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Trends of impact factor contributors to the *Injury Journal: A bibliometric analysis*

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ABSTRACT

Purpose: This study aims to analyse papers concerning journal impact factors published in the *Injury-International Journal of the Care of the Injured* between 1997 and 2022. Through this analysis, the research offers valuable insights into the publication performance and contributors to the journal impact factor, encompassing papers, authors, institutions, and countries.

Methods: Articles and reviews published in the *Injury* between 1995 and 2021 were examined using the Science Citation Index Expanded database. The study employed the journal impact factor contributing indicator to compare highly cited and high journal impact factor papers across various aspects, including papers, authors, institutions, and countries.

Results: A notable correlation exists between prolific authors, institutions, and countries, alongside those who contribute to high journal impact factors. However, a less distinct connection was observed between highly cited papers/authors and high journal impact factor contributors. The *Injury* serves as a well-regarded international journal. Notably, editorial members of the journal play a substantial role, serving as model editors and contributing significantly to the journal's success.

Out of the Top 25 IF contributing papers with the *CN* of 34 or more the following themes were noted to dominate: bone healing/tissue regeneration (40 %) of papers, covid-19 pandemic (24 %), polytrauma/coagulopathy (12 %) and infection (8 %).

Conclusions: Utilizing the journal impact factor to assess research performance at the individual, institutional, or national levels appears not to be the most appropriate method. The results show that highly cited authors did not hold the distinction of being the primary contributors to the IF. Analysis revealed a low significant relationship among the primary contributors to the IF, highly cited papers, and the most influential papers in 2022. A more effective indicator could involve considering the total number of citations a publication receives from its year of publication up to the end of the most recent year.

Introduction

The *Injury-International Journal of the Care of the Injured* represented by its ISO abbreviation "*Injury-Int. J. Care Inj.*" and Journal Citation Reports (JCR) abbreviated title "*Injury*" has been listed in the Science Citation Index Expanded (SCI-EXPANDED) since 1972. In the year 2022, it received a journal impact factor of 2.5, securing the 12nd position out of 32 journals in the Web of Science category of emergency medicine, 36th of 86 journals in the category of orthopaedics, 80th of 212 journals in the category of surgery, and 27th of 35 journals in the category of critical care medicine. In 1955, in order to evaluate the significance of a particular publication and its contribution and impact on the research world, an "impact factor" was presented by Garfield [1]. In 1963, Garfield and Sher proposed the "journal impact factor" to evaluate journals in the Citation Index and to assist librarians in choosing which journals to subscribe to [2]. In a relatively simple formula, a journal's impact

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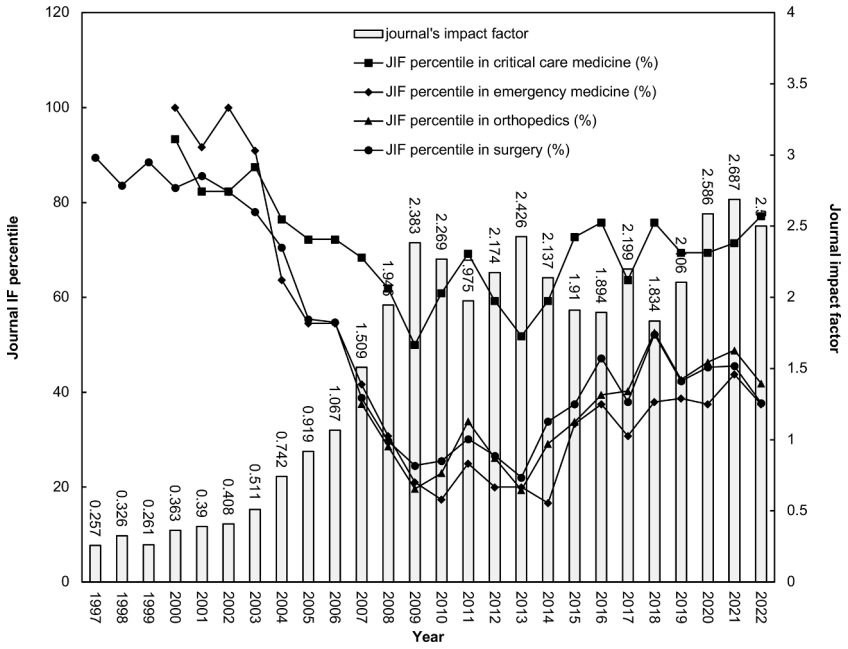

Fig. 1. Rankings of the *Injury* by IF in the Web of Science categories of critical care medicine, emergency medicine, orthopedics, and surgery.

factor is an average of the citations that papers published in the previous two years attracted that year [3]. Although it has become a staple in many types of analyses of a journal's scientific impact, recently the application of the journal impact factor in politics and decision-making in academia has been criticized as it can often be based on false beliefs and unjustified inferences [4,5]. It is quite well known that the average number of citations to articles in a journal over a specific period of time can be affected by many factors other than the quality of the research [5].

Therefore, it has been recommended that the starting point for evaluating and stimulating multidimensional performance is the comprehensive contribution of researchers to knowledge processes, not just isolated journal impact factor or citation counts [6]. Brunstein presented that the Internet's expansion and online publishing strategies mark the decline of "journal impact factors," as authors prioritize finding important articles over the journals they are published in [7]. Furthermore, there is clear and rapid growth in the number of open access journals. Although on the one hand there may be rumours and criticisms about it, such as vulnerability to manipulation by questioned editors who do not have experience, conflicts of interest, and manuscripts produced by paper mills [8], on the other hand these journals can help in the development of researchers in regions and countries without a great tradition in scientific publishing, especially in those where English is not the native language [9].

