242	22
(91)	Troeberg, Linda; Nagase, Hideaki (2012) Proteases involved in cartilage matrix degradation in osteoarthritis– BIOCHIMICA ET BIOPHYSICA ACTA-PROTEINS AND PROTEOMICS. doi:10.1016/j.bbapap.2011.06.020	241	26,78
(92)	Dodds, A. L.; Halewood, C.; Gupte, C. M.; Williams, A.; Amis, A. A. (2014) The anterolateral ligament ANATOMY, LENGTH CHANGES AND ASSOCIATION WITH THE SECOND FRACTURE-BONE JOINT JOURNAL. doi:10.1302/0301620X.96B3.33033	237	33,86
(93)	Svedbom, A.; Hernlund, E.; Ivergard, M.; Compston, J.; Cooper, C.; Stenmark, J.; McCloskey, E. V.; Jonsson, B.; Kanis, J. A. (2013) Osteoporosis in the European Union: a compendium of country-specific reports–ARCHIVES OF OSTEOPOROSIS. doi:10.1007/s11657-013-0137-0	237	29,63
(94)	Labek, G.; Thaler, M.; Janda, W.; Agreiter, M.; Stoeckl, B. (2011) Revision rates after total joint replacement CUMULATIVE RESULTS FROM WORLDWIDE JOINT REGISTER DATASETS–JOURNAL OF BONE AND JOINT SURGERY-BRITISH VOLUME. doi:10.1302/0301-620X.93B3.25467	235	23,5
(95)	Jansen, Esa; Huhtala, Heini; Puolakka, Timo; Moilanen, Teemu (2009) Risk Factors for Infection After Knee Arthroplasty A Register-Based Analysis of 43,149 Cases–JOURNAL OF BONE AND JOINT SURGERYAMERICAN VOLUME. doi:10.2106/JBJS.G.01686	233	19,42
(96)	Gelalis, Ioannis D.; Paschos, Nikolaos K.; Pakos, Emiliios E.; Politis, Angelos N.; Arnaoutoglou, Christina M.; Karageorgos, Athanasios C.; Ploumis, Avraam; Xenakis, Theodoros A. (2012) Accuracy of pedicle screw placement: a systematic review of prospective in vivo studies comparing free hand, fluoroscopy guidance and navigation techniques–EUROPEAN SPINE JOURNAL. doi:10.1007/s00586-011-2011-3	228	25,33
(97)	Basad, Erhan; Ishaque, Bernd; Bachmann, Georg; Stuerz, Henning; Steinmeyer, Juergen (2010) Matrix-induced autologous chondrocyte implantation versus microfracture in the treatment of cartilage defects of the knee: a 2-year randomised study–KNEE SURGERY SPORTS TRAUMATOLOGY ARTHROSCOPY. doi:10.1007/s00167-009-1028-1	228	20,73

Table 1: List of top 100 cited publications by EFORT memberships

Rank	Top 100 publications	Count	Citation density (cites per year)
(98)	Jones, S. W.; Watkins, G.; Le Good, N.; Roberts, S.; Murphy, C. L.; Brockbank, S. M. V.; Needham, M. R. C.; Read, S. J.; Newham, P. (2009) The identification of differentially expressed microRNA in osteoarthritic tissue that modulate the production of TNF-alpha and MMP13-OSTEOARTHRITIS AND CARTILAGE. doi:10.1016/j.joca.2008.09.012	228	19
(99)	Hailer, Nils P.; Garellick, Goran; Karrholm, Johan (2010) Uncemented and cemented primary total hip arthroplasty in the Swedish Hip Arthroplasty Register Evaluation of 170,413 operations-ACTA ORTHOPAEDICA. doi:10.3109/17453671003685400	227	20,64
(100)	Padulo, Johnny; Oliva, Francesco; Frizziero, Antonio; Maffulli, Nicola (2016) Muscles, Ligaments and Tendons Journal Basic principles and recommendations in clinical and field Science Research: 2016 Update-MLTJ- MUSCLES LIGAMENTS AND TENDONS JOURNAL. doi:10.11138/mltj/2016.6.1.001	226	45,2

