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The coverage of basic and applied research in press releases on EurekAlert!

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Abstract

Research organisations routinely reach out to the media via press releases to announce research news and promote advances in science. This paper explores the presence of basic and applied research in press releases issued through EurekAlert!. Using a scientometric approach to classify research papers featured in press releases into basic and applied research, we found that more than half of the press releases in our dataset were related to basic research. This trend was particularly notable in life and earth sciences, physical sciences, and engineering fields. In contrast, press releases in the biomedical and health sciences, as well as in social sciences and humanities, were more frequently associated with applied research. Additionally, we present findings on the similarity and readability of press releases compared to their corresponding research papers, which confirm the role of institutional press officers in making research papers more accessible to the public and media. This adaptation appears to be more pronounced for basic research.

Keywords

Popularization of science and technology; Public understanding of science and technology; Science and media

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1 ▪ Introduction and background

Scientific organisations such as universities, research institutes, funding agencies, academic publishers and scientific societies invest in media relations to attract public and policy attention to their work [Entradas, Bauer, Marcinkowski & Pellegrini, 2024; Marcinkowski & Kohring, 2014]. These media efforts help make science more visible to society [Meredith, 2021; Peters, 2013], thereby supporting normative expectations of informing citizens and policymakers about new scientific advances and justifying public spending on science [Broer, Lemke, Mazarakis, Peters & Zinke-Wehlmann, 2023]. However, some scholars argue that institutional media relations essentially constitute a form of public relations (PR) for science, driven primarily by promotional and reputation-building objectives [Carver, 2014; Entradas et al., 2020; Väliverronen, 2021; Weingart & Joubert, 2019].

The role of press releases. Press releases are the most used tool in science PR [Autzen, 2014, 2018; Vogler & Schäfer, 2020] and have become integral to the communicative ecosystem of knowledge production in higher education [Autzen, 2018]. While they are primarily designed for media uptake, press releases also serve as a means of direct communication with the public through online and social media tools. The dual role of academic press releases — as both strategic and communicative — is supported by Polino and Castelfranchi [2012] and Autzen [2018].

Academic press releases are typically based on presenting the results of individual research papers, aiming to explain new findings in accessible language, provide context and highlight their scientific novelty or societal relevance [Autzen, 2018]. They are usually written and distributed by staff in the marketing and PR departments of academic organisations, forming a vital link between science and the mass media [Lynch, Bennett, Luntz, Toy & VanBenschoten, 2014]. Furthermore, science journalists often rely on these press releases, with studies showing a high degree of similarity between media coverage of scientific advances and the content of institutional press releases [e.g. Comfort, Gruszczynski & Browning, 2022; Heyl, Joubert & Guenther, 2020].

From a scholarly perspective, Orduña-Malea and Costas [2023] describe academic press releases as science communication objects (SCOs) produced by science communication actors, which can lead to various impacts and effects via the mass media. They position press releases as objects of quantitative analytics, similar to how research papers are studied in scientometrics. Scientometrics involves the quantitative study of science, scientific communication, and science policy [Hess, 1997], with a particular focus on measuring and analysing scientific publications [Leydesdorff & Milojević, 2012]. Consequently, press releases constitute a valuable data source for exploring how research organisations communicate science, including the emphasis on basic versus applied sciences.

The role of institutional science press officers. The crucial role of PR officers as sources of information for journalists and the general public has long been recognised [e.g., Nelkin, 1995]. From a theoretical standpoint, institutional press officers who prepare and distribute research-based press releases function as boundary spanners between science and mass media. This role demands specialised knowledge of the media landscape and the ability to balance different interests and expectations [Lo & Peters, 2013]. When preparing press releases, they must adhere to the norms and values of science regarding accuracy and objectivity, while also enhancing media appeal by responding to news values [Harcup &

O'Neill, 2017]. This means that they face the challenge of making science newsworthy without compromising its integrity and accuracy [Autzen, 2018]. To navigate this challenge, research organisations typically employ expert communicators to act as intermediaries between researchers and the media — professionals who can identify research with news potential and apply media logic to achieve press coverage for institutional research [Dudo, 2015; Marcinkowski, Kohring, Fürst & Friedrichsmeier, 2014; Shipman, 2014].