Garfield expressed confidence in the invention of a new impact factor post the era of print publications [10]. Webometrics emerged in the mid-1990s, and the concept of measuring Web Impact Factors (Web-IF) was explored by Björneborn and Ingwersen [11]. Garfield also suggested using individual paper citation frequency for evaluating scientists instead of relying on journal impact factors [10]. The "impact factor," a citation-based metric for ranking scientific journals, has faced significant criticism over the years due to its inadequate suitability as a measure for evaluating the quality of individual research papers [12]. Furthermore, the SAN FRANCISCO DECLARATION ON RESEARCH Assessment (DORA) seeks to rectify distortions in scientific research evaluation by advocating against the utilization of the "journal impact factor" as a measure for assessing the work of individual scientists [13].

Initially designed for journal comparisons, particularly within the same category, the journal impact factor was never intended for evaluating the quality of individual papers, scientists, or departments, as highlighted in the introduction. Consequently, the aim of this study was to analyse articles and reviews related to impact factors from 1997 to 2022 in the *Injury-International Journal of the Care of the Injured* and to identify highly cited papers and authors, as well as the journal impact factor contributing papers and contributors.

Materials and methods

The documents used in this study were derived from the Science Citation Index Expanded (SCI-EXPANDED) of the Web of Science Core Collection, Clarivate Analytics. The searching keyword phrase "*Injury-International Journal of the Care of the Injured*" was searched as a publication name and considered the impact factor (IF_{1997} to IF_{2022}) related years from 1995 to 2021 (data updated on 30 July 2023).

According to the definition of the journal impact factor, it was recommended searching documents published in 2022 from SCI-EXPANDED after IF_{2022} was presented by the Journal Citation Reports (JCR) on 28 June 2023 [14].

Characteristics of the journal impact factor (IF)

The journal impact factor (IF_{year}) is defined as in the Journal Citation Reports (JCR) year – i.e. the average number of citations of a journal paper published in the past two years.

The denominator is made of three document types such as reviews, scientistic articles, and proceedings papers. It was found that all proceedings papers were also classified to be articles in the *Injury*.

The journal impact factor has the following formula

$$IF_{year} = \frac{C_{year-2} + C_{year-1}}{TP_{year-2} + TP_{year-1}}$$

where IF_{year} is the journal impact factor in a specific JCR year,

$C_{year\text{-}2}$: total number of citations from JCR year to items in "year - 2″,
$C_{year\text{-}1}$: total number of citations from JCR year to items in "year - 1″,
$TP_{year\text{-}2}$: total number of citable items in "year - 2″,
$TP_{year\text{-}1}$: total number of citable items in "year - 1″,
year: a specific JCR year which is not publication year.

Table 1
Top 25 IF contributing papers with the *CN* of 34 or more in the *Injury*.

Title	Rank (*CN*)	Rank (C_{year-2})	Rank (C_{year-1})	Rank (TC_{2022})	Rank (C_{2022})
Impact of the COVID-19 Pandemic on an Emergency Traumatology Service: Experience at a Tertiary Trauma Centre in Spain [24].	1 (149)	1 (55)	1 (94)	62 (173)	9 (55)
Fracture-related infection: A consensus on definition from an international expert group [25].	2 (70)	3 (46)	6 (24)	36 (249)	4 (98)
An emerging pattern of subtrochanteric stress fractures: A long-term complication of alendronate therapy [26].	3 (68)	4 (42)	5 (26)	19 (293)	1194 (4)
Epidemiology and social costs of hip fracture [27].	4 (65)	2 (50)	26 (15)	28 (271)	3 (118)
FDA approved guidance conduits and wraps for peripheral nerve injury: A review of materials and efficacy [28].	5 (56)	6 (35)	10 (21)	9 (461)	13 (49)
Infection after fracture fixation: Current surgical and microbiological concepts [29].	5 (56)	7 (34)	9 (22)	67 (165)	9 (55)
Pathophysiology of polytrauma [30].	7 (55)	5 (36)	17 (19)	6 (579)	28 (30)
Regional healthcare costs and burden of injury associated with electric scooters [31].	8 (50)	11 (30)	13 (20)	683 (54)	28 (30)
Impact of the 2020 COVID-19 pandemic on the workload of the orthopaedic service in a busy UK district general hospital [32].	8 (50)	22 (21)	3 (29)	752 (51)	56 (21)
The biology of fracture healing [33].	10 (46)	9 (31)	26 (15)	3 (907)	2 (126)
The influence of a statewide "Stay-at-Home" order on trauma volume and patterns at a level 1 trauma center in the united states [34].	10 (46)	15 (26)	13 (20)	893 (46)	34 (26)
Early coagulopathy in multiple injury: An analysis from the German Trauma Registry on 8724 patients [35].	12 (45)	11 (30)	26 (15)	8 (491)	73 (18)
Early coagulopathy in trauma patients: An on-scene and hospital admission study [36].	12 (45)	35 (18)	4 (27)	41 (223)	43 (23)
Platelet-rich plasma: New clinical application A pilot study for treatment of jumper's knee [37].	14 (43)	13 (28)	26 (15)	49 (201)	1194 (4)
Autologous osteochondral grafting-technique and long-term results [38].	15 (41)	9 (31)	70 (10)	21 (289)	158 (12)
Autologous chondrocyte implantation-technique and long-term follow-up [39].	16 (40)	8 (33)	191 (7)	58 (181)	456 (7)
Complications following autologous bone graft harvesting from the iliac crest and using the RIA: A systematic review [40].	16 (40)	13 (28)	44 (12)	7 (502)	8 (56)
Preoperative predictors for mortality following hip fracture surgery: A systematic review and meta-analysis [41].	18 (39)	31 (19)	13 (20)	12 (399)	15 (47)
The new 'normal': Rapid adoption of telemedicine in orthopaedics during the COVID-19 pandemic [42].	18 (39)	31 (19)	13 (20)	1152 (40)	66 (19)
Mesenchymal stem cells and bone regeneration: Current status [43].	20 (38)	19 (23)	26 (15)	83 (152)	343 (8)
Delayed union and nonunions: Epidemiology, clinical issues, and financial aspects [44].	20 (38)	31 (19)	17 (19)	19 (293)	11 (50)
Epidemiologic characteristics of traumatic fractures during the outbreak of coronavirus disease 2019 (COVID-19) in China: A retrospective & comparative multi-center study [45].	22 (37)	49 (16)	10 (21)	1152 (40)	92 (16)
Autologous bone graft: Is it still the gold standard [46].	23 (36)	5327 (0)	2 (36)	1056 (42)	23 (36)
Trends in 1029 trauma deaths at a level 1 trauma center: Impact of a bleeding control bundle of care [47].	24 (34)	22 (21)	35 (13)	90 (147)	19 (38)
Epidemiological pattern of pediatric trauma in COVID-19 outbreak: Data from a tertiary trauma center in Iran [48].	24 (34)	39 (17)	20 (17)	1491 (34)	83 (17)