Results

A macroscopic analysis of the 160 thousand publications led us to outline three vectors of interest: the number of publications per year, the number of publications per Countries/Region, the most influential universities. In the analyzed timespan, i.e. 2009–2019, the annual average of the published articles remained constant with about 19 thousand publications, with the exception of 2019 with 14 thousand publications. However, this search performed in January 2020, may not count other publications in press. Therefore, this data is not statistically significant. England produced a greater number of publications than other states, 30 thousand of publications(t.p.), with a gap of a quarter compared to Italy, which was the second country for number of publications with 22 thousand of publications. In this ranking, the third country was Germany with 21 thousand of publications, with a little quantitative difference compared to Italy. France and Holland, respectively in fourth and fifth place in terms of scientific productivity, with 16 and 15 t.p. respectively, distanced themselves from the second and third states, with around a quarter of publications less. Below the remaining states: Turkey 12 t.p.; Spain 11 t.p.; UK 10 t.p.; Switzerland 9 t.p.; Sweden 8 t.p.; Belgium and Denmark 6 t.p.; Austria 5 t.p.; Norway, Greece, Scotland, Poland and Finland just below 5 t.p. sorted descending; Ireland and Portugal 3 t.p.; Wales, Czech Republic, Romania, Hungary and Croatia under 2 t.p..

The University of London was the most prolific institution having 5913 publications (p.), followed by Assistance Publique Hopitaux Paris APHP, with 5134 p.. Institute National De La Sante Et de La Recherche Medicale Inserm as third with 4556 p.. Following University College London 3240 p., University of Copenhagen 2831 p., Karolinska Institutet 2690 p., University of Oxford 2556 p., Leiden University 2496 p., Vrije Universiteit Amsterdam 2425 p., Erasmus University Rotterdam 2341 p., Utrecht University 2380 p., University of Amsterdam 2298 p., Erasmus MC 2285 p., Humboldt University of Berlin 2122 p., Charite Medical University of Berlin 2083 p., Radboud University Nijmegen 2226 p., Academic Medical Center Amsterdam 2002 p., Leiden University 1943 p., Sorbonne Universite 1936 p., Free University of Berlin 2132 p., University of Oslo 1953 p. and Lund University 1927 p. In Italy, the University of Milan had the highest number of publications (2101), followed by Sapienza University Rome (2074).

We manually reviewed the 100 top-cited publications studying the title, the abstract and finally the full text. The following items were extracted and analyzed: average citation per year, publication type, sample size, countries, organization, publishing journal and Impact Factor.

The average citations per item was 336.77 and the average citations per year was 34,17, calculated using Web of Science tools.

Among the 100 top-cited articles, there were 55 review, 26 observational study (of which 9 retrospec-

tive studies, 10 prospective studies, 5 cross-sectional studies and 2 descriptive studies), 11 clinical trial and 6 preclinical experimental study.

The size of the population sample was extremely variable: the lower limit was represented by a cohort of 54 subjects, while the upper limit was characterized by entire national registers, as the Danish registry of hip fracture (more than 41000 patients), or the Finnish arthroplasty registry (a total of 43149 subjects), or the Swedish hip arthroplasty registry (with 170413 surgical interventions).

The largest number of publications, among the 100 top-cited, were produced by England with 39 p., which appears to have 3/5 more publications than Netherlands (16p.). and Switzerland (14p.), respectively in second and third place. Following were ranked Italy that produced 12p., Germany and Sweden with 11p., Belgium with 9p., Denmark and France with 8p., Austria with 6p., Norway and Spain with 5p., Finland with 3p., Portugal with 2p., Croatia, Czech Republic, Greece, Poland, Scotland and Slovenia with only 1p. each one.