One of the many challenges that institutional press officers face is deciding which research articles to promote to the mass media via press releases. Since the primary aim of a press release is to attract media attention and secure coverage, it is reasonable to expect that press officers will select research articles that align with contemporary journalistic news values [Harcup & O'Neill, 2017], particularly those addressing issues that are relevant to everyday life, such as health research [Bartlett, 2002]. Since applied research topics are more closely related to practical applications in daily life, they are more likely to meet journalistic news values and selection criteria. Consequently, one might hypothesise that the majority of press releases would feature applied science.

Another key task for institutional press officers who write research-based press releases is the translation of scientific content to make it more accessible, which includes removing the jargon that often characterises academic papers [Baram-Tsabari et al., 2020; Willoughby, Johnson & Sterman, 2020]. Making academic research more accessible to lay audiences, including the media, is particularly important given the evidence that jargon can hinder people's ability to process scientific information and reduce their interest in engaging with and identifying with science [Shulman, Dixon, Bullock & Colón Amill, 2020].

1.1 ▪ *EurekAlert! as an example of a global press release service*

Instead of relying on keeping up-to-date institutional media contact lists, research organisations increasingly use global press release services to reach an expansive network of science journalists and achieve global visibility for their work [Autzen, 2018]. Since its launch in May 1996 by the American Association for the Advancement of Science (AAAS), EurekAlert! has become one of the most extensive science press release services, significantly influencing the coverage of science in the mass media [Lane, 2016; Stockton, 2016].

EurekAlert! is a nonprofit distribution platform for science-based press releases that provides science news to journalists and the public. Organisations such as universities, journal publishers, government agencies, corporations, and other research organisations pay a fee to submit their press releases. EurekAlert! only publishes press releases that meet specific eligibility criteria, including the requirement that they be posted by public information officers (PIOs) employed at eligible organisations that conduct, publish, or fund scientific research. All press releases are freely available to the public. Journalists can apply for free access to a section of the website reserved for reporters, where they can view embargoed press releases and supporting publicity materials provided by academic journals and research institutions for exclusive use by working journalists.

The number of press releases posted annually on EurekAlert!, along with the organisations posting them and their country affiliations, has steadily increased since the launch of this service. By the end of February 2021, 455,703 press releases were available online from EurekAlert! [Orduña-Malea & Costas, 2023]. Due to its size and ongoing growth, EurekAlert!

is widely recognised as the most used news source among science journalists worldwide and has a significant impact on how science is covered in the mass media [Stockton, 2016]. This influence extends to determining which scientific research becomes visible in the public arena [Autzen, 2018].

1.2 ▪ *Basic and applied research*

The discourse surrounding the concepts of basic and applied research dates back to the 19th century, with the understanding of "basic research" evolving through changing science-society interactions and the demands of science policy [Schauz, 2014]. Vannevar Bush's definitions in his 1945 report "Science — the Endless Frontier" are particularly noteworthy [Bush, 2020]. He describes basic research as being conducted "without thought of practical ends", resulting in "general knowledge and an understanding of nature and its laws" [Bush, 2020, p. 17]. This knowledge would form the basis for addressing "practical problems", with applied research providing "complete answers" [Bush, 2020, p. 17]. Although brief, these definitions had a profound influence in the decades that followed [Schauz, 2014].

Bentley, Gulbrandsen and Kyvik [2015] define basic research as research conducted to advance knowledge for its own sake. According to these authors, knowledge produced within the context of application has become the dominant form of knowledge production. Consequently, 'pure', 'blue-skies', 'theoretical' or 'fundamental' research is increasingly relegated to a minority role, even in research settings that traditionally supported basic research.

Setting aside the more conceptual questions surrounding basic and applied research, studies of science have investigated methods for classifying research papers into these categories. In the area of biomedicine, Narin, Pinski and Gee [1976] introduced four research levels: clinical observation, clinical mix, clinical investigation, and basic research, and classified a set of approximately 900 journals accordingly. Their analysis of citation relationships revealed that journals focused on more applied research levels cited journals from more basic research levels more frequently than the reverse. Building on Narin et al. [1976], Boyack, Patek, Ungar, Yoon and Klavans [2014] proposed a classification at the article level for a broad range of fields. Their approach considers not only cited references but also the titles and abstracts of the research papers. This resulted in a classification into four research levels, with more general labels: applied technology, engineering-technological mix, applied research, and basic scientific research [Boyack et al., 2014]. This approach has been used in subsequent scientometric research [e.g. Álvarez-Bornstein, Díaz-Faes & Bordons, 2019; Donner & Schmoch, 2020] and provides a technical, if not conceptual, approach to distinguishing between basic and applied research. Consequently, it offers a useful technique for classifying press releases as either reporting on basic or applied research.