CN: $TC_{year-1} + TC_{year-2}$;.
TC_{year-2}: number of citations from JCR year to publications in "year - 2".
TC_{year-1}: number of citations from JCR year to publications in "year - 1".
TC_{2022}: total number of citations from Web of Science Core Collection since publication year to the end of 2022.
C_{2022}: total number of citations from Web of Science Core Collection in 2022.

According to the 2022 JCR, JCR used 178 Web of Science categories in SCI-EXPANDED to index 9510 journals which were explored. A total of 8410 papers were retrieved including 7808 articles and 602 reviews. All paper information from SCI-EXPANDED and each year's citation times for every paper sorting from the Web of Science Core Collection was checked and downloaded into Excel Microsoft 365, and additional coding was manually performed [15,16]. The journal impact factors from 1997 (IF_{1997}) to 2022 (IF_{2022}) were taken from the JCR.

In the SCI-EXPANDED database, the corresponding author is labelled as a reprint author, however, in this study, we adopted the term "corresponding author" as outlined by Chiu and Ho [17]. In the cases of single-author papers, single-institution papers, and single-country papers with unspecified author information, the author, institution, and country were both the first as well as corresponding author, institution, and country [18]. In multi-corresponding author papers, all the corresponding authors, institutions, and countries were considered [16]. Papers with corresponding authors in SCI-EXPANDED, that had only address but not affiliation names were checked out and the addresses were changed to be affiliation names [16]. The reclassification of

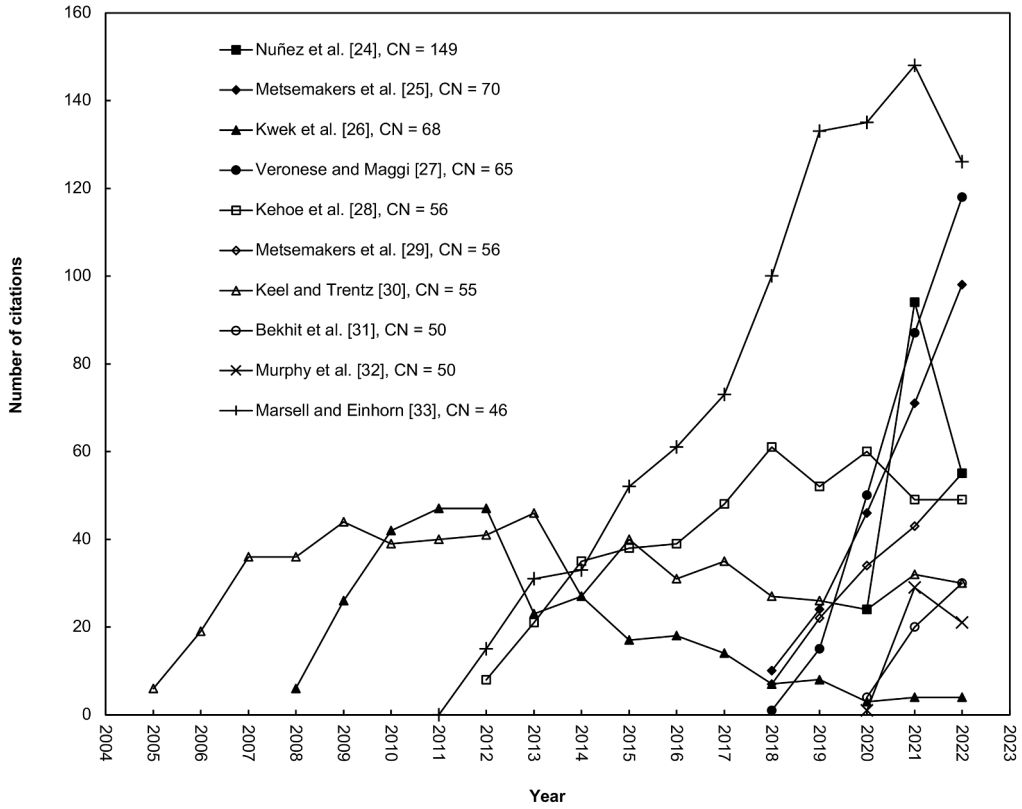

Fig. 2. Citation histories of the top ten IF contributing papers in the *Injury*.

affiliations originating in England, Scotland, North Ireland (Northern Ireland), and Wales is to be collectively categorized as the United Kingdom (UK) [19]. Similarly, a reclassification of affiliations based in Hong Kong before 1997, assigned them to China [20]. A comprehensive evaluation of affiliations previously attributed to Yugoslavia, subsequently reclassifying them as originating from Serbia [21]. Additionally, affiliations located in Turkiye were reclassified and identified as being from Turkey.