The institution with the highest number of contributions was the University of Oxford, with 13 p., followed by the University of Sheffield with 7 p.. Other two English universities were in third and fourth place, the University of London and the University of Southampton, with 6 p. each. In fifth place we found the first non-English university, the Utrecht University, still with 6 p.. Following other institutes: Ku Leuven, University of Copenhagen, Utrecht University Medical Center, World Health Organization (5p.); Addenbrooke S Hospital, Assistance Publique Hopitaux Paris Aphp, Imperial College London, Nuffield Orthopaedic Centre, University of Bern, University of Cambridge, University of Leeds (4 p.); Elisabeth Tweesteden Ziekenhuis Etz, Erasmus MC, Erasmus University Rotterdam, Gentoft Hospital, Hopital Universitaire Saint Antoine Aphp, Institut National De La Sante Et De La Recherche Medicale Inserm, International Osteoporosis Foundation Switzerland, Leiden University, Linkoping University (1 p.).

The journal with the greatest number of most cited publications was the American Journal of Sports Medicine, with 8 p., followed by the Journal of Bone and Joint Surgery British Volume, with 7 p.. Osteoarthritis and Cartilage produced 5 p.; Lancet and Nature

Reviews Rheumatology with 4 p.; Bmj British Medical Journal, British Journal Of Sports Medicine, Knee Surgery Sports Traumatology Arthroscopy, New England Journal Of Medicine, Osteoporosis International, Pain, Sports Medicine with 3 p.; Acta Biomaterialia, Annals Of The Rheumatic Diseases, Archives Of Osteoporosis, Arthritis Rheumatism Arthritis Care Research, Bone, British Medical Bulletin, European Spine Journal, Journal Of Bone And Joint Surgery American Volume, Journal Of Bone And Mineral Research with 2 p.; Acta Orthopaedica, Advanced Drug Delivery Reviews, Age And Ageing, Anesthesiology with only 1 p. each one.

A statistical analysis showed that 85% of the publishing journals were in the first quartile (Q1) of the Quartile Score based on Impact Factor. The 10% were in Q2, the 4% were in Q3 and only the 1% were ranked in Q4.

Analyzing in detail the 100 top-cited articles, 16 macro topics emerged: osteoarthritis, osteoporosis, sport medicine, orthopedic basic science, prosthetic surgery, MOM (metal on metal), oncology, spine, ACL (anterior cruciate ligament), PRP (platelet rich plasma), knee arthroscopy, pain, reconstruction, materials, traumatology, clinical orthopedics (see Figure 1).

The most common was osteoarthritis, with 24 publications (24%), followed by orthopedic basic science with 22 publications (22%). Then, we found sport medicine (14%), prosthetic surgery (13%) and osteoporosis (11%). All other topics appeared in a lower percentage than those listed above: they represented only the 16% of the topics treated among the top-100 cited articles.

The articles classified as "orthopedic basic science" was further categorized. The field of application of the basic research was osteoporosis in 2 cases, osteoarthritis in 4 cases, sport medicine in 1 case and materials in 6 cases. Overall publication output showed a linearly decreasing trend by year. Considering the study period 2009-2019, no more articles appeared after 2016 among the 100 top-cited publications.

Osteoarthritis, sport medicine and orthopedic basic science showed the greatest relative decrease in annual publication numbers. Osteoporosis, as well as all other topics, showed a constant trend in the annual proportion of publications across the study period (Figure 2).

