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Conference Paper — Published Version

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Suggested Citation: Fraser, Nicholas; Bräuer, Paula; Peters, Isabella (2021) : Altmetrics for evaluation of medical research in Germany, In: Glänzel, Wolfgang et. al. (Ed.): Proceedings of the 18th International Conference on Scientometrics & Informetrics (ISSI 2021), 12–15 July 2021, ISBN 9789080328228, International Society for Scientometrics and Informetrics (ISSI), Leuven, pp. 1471-1472,
https://issi2021.org/proceedings/

This Version is available at:
http://hdl.handle.net/11108/504

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Altmetrics for evaluation of medical research in Germany

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Introduction

Since 2004, all medical faculties in Germany have been partially allocated funding according to performance indicators based predominantly on two scientometric criteria: (1) the amount of awarded third party funding, and (2) the number and quality of authored publications. Whilst the exact model by which each medical faculty evaluates their own publication performance varies, the evaluation of publication 'quality' has largely been based on citation-based metrics, namely Journal Impact Factors (JIF). Such JIF-based measures have been widely as indicators of individual publication quality, both nationally by the Association of Scientific Medical Societies in Germany (Hermann-Lingen et al., 2014), and internationally through initiatives such as the San Francisco Declaration on Research Assessment (DORA; https://sfdora.org/).

An additional factor complicating the usage of citation-based metrics for medical research assessment relates to an apparent citation "preference" or "advantage" of basic research (i.e. studies of fundamental functions and systems) in comparison to clinical research (i.e. studies of health and disease treatment in human subjects; van Eck et al., 2013; Donner & Schmoch, 2020; Ke, 2020). Applying citation-based metrics at an institutional level must therefore take into account differences in the research focus of each individual institution.

Altmetrics are metrics that capture countable signals for the access, usage and sharing of research objects on online platforms. They can provide a measure of public interest or discussion of scholarly works (Tahamtan & Bornmann, 2020), which may be an important contribution to multidimensional research evaluation methods, particularly in biomedical and health science fields which have been found to rank highly in terms of sharing rates on social media and news platforms (Costas et al., 2015).

In this poster, we will present results of an investigation into how articles authored by researchers at German medical research institutions are shared on various online platforms. In doing so, we will also assess how individual altmetric indicators vary with respect to their tendencies towards research levels (basic vs clinical research).

Methods

A list of titles and ISSNs for journals indexed in MEDLINE (N = 5007), a biomedical bibliographic database maintained by the US National Library of Medicine, were downloaded. Journals were matched to those indexed in the Web of Science (WoS), leveraging the data infrastructure of the German Competence Centre for Bibliometrics (http://www.forschungsinfo.de/Bibliometrie/en/index.php), on the basis of exactly-matching titles or ISSNs. We excluded journals with the WoS classification of "Multidisciplinary Sciences"; 16 journals), which included journals with a non-exclusive biomedical focus such as *PLOS ONE* or *Scientific Reports*. In total 4,442 MEDLINE journals were matched to journals in WoS.

We subsequently extracted publication metadata (DOI, publication year, article title, abstract) for all articles published in these journals with at least one author associated with a German research institution. Articles were limited to those published between 2012 and 2018, to "Article" and "Review" types, and to those with a valid DOI. In total we extracted details of 336,193 articles.

Altmetrics information were extracted from Altmetric (https://altmetric.com), by iteratively querying the API for each article DOI. We extracted counts from 5 main sources: Twitter, Facebook, mainstream media, blogs and policy documents (which include documents issued from government guidelines, reports or white papers; independent policy institute publications; advisory committees on specific topics; and international development organisations[1]). The Altmetric API only provides a valid response when an article has been mentioned in at least one of the single sources tracked – thus queries resulting in invalid responses ("Not Found") were included with counts of 0 for all sources considered.

To understand how altmetrics vary by indicators and research levels, we rely on visualisations of term co-occurrence maps using the *VOSViewer* software (van Eck & Waltman, 2010). In brief terms, each node in the map represents a term, whereby the size of the node is proportional to the total number of times a term is mentioned in the title and abstracts of our set of articles, and the distance between the nodes is proportional to the number of times that terms co-occur together in the same document.

Preliminary Results

Figure 1 shows three term maps as an indicator of our preliminary results – full results will be presented in the conference poster. Panel A shows clustering of terms present in our sample of articles – notably we see a transition from terms that we consider to align with basic research (e.g. "cell", "protein", "property", "structure") on the left side (red), to terms that we consider to align with clinical research (e.g. "patient", "therapy", "diagnosis", "participant") on the right side (blue). Panel B replicates Panel A in structure, but differs in that colors represent the strength of mentions of a term on Twitter (darker red = more-tweeted terms). We observe a slight tendency of articles containing clinical-related terms to be more tweeted than articles containing basic-related terms. In Panel C, colors refer to the number of citations in policy documents. We observe a stronger tendency for articles containing clinical-related terms to be cited in policy documents. The results highlight variation in the response of individual metrics to different research levels in medical research; for conducting evaluation of research at the institutional level, understanding these differences will be of key importance.

Future work will expand on these preliminary results, by considering further factors influencing these relationships, such as author and publication properties, or collaboration networks.

Acknowledgements

The authors acknowledge funding from the German Federal Ministry for Education and Research, grant number 01PU17011D (QuaMedFo).

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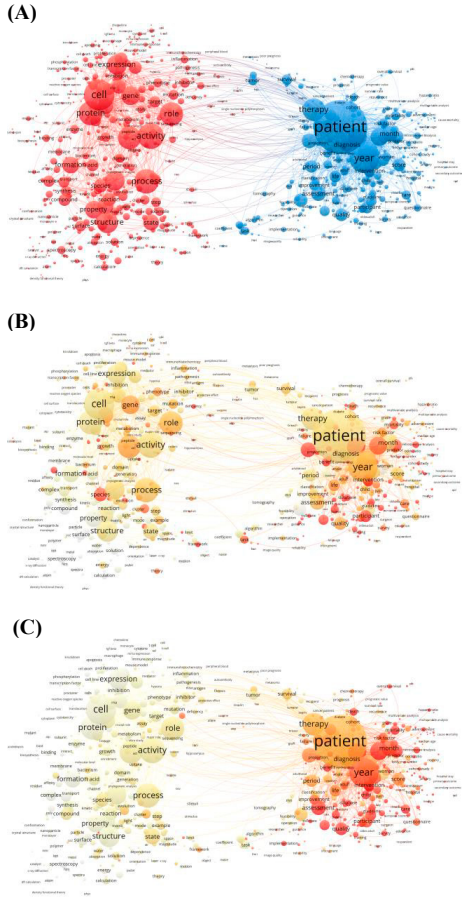

Figure 1. Term co-occurrence maps generated with VOSViewer (term frequency: > 250; term relevance: 60%) (A) Map overlain by topical clusters. (B) Map overlain by Twitter strength (darker red = terms more tweeted). (C) Map overlain by policy-document strength (darker red = terms cited more in policy documents).

[1]https://help.altmetric.com/support/solutions/articles/6000236695-policy-documents