Results and discussion

Injury has been indexed in the Web of Science categories of critical care medicine, emergency medicine, orthopaedics, and surgery since 2000, 2000, 2007, and 1997 respectively. Fig. 1 shows its IF and ranking within the subject categories from 1997 to 2022. The IF fluctuated and slightly increased from 0.257 in 1997 to 0.511 in 2003 and then sharply increased to reach a plateau in 2008 with a maximum of 2.687 in 2021. The ranking of the *Injury* in the Web of Science categories of critical care medicine and emergency medicine were slightly fluctuated, changing in the last decade (Fig. 1). However, the ranking of the journal in the categories of orthopaedics and surgery were fluctuated and decreased from 2013 to 2018 (Fig. 1). The journal had a higher ranking in the categories of emergency medicine and surgery in 2022 with IF percentile of 38 % respectively.

Top IF contributing papers, countries, institutions, and authors

Sum of citation numbers (*CN*) related to the IF is defined as the IF contributing indicator:

$CN = (C_{year\text{-}1} + C_{year\text{-}2})$. The *CN* can be applied to authors, institutions, countries, publication years, document types, and languages;

TC_{2022}: the total number of citations from Web of Science Core Collection received since publication year till to the end of 2022 [22];

C_{2022}: total number of citations from Web of Science Core Collection in 2022 [23].

The top 25 IF contributing papers with the *CN* of 34 citations or more are listed in Table 1 [24–48]. 44 %, 32 %, and 24 % of them were published in the 2010s, the 2020s, and 2000s, respectively. Only five of the top 25 most IF contributing papers (20 % of 25 papers) by Kehoe et al. [28], Marsell and Einhorn [33], Dimitriou et al. [40], Hu et al. [41], and Hak et al. [44] were also ranked the top 25 in terms of citation indexes TC_{2022} and C_{2022}, respectively. These papers are the papers with the largest contribution to the *Injury* IF and the most cited papers from 1997 to 2022 as well as the most influential papers in the most recent year of 2022.

Jorge H. Nuñez as both the first and the corresponding author, who published the article entitled “Impact of the COVID-19 pandemic on an emergency traumatology service: Experience at a tertiary trauma centre in Spain” [24] was the best contributing paper in terms of IF in the *Injury* with a *CN* of 149. Nine of the top 25 IF contributing papers with the *CN* also ranked within the top 25 in total citations with the TC_{2022}, including five articles by Kwek et al. [26], Marsell and Einhorn [33], Maegele et al. [35], Hangody et al. [38], and Hak et al. [44] with TC_{2022} of 293, 907, 491, 289, and 293, respectively, as well as four reviews by Kehoe et al. [28], Keel and Trentz [30], Dimitriou et al. [40], and Hu et al. [41] with TC_{2022} of 461, 579, 502, and 399, respectively. These papers were not only high IF contributing papers but also the most frequently cited papers. Similarly, eleven of the top 25 papers with the *CN* ranked within the top 25 in total citations in 2022 with C_{2022}, as the most impactful papers in the most recent year – 2022, including seven articles by Nuñez et al. [24], Metsemakers et al. [25], Veronese and Maggi [27], Marsell and Einhorn [33], Hak et al. [44], Schmidt [46], and Oyeniyi et al. [47]

Table 2
Characteristics of the top 11 productive countries.

Country	Total papers		Single-country		International collaboration		First author		Corresponding author		Single author	
	R (TP)	R (*CN*)	R (IP_C)	R (*CN*)	R (CP_C)	R (*CN*)	R (FP)	R (*CN*)	R (RP)	R (*CN*)	R (SP)	R (*CN*)
UK	1 (2316)	1 (7253)	1 (1502)	1 (4195)	1 (814)	2 (3058)	1 (1895)	1 (5393)	1 (1883)	1 (5623)	1 (106)	2 (164)
USA	2 (1636)	2 (6509)	2 (879)	2 (3400)	2 (757)	1 (3109)	2 (1190)	2 (4625)	2 (1212)	2 (4639)	2 (57)	1 (179)
Germany	3 (739)	3 (3803)	3 (362)	3 (1866)	3 (377)	3 (1937)	3 (539)	3 (2733)	3 (571)	3 (2733)	4 (24)	3 (88)
China	4 (549)	7 (1893)	4 (341)	5 (1192)	6 (208)	9 (701)	4 (453)	6 (1575)	4 (457)	5 (1549)	6 (16)	12 (19)
Australia	5 (539)	4 (2343)	5 (305)	4 (1292)	5 (234)	6 (1051)	5 (430)	4 (1886)	5 (428)	4 (1818)	5 (17)	8 (29)
Netherlands	6 (442)	5 (2181)	6 (259)	7 (1097)	7 (183)	5 (1084)	6 (360)	5 (1583)	6 (340)	6 (1520)	9 (11)	6 (31)
Italy	7 (406)	6 (1904)	7 (251)	6 (1113)	9 (155)	8 (791)	7 (321)	7 (1452)	7 (319)	7 (1366)	12 (7)	20 (8)
Switzerland	8 (395)	8 (1697)	9 (142)	10 (387)	4 (253)	4 (1310)	8 (247)	9 (830)	8 (249)	9 (856)	3 (31)	5 (34)
Canada	9 (309)	9 (1528)	11 (133)	8 (536)	8 (176)	7 (992)	9 (210)	8 (908)	9 (216)	8 (874)	17 (5)	32 (2)
Greece	10 (250)	11 (898)	13 (111)	13 (357)	10 (139)	12 (541)	10 (185)	12 (567)	15 (167)	12 (520)	9 (11)	12 (19)
Spain	11 (243)	10 (969)	12 (130)	11 (383)	12 (113)	11 (586)	12 (182)	10 (691)	10 (190)	10 (781)	14 (6)	26 (5)