1.3 ▪ *Scholarship about communicating basic research*

Sawyer and Smith [2024] define the communication of basic research as "communication of research for which applications are neither a guarantee nor the point", encompassing communication of the work of scientists who conduct such research. This type of science communication requires communicators to strategically engage with audiences and set concrete communication goals that will lead to measurable outcomes resulting from their

efforts [Besley & Dudo, 2022]. However, articulating such communication goals can be more challenging for scientists focused on basic research compared to those working on applied research [Budenholzer, Sawyer, Borchelt & Smith, 2023; Hendricks & Fond, 2023].

Newman et al. [2021] found that among approximately 1.5 million science communication articles in STEM journals, only 43 focused on communicating basic science, and none addressed public engagement with basic science. Additionally, little attention is paid to communicating basic science research in science communication journals. Besley, Dudo, Yuan and Ghannam [2020] found that less than 5% of 2,386 publications in top-tier science communication journals focused on how or why to communicate basic science.

Borchelt, Sawyer and Smith [2022] confirm the general lack of evidence regarding best practices for communicating about and engaging with basic science, highlighting the complexities associated with the social and societal questions of public engagement in this field. Furthermore, there is limited insight into the motivations of researchers in basic sciences for engaging with public audiences [Newman et al., 2021]. Policymakers are also concerned about the public's lack of awareness about how and where basic research is conducted, how it is funded, and why it needs long-term support [Sawyer, Church & Borchelt, 2021]. In this context, understanding how different types of research are communicated to the media, including the difference between basic and applied science, is a crucial topic in science communication research.

1.4 ▪ *Research questions*

Given the differences between basic and applied science, and the significance of press releases as tools in institutional science communication, our first two research questions explored how press releases on EurekAlert! featured basic and applied research, as well as different research fields and topics over time.

RQ1) How are EurekAlert! press releases related to basic and applied research distributed over time?

RQ2) How are press releases on EurekAlert! distributed across broad research field and according to scientific topics?

Since research institutes employ specialist communicators to select and craft press releases, our next research question aims to explore the comparative text similarity and readability of press releases and their corresponding research papers in basic and applied research across broad fields. Therefore, research question three investigated how the wording of press releases differs from the titles and abstracts of the corresponding research articles, serving as a proxy to investigate the challenges of making research more accessible to a lay audience and how these challenges vary between basic and applied sciences.

RQ3) To what extent is the text of EurekAlert! press releases adapted compared to the wording of the titles and abstracts of the scientific papers they report on, and how does this adaptation differ between basic and applied research?

Our final research question examined the role of the institutions issuing press releases to explore the influence of institutional settings and the roles played by science press officers, as discussed in our introduction.

RQ4) Which journals and institutions issue the most press releases on EurekAlert!, and how are these press releases divided between basic and applied research?

2 ▪ Methodology

Our study combines a dataset of press releases from EurekAlert!, including metadata and full texts, with the metadata of research papers referenced in those press releases. We collected the press release data using a web-crawling approach, identifying a total of 495,180 press releases published before March 2023 [Zhang, Dudek, Orduña-Malea & Costas, unpublished]. Since press releases on EurekAlert! were not connected to digital object identifiers (DOIs) until 2015, we focused on data collected from 2015 to 2022. After filtering for press releases that mentioned a scientific article via a DOI, 129,319 press releases remained. Of those, a final set of 116,777 could be matched via DOIs with research papers in OpenAlex, an open database of publication metadata.[1] We subsequently collected the titles, abstracts, journal names, and author affiliations of these publications from OpenAlex.

Below, we describe how we classified the research papers in our dataset into broad research fields and research levels. For the textual comparisons between research papers and their associated press releases, we introduce methods of text similarity modelling and the calculation of a reading ease score.

2.1 ▪ *Classification into broad research fields*

To assign research papers (and, by extension, press releases) to broad research fields, we used a classification of articles from OpenAlex, extracted in February 2023 and available in-house at the Centre for Science and Technology Studies (CWTS). This publication-level classification is a predecessor of the approach described by Van Eck and Waltman [2024] and follows the methodology described by Waltman and Van Eck [2012]. It algorithmically clusters scientific papers into 4,521 research areas based on citation relationships. These areas are then linked to five broad main fields.