SUBJECT	2009	2010	2011	2012	2013	2014	2015	2016
OA	7	5	3	4	3	1	1	
OP	3	2	2	1	3			
SM	4	7	3					
OBS	7	4	3	5		3		
PS	3	3	5	1		1		
MOM		1	1	1				
ONCO		1	1		1			
SPINE	2	2	1	1				
ACL	1					1		
KNEE ARTHRO		1			1			
PAIN				1				
RECONSTRUCTION		1	1					
PRP	1	2	2					
CLINIC								1
TRAUMA	1	2						
MATERIALS	1			3		2		

Figure 1. Distribution per year of the 16 macro topics emerged among the 100 top cited articles

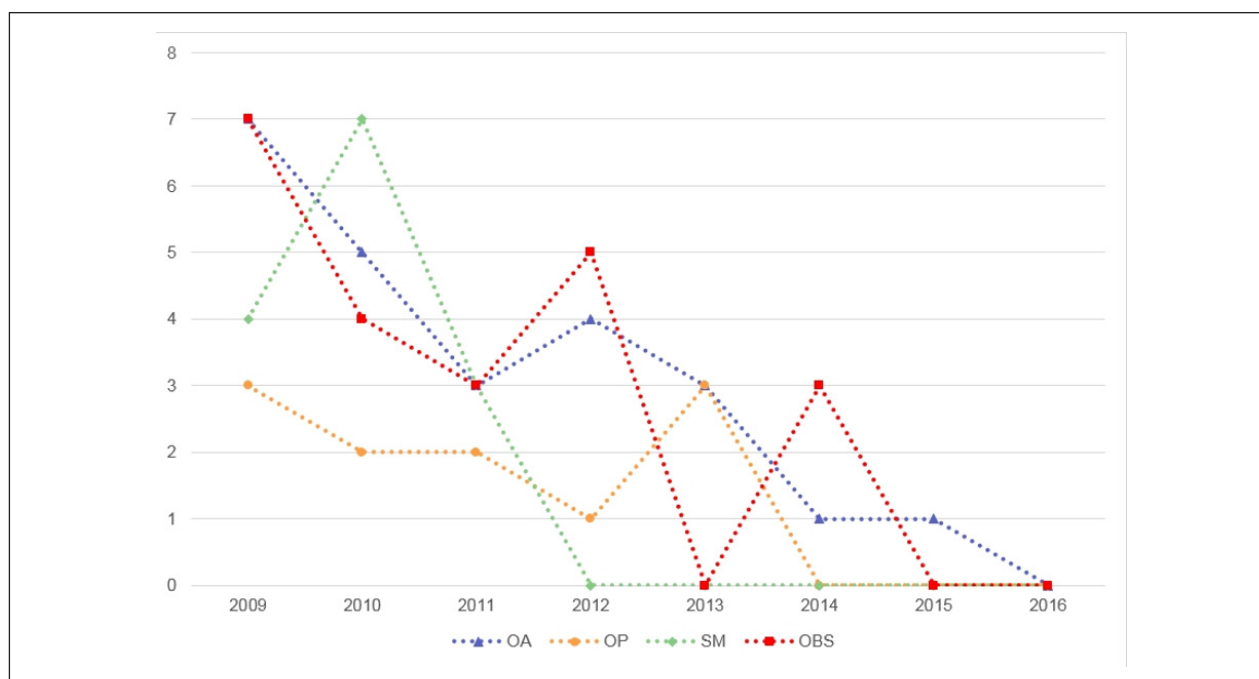


Figure 2. Number of publications per topics (Osteoarthritis(OA), Osteoporosis(OP), Sport Medicine(SM), Orthopedic basic sciences(OBS)) between 2009-2016.

The most cited publication, within the 100 top-cited, was a review published in the Lancet in 2011 titled “Osteoarthritis: an update with relevance for clinical practice” (13). This article was cited 843 times, as evidence of high interest on the most preva-

lent chronic joint disease. In this article, epidemiology, pathology, clinical features, diagnosis and treatment of osteoarthritis have been addressed in depth.

The second most cited text was a review published in Osteoporosis International in 2013 titled “Europe-

an guidance for the diagnosis and management of osteoporosis in postmenopausal woman” (14).

It was an update of the existing guidance, edited by the Scientific Advisory Board of the ESCEO (European Society for Clinical and Economic Evaluation of Osteoporosis and Osteoarthritis) and IOF (International Osteoporosis Foundation), with the aim of stimulate a cohesive approach to the management of osteoporosis in Europe. It was cited 719 times.