TP: number of total articles in the Injury from 1995 to 2021; IP_C: number of single-country articles; CP_C: number of internationally collaborative articles; FP: number of first-author articles; RP: number of corresponding-author articles; SP: number of first-author articles; *CN* (the IF contributing indicator): sum of ($C_{year\text{-}1}$ + $C_{year\text{-}2}$); R: rank in each category.

with C_{2022} of 55, 98, 118, 126, 50, 36, and 38, respectively, as well as four reviews by Kehoe et al. [28], Metsemakers et al. [29], Dimitriou et al. [40], and Hu et al. [41] with C_{2022} of 49, 55, 56, and 47, respectively.

Furthermore, 40 % and 43 % of the top 100 IF contributing papers in terms of *CN* were found in the top 100 papers in terms of TC_{2022} and C_{2022}, respectively, whereas only 22 % of the top 100 papers in terms of *CN* were found in both the top 100 C_{2022} and TC_{2022}. In addition, only 52 % of the top 100 papers in terms of TC_{2022} were found in the top 100 C_{2022}. From the results, it can be concluded that although the IF of a journal serves as a valuable tool for assessing a journal's comparative significance within its field, it is not a suitable metric for evaluating the publication performance of individuals, institutions, or countries.

Fig. 2 shows the citation histories of the top ten IF contributing papers. Most of them had citation decreasing trends after a couple of years of publication. Only some papers were keeping an increased trend of citations, such as the papers by Marsell and Einhorn [33], Veronese and Maggi [27], Metsemakers et al. [25], and Metsemakers et al. [29].

Interestingly, there were 40 papers (0.48 % of 8410 papers) published in *Injury* without affiliations in SCI-EXPANDED from 1995 to 2021. A total of 8370 papers including 7769 articles and 601 reviews in the journal were published by authors affiliated from 115 countries including 6019 single-country papers (72 % of 8370 papers) published by authors from 64 countries and 2351 internationally collaborative papers (28 %) published by authors from 112 countries. The maximum number of countries and institutions in a paper by Coccolini et al. [49] was 23 countries and 55 institutions respectively. This finding indicated that *Injury* is an international journal publishing papers by authors from widely countries. Six publication indicators were utilized based on the work by Hsu and Ho [50], alongside six corresponding IF contributing indicators (*CN*), in order to conduct a comparative analysis among the top 11 most prolific countries in *Injury* (Table 2). Eight of the top 11 productive countries in *Injury* were in Europe, two in North America, and one in Asia and Oceania, respectively. There are still no African or Latin American countries getting into the top 11 productive countries, which reflects the difficulties and barriers encountered by most authors from low- and middle-income countries to conduct and publish a high-quality study in the major scientific journals [9,51].

The most productive African country in the journal was South Africa with 137 papers (ranked 20th). The UK dominated in all the six publication indicators with a TP of 2316 papers (28 % of 8370 papers), an IP_C of 1502 papers (25 % of 6019 single-country papers), a CP_C of 814 papers (35 % of 2351 internationally collaborative papers), an FP of 1895 papers (23 % of 8370 first-author papers), an RP of 1883 papers (22 % of 8369 corresponding-author papers), and an SP of 106 papers (34 % of 309 single-author papers).

In comparison to the top 11 most productive countries outlined in Table 2, it becomes evident that the UK emerges as the leading contributor to IFs spanning the period from 1997 to 2022 (IF_{1997} to IF_{2022}). This prominence is underscored by *CN* of 7253, 4195, 5393, and 5623 citations for total papers, single-country papers, first-author papers, and corresponding-author papers, respectively. The United States of America (USA) contributed the IF by *CN* of 3109 and 179 citations for internationally collaborative papers and single-author papers respectively. Furthermore, the top 11 productive countries in Table 2 were not only the most productive countries but also the top 11 most IF contributing countries.

In terms of single-institution papers and inter-institutionally collaborative papers out of the 8370 papers published in *Injury* from 1995 to 2021, 2428 were single-institution papers (29 % of 8370 papers) and

Table 3
Characteristics of the top 11 productive institutions.

Institution	Total papers		Single-institution		Inter-institutional collaboration		First author		Corresponding author	
	R (TP)	R (*CN*)	R (IP_I)	R (*CN*)	R (CP_I)	R (*CN*)	R (FP)	R (*CN*)	R (RP)	R (*CN*)
Monash Univ, Australia	1 (169)	2 (929)	16 (14)	8 (86)	1 (155)	2 (843)	1 (73)	2 (415)	1 (72)	2 (385)
Univ Leeds, UK	2 (141)	1 (1116)	16 (14)	2 (142)	2 (127)	1 (974)	2 (71)	1 (638)	2 (56)	1 (506)
Alfred Hosp, Australia	3 (96)	3 (482)	28 (11)	94 (19)	3 (85)	3 (463)	6 (43)	7 (199)	6 (45)	7 (198)
Univ Sydney, Australia	4 (87)	4 (397)	80 (6)	114 (17)	4 (81)	4 (380)	15 (29)	21 (124)	11 (31)	19 (140)
Univ Maryland, USA	5 (80)	12 (338)	1 (33)	4 (107)	13 (47)	16 (231)	3 (51)	13 (157)	3 (47)	16 (146)
Hannover Med Sch, Germany	6 (74)	20 (264)	3 (26)	20 (59)	11 (48)	22 (205)	4 (49)	10 (177)	4 (46)	12 (162)
Univ Athens, Greece	7 (68)	19 (268)	16 (14)	30 (45)	7 (54)	18 (223)	8 (38)	25 (108)	9 (33)	26 (108)
Univ Toronto, Canada	8 (67)	5 (392)	65 (7)	34 (41)	5 (60)	8 (351)	28 (23)	17 (144)	29 (23)	18 (142)
Univ Washington, USA	9 (66)	21 (255)	38 (9)	104 (18)	6 (57)	15 (237)	22 (25)	58 (71)	21 (25)	51 (71)
Univ Calif San Francisco, USA	10 (65)	10 (342)	12 (16)	10 (74)	10 (49)	9 (268)	9 (34)	19 (132)	10 (32)	21 (130)
St James Univ Hosp, UK	11 (61)	10 (342)	2 (32)	1 (180)	35 (29)	37 (162)	5 (45)	3 (262)	4 (46)	5 (260)

TP: number of total articles in the Injury from 1995 to 2021; IP_I: number of single-institution articles; CP_I: number of inter-institutionally collaborative articles; FP: number of first-author articles; RP: number of corresponding-author articles; SP: number of first-author articles; *CN* (the IF contributing indicator): sum of ($C_{year\text{-}1}$ + $C_{year\text{-}2}$); R: rank in each category.

Table 4
Characteristics of the top 20 *IF* contributors to the *Injury* with *CN* > 180.

Author	PS	Total papers		First-author papers		Corresponding-author papers		Single-author papers	
		R (*CN*)	R (TP)	R (*CN*)	R (FP)	R (*CN*)	R (RP)	R (*CN*)	R (SP)
P.V. Giannoudis	Editor-in-Chief	1 (1540)	1 (195)	1 (378)	1 (39)	1 (886)	1 (114)	10 (12)	31 (1)
H.C. Pape	Editor	2 (411)	2 (69)	56 (35)	26 (6)	14 (71)	4 (17)	N/A	N/A
N.K. Kanakaris	N/A	3 (370)	7 (42)	7 (85)	3 (14)	184 (21)	91 (5)	N/A	N/A
W.J. Metsemakers	N/A	4 (338)	37 (21)	2 (232)	6 (10)	2 (282)	12 (13)	N/A	N/A
P.A. Cameron	N/A	5 (320)	5 (44)	198 (19)	380 (2)	29 (54)	28 (9)	N/A	N/A
G.M. Calori	N/A	6 (309)	9 (38)	3 (188)	2 (19)	3 (179)	6 (16)	N/A	N/A
M.H.J. Verhofstad	N/A	7 (276)	25 (26)	5121 (0)	1146 (1)	4661 (0)	1200 (1)	N/A	N/A
R.G. Richards	N/A	8 (260)	66 (16)	5121 (0)	1146 (1)	N/A	N/A	151 (0)	31 (1)
G. Schmidmaier	N/A	9 (246)	45 (20)	11 (68)	44 (5)	17 (67)	91 (5)	N/A	N/A
M. Morgenstern	N/A	10 (244)	89 (14)	48 (38)	68 (4)	52 (39)	91 (5)	N/A	N/A
M.J. Parker	Editor	11 (239)	4 (57)	11 (68)	3 (14)	7 (108)	2 (26)	3 (28)	2 (5)
T.F. Moriarty	N/A	12 (229)	220 (9)	N/A	N/A	4661 (0)	1200 (1)	N/A	N/A
V. Alt	Editor	13 (218)	28 (24)	34 (42)	68 (4)	5 (114)	14 (12)	4 (23)	31 (1)
C. Krettek	Editor	14 (214)	3 (58)	140 (22)	8 (9)	164 (22)	65 (6)	N/A	N/A
R. Lefering	N/A	15 (207)	17 (30)	2052 (4)	1146 (1)	1578 (5)	462 (2)	45 (4)	31 (1)
B.J. Gabbe	N/A	16 (206)	9 (38)	82 (27)	159 (3)	19 (63)	91 (5)	N/A	N/A
K. Curtis	N/A	17 (199)	12 (36)	33 (44)	8 (9)	59 (37)	38 (8)	N/A	N/A
K. Inaba	Editor	18 (198)	13 (34)	773 (9)	380 (2)	36 (48)	49 (7)	N/A	N/A
O. Borens	N/A	19 (190)	176 (10)	N/A	N/A	610 (11)	1200 (1)	N/A	N/A
L.P.H. Leenen	N/A	20 (182)	8 (40)	2585 (3)	1146 (1)	131 (25)	65 (6)	64 (3)	31 (1)

PS: position of the *Injury*; TP: number of total articles in the Injury from 1995 to 2021; FP: number of first-author articles; RP: number of corresponding-author articles; SP: number of first-author articles; *CN* (the IF contributing indicator): sum of ($C_{year\text{-}1}$ + $C_{year\text{-}2}$); R: rank in each category.