The third most cited publication was again a review, cited 652 times, published in 2011 in British Journal of Sports Medicine, titled “Physical activity and mental health in children and adolescent: a review of reviews” (15). This research highlighted and synthesized evidence on correlation between physical activity and mental health. These three most cited articles offer a broad definition of good professional practice in that specific topic, being based on systematic analyzes, assessments and interpretations of scientific evidence. For this reason, these types of articles enjoy a high scientific interest, being an aid in clinical decision-making.

The topics of these first three article corresponded in order to the three most common macro-topics present among the 100 top-cited publications.

Times cited is a traditional metric to determine the relevance of a specific topic in the scientific world and research trends. However, the usage count is a more recent indicator on the Web of Science Platform: it measures the level of interest in a specific item calculated as the number of times the article has met a user’s information needs as demonstrated by clicking links to the full-length article at the publisher’s website.

Guoqiang et al. in 2017 demonstrated that usage count can shorten the time lag in research fronts detection than using times cited (16). Analyzing the top 100 most cited papers ordered by usage count, the ranking of macro-topics was different. If “osteoarthritis” and “osteoporosis” were the most common topics by ordering the 100 analyzed articles according to times cited parameter, “materials” and “sport medicine” were the most common topics when ordering articles according to usage count.

In fact, the most cited publication was a review titled “Chitosan, hyaluronan and chondroitin sulfate in tissue engineering for cartilage regeneration: a review”,

published in 2012 in the Carbohydrate Polymers. The second most cited was a review published in 2014 titled “Calcium phosphate cements for bone substitution: chemistry, handling and mechanical properties”. The third most cited article was the same both in the list ordered by times cited and in that ordered by usage count. Thus, usage count could be a useful indicator in the recentness detection of research fronts.

All these data, compared to a similar research published by Churchill et al., showed a different topic trend from what happened in Australia and New Zeland, where the most successful topic was the ACL surgery (4).

Our analysis evidenced the importance influence that the English literature has among EFORT memberships. England was the country with the highest number of publications among both all orthopedic publications by EFORT membership and within the 100 most cited articles. This means that a large number of articles written in England arouse the interest of the scientific public.

The University of London is the most productive organization; however, analyzing the 100 most cited articles we noticed that most of these publications are produced by the University of Oxford (13 articles), while the University of London contributed with 6 publications among the 100 most cited. The University of Oxford is on the podium in the ranking of universities all over the world, thus it has a lot of influence in orthopedic scientific community, as shown by the numbers. Finally, our study highlighted that the type of article that arouse the greatest interest in the scientific public is the review and almost all of the most cited articles are published in journal ranked as Q1. This kind of article summarizes the current state of play on a specific topic and provides the basis and ideas for future experimental research in that specific area. The great utility of the reviews explains their success.

Conclusion

The aim of this study was to define a list of articles which have been influential in the European scientific orthopedic world and to outline the characteristics that allow one article to be more cited than another.

In particular, two are the most interesting conclusions: reviews published in journal ranked in Q1 are the most popular publications and probably, as suggested by the use of usage count, the new research fronts concern biomaterial in orthopedic and sport medicine.

This type of bibliometric study could be influenced by articles categorization of Web of Science, that can exclude some relevant publications. Furthermore, time effect should be taken into consideration because the most recent articles are penalized in the number of citations. Despite these limits, this list can be taken as a starting point to identify topics of interest for future scientific research.

Conflicts of interest: Each author declares that he or she has no commercial associations (e.g. consultancies, stock ownership, equity interest, patent/licensing arrangement etc.) that might pose a conflict of interest in connection with the submitted article.

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15. Biddle S. J. H. & Asare M. Physical activity and mental health in children and adolescents: A review of reviews, *Br. J. Sports Med.*, 2011; 45: 886–895
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