5942 were inter-institutionally collaborative papers (71 %). Five publication indicators [50] and five corresponding IF contributing indicators (*CN*) were applied to evaluate publication performance among the top 10 most prolific institutions in the *Injury* (Table 3). Three of the top 11 productive institutions in *Injury* were in Australia and the USA respectively, two in the UK, and one in Canada, Germany, and Greece respectively. The Monash University in Australia ranked the top in four of the five publication indicators with a TP of 169 papers (2.0 % of 8370 papers), a CP_I of 155 papers (2.6 % of 5942 inter-institutionally collaborative papers), an FP of 73 papers (0.87 % of 8370 first-author papers), and an RP of 72 papers (0.86 % of 8362 corresponding-author papers). The University of Maryland in the USA ranked the top with an IP_I of 33 papers (1.4 % of 2428 single-institution papers).

Compared to the top 11 productive institutions in Table 4, the University of Leeds in the UK was the most IF contributor from 1997 to 2022 by *CN* of 1116, 974, 638, and 506 citations for total papers, inter-institutionally collaborative papers, first-author papers, and corresponding-author papers, respectively. The St James's University Hospital in the UK was the most IF contributor by a *CN* of 180 citations for single-institution papers. Furthermore, the University of Maryland in USA with 80 papers (ranked 5th), the Hannover Medical School in Germany (74 papers; ranked 6th), the University of Athens in Greece (68 papers; ranked 7th), and the University of Washington in USA (66 papers; ranked 9th) were not the main IF contributors.

In the SCI-EXPANDED, 8378 papers with author information were further analysed for authors' contributions to IF. The mean number of authors per paper was 4.9 with the maximum number of 176 from the USA and Canada [52]. Four publication indicators such as total papers (TP), first-author papers (FP), corresponding-author papers (RP), and single-author papers (SP) [23] as well as the IF contributing indicator (*CN*) for papers published from 1995 to 2021 were applied for the analysis of authors' contributions to the *Injury*. The 8378 papers were published by 25,575 authors including 6471 authors who published first-author papers, 5807 authors who published corresponding-author papers, and 273 authors who published single-author papers. Table 4 lists the top 20 IF contributors to the *Injury* with *CN* more than 180. The Editor-in-Chief, P.V. Giannoudis, who published not only the most total papers with a TP of 195 papers (2.3 % of 8378 papers), first-author papers with an FP of 39 papers (0.47 % of 8378 first-author papers), and corresponding-author papers with an RP of 114 papers (1.4 % of 8178 corresponding-author papers) but also the most contributed IF contributor with a *CN* of 1540, 378, and 886 for TP, FP, and RP respectively. Editor H.C. Pape has also contributed significantly papers and IF. Eight of the top 20 authors (40 % of the 20 authors) in Table 4, such as T.F. Moriarty, O. Borens, M. Morgenstern, R.G. Richards, G. Schmidmaier, W.J. Metsemakers, V. Alt, and M.H.J. Verhofstad published less papers in the *Injury*, however, these authors were the main IF contributors. Furthermore, eight of the top 20 productive authors (40 % of 20 authors) such as S.M. Perren, R.V. O'Toole, B. Bakota, J.C. Goslings, F. Hildebrand, P.N. Soucacos, D. Demetriades, and E.M.M. Van Lieshout were not the main IF contributors. Furthermore, 59 % of the top 100 IF contributing authors in terms of *CN* were found in the top 100 authors in relation to TP.

Table 5
Top nine authors with four or more highly cited papers in the *Injury*.

Author	Total papers		First-author papers		Corresponding-author papers	
	R (TP)	R (*CN*)	R (FP)	R (*CN*)	R (RP)	R (*CN*)
P.V. Giannoudis	1 (30)	1 (534)	1 (10)	1 (154)	1 (20)	1 (323)
H.C. Pape	2 (10)	2 (154)	N/A	N/A	3 (2)	108 (9)
C. Krettek	3 (7)	61 (54)	11 (1)	173 (1)	N/A	N/A
G.M. Calori	4 (6)	18 (98)	2 (4)	7 (57)	2 (3)	9 (53)
C.M. Court-Brown	4 (6)	26 (72)	3 (3)	19 (34)	3 (2)	68 (17)
M.J. Parker	6 (5)	42 (67)	N/A	N/A	13 (1)	38 (22)
N.K. Kanakaris	6 (5)	18 (98)	5 (2)	22 (32)	N/A	N/A
C. Tzioupis	8 (4)	45 (62)	11 (1)	103 (11)	N/A	N/A
R. Dimitriou	8 (4)	17 (103)	3 (3)	4 (85)	N/A	N/A

TP: total number of highly cited papers in the Injury from 1995 to 2021; FP: number of first-author papers; RP: number of corresponding-author papers; *CN* (the IF contributing indicator): sum of ($C_{year\text{-}1}$ + $C_{year\text{-}2}$); N/A: not available.

Highly cited papers

The total number of citations was obtained from the Web of Science Core Collection since publication year to the end of 2022 as the citation indicator, TC_{2022}. Articles with a TC_{year} of 100 or more, were generally named highly cited articles [53,54]. The main research fescues in a research topic might be reflected by highly cited papers. In *Injury*, 213

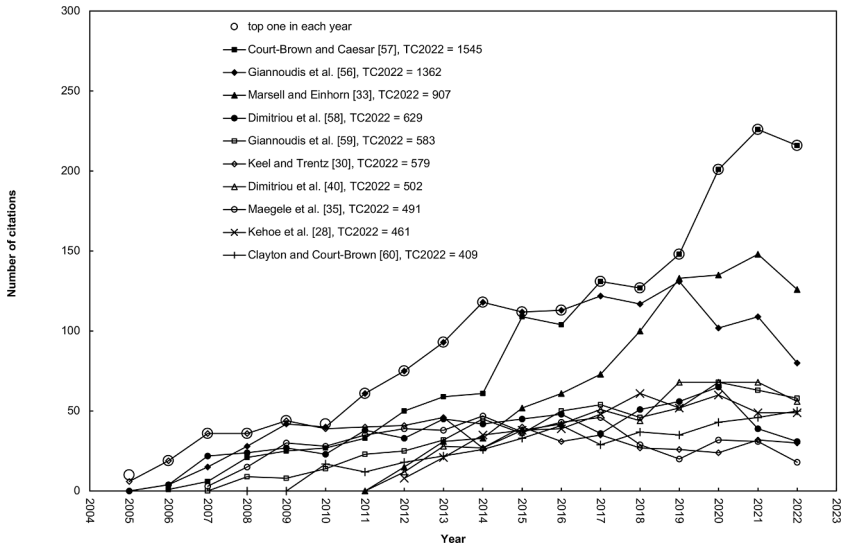

Fig. 3. Citation histories of the top ten most frequently cited papers in the *Injury*.

papers (2.5 % of 8410 papers) including 166 articles and 47 reviews were highly cited papers with TC_{2022} of 100 or more. The 213 highly cited papers were published by 806 authors including 191 authors who published first-author papers, 179 authors who published corresponding-author papers, and 11 authors who published single-author papers. Table 5 lists the top nine productive highly cited authors with four highly cited papers or more in the *Injury*. The Editor-in-Chief of the journal, P.V. Giannoudis (also P. Giannoudis), dominated the highly cited publication indicators, ranking first in all four indicators with a TP of 30 papers (14 % of 213 highly cited papers), an FP of 10 papers (4.7 % of 213 highly cited first-author papers), and an RP of 20 papers (9.5 % of 210 highly cited corresponding-author papers). Giannoudis and other 10 authors published one highly cited single-author paper, respectively. Only two of the top ten highly cited authors, P.V. Giannoudis and H.C. Pape, ranked in the top ten IF contributors. Furthermore, the only classic article [55] was entitled "Bone substitutes: An update" [56] by Giannoudis, Dinopoulos, and Tsiridis from the St James's University Hospital in the UK with a TC_{2022} of 1362. P.V. Giannoudis is the first author and corresponding author in the classic article in the *Injury*. The only classic review entitled "Epidemiology of adult fractures: A review" [57] by Court-Brown and Caesar from the Royal Infirmary of Edinburgh NHS Trust had a TC_{2022} of 1545. This classic review in *Injury* was also the most impactful in the recent year of 2022 with a C_{2022} of 216. C.M. Court-Brown with four highly cited papers ranked 4th, and with a *CN* of 179 citations ranked 21st in *Injury*.

Citation histories of the top ten most frequently cited papers in *Injury* is shown in Fig. 3 [28,30,33,35,40,56–60]. The classic article by Giannoudis et al. [56] and the classic review by Court-Brown and Caesar [57] had the highest annual citations in the *Injury* from 2011 to 2016 and 2017 to 2022, respectively. The review by Court-Brown and Caesar [57] and the article by Marsell and Einhorn [33] had a sharply increased trend after their publication year to reach a peak in 2021. However, a slightly decreasing of citation was found in 2022 with C_{2022} of 216 and 126, respectively. Most of the highly cited articles had an increasing trend after publication for couple of years and keep in a plateau. Highly cited papers would not always have a high impact or visibility after publication. Furthermore, only 52 % of the top 100 papers in terms of C_{2022} were found in the top 100 in terms of TC_{2022} in the *Injury*.

Finally,

Overall, the theme of the Top 25 IF contributing papers with the *CN* of 34 or more in the *Injury* journal can be divided in the following themes: a) bone healing/tissue regeneration 10/25 (40 %) of papers [26,28,33,37–40,43,44,46]; b) covid-19 pandemic 6/25 (24 %) [24,32,34,42,45,48]; c) polytrauma coagulopathy 4/25 (12 %) [30,35,36,47] and infection 2/25 (8 %) [25,29].

Conclusion

A total of 8410 papers, comprising 7808 articles and 602 reviews, were published in the *Injury-International Journal of the Care of the Injured* from 1995 to 2021. The ranking of the IF in four medical-related categories exhibited an upward trend leading up to 2010, though notable changes were not observed over the past decade. Analysis revealed a low significant relationship among the primary contributors to the IF, highly cited papers, and the most influential papers in 2022. Functioning as a globally recognized publication, the Injury garnered contributions primarily from the UK. The primary IF contributors comprised both from the UK and the USA. Noteworthy participation was observed from Monash University in Australia, which contributed the highest number of papers, while the University of Leeds in the UK was responsible for the most citations related to the IF. In terms of editorial involvement, the Editor-in-Chief of the Injury emerged as the most prolific contributor and IF contributor to the journal. Editors collectively also played a significant role in shaping the journal's content. The results show that highly cited authors did not hold the distinction of being the primary contributors to the IF. A more effective indicator could involve considering the total number of citations a publication receives from its year of publication up to the end of the most recent year.

Declaration of Competing Interest

All authors declare no conflict of interest in relationship to the content of the manuscript.

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