We matched all research papers in our dataset with the pre-existing classification data and assigned each one to a broad research field. The same field was also assigned to the associated press release. Table 1 lists the five broad main fields and the number of press releases per field in our dataset from 2015 to 2022, totalling 116,777 press releases. The data, including the classification of research papers, is available in the supplementary material accompanying this manuscript.

2.2 ▪ *Classification into research levels*

We followed the approach described by Boyack et al. [2014] to assign research papers to basic and applied research levels. Boyack et al. [2014] trained a multinomial logistic regression model to classify a large set of publications into four research levels. This model was trained using textual input from over 400,000 publications across more than 2,000 journals that had a pre-existing classification into the four levels. The trained model was then used to classify over 25 million individual publications based on their titles, abstracts, and

1. https://openalex.org/.

Table 1. Press releases on EurekAlert! (2015 to 2022) classified according to the broad research field of the research papers.

Broad research field	Abbreviation	Number of press releases
Biomedical and health sciences	BHS	31,567
Life and earth sciences	LES	39,293
Mathematics and computer science	MCS	4,052
Physical sciences and engineering	PSE	26,443
Social sciences and humanities	SSH	15,422

references [Boyack et al., 2014]. We obtained the dataset of EurekAlert!-linked DOIs classified into the four research levels from the authors of the classification and matched the research papers and the associated press releases accordingly.

However, while Boyack et al. classify research into four levels — basic scientific research, applied research, engineering and technology mix, and applied technology — we categorised research papers into only two levels: basic research and applied research. All labels except "basic research" were re-labelled as "applied research". This simplification helps to more clearly illustrate the differences between basic and applied science. By combining the three more applied levels into one, we aimed to compare two research levels that are more or less equally represented. Previous research has also found the distinctions between the three applied research levels in the approach by Boyack et al. [2014] to be inconclusive, leading to a similar merging of categories as done here [Donner & Schmoch, 2020]. For completeness, results based on the original classification by Boyack et al. can be found in Appendix A.

2.3 ▪ *Text similarity*

We employed a TF-IDF-weight vector space model to generate vectors representing the titles of academic press releases and research papers. The vector space model (VSM) [Salton, Wong & Yang, 1975] is a methodological framework that transforms text into multidimensional vectors based on the presence or absence of keywords and their corresponding weights. We used TF-IDF to calculate keyword weights and build the keyword dictionary. TF-IDF [Salton & Buckley, 1988] evaluates the significance of a keyword within a given text by combining two metrics: term frequency (TF) and inverse document frequency (IDF), as follows:

$$TF\,(t,d) = \frac{\text{Number of times term } t \text{ appears in document } d}{\text{Total number of terms in document } d}$$

$$IDF\,(t,D) = \log\left(\frac{N}{|\{d \in D\colon t \in d\}|}\right)$$

In the equation above, *N* represents the total number of documents in the corpus, and $|\{d \in D\colon t \in d\}|$ denotes the number of documents in which the term t appears. Term Frequency (TF) measures how frequently a term occurs within a document, while Inverse Document Frequency (IDF) evaluates the term's rarity across the entire document corpus.

A term with a lower frequency across the corpus has a higher IDF value, indicating its importance in distinguishing between documents. By integrating the local importance of a

term within a document (TF) with its global rarity (IDF), TF-IDF effectively measures a term's overall significance.

We utilised the titles and full texts of academic press releases, along with the titles and abstracts of the corresponding research papers, to compute TF-IDF vectors. This approach enabled us to construct a TF-IDF vector space model and generate the corresponding TF-IDF vectors for the titles.

Cosine similarity was used to calculate the distance between two text vectors, specifically, the titles of the press releases and the titles of the research papers mentioned in those press releases. The cosine similarity formula is as follows:

$$\text{Cosine Similarity} = \cos(\theta) = \frac{A \cdot B}{|| A || \cdot || B ||}$$

In this equation, A and B represent the TF-IDF vectors of the compared titles, while ||A|| and ||B|| represent the magnitudes of vectors A and B, respectively. We quantified the textual similarity between the titles of the press releases and the titles of the associated research papers using this formula.

2.4 ▪ *Reading ease*

To measure the readability of academic press releases and the abstracts of associated research papers, we used the Flesch Reading Ease Score (FRES). First published in 1943 and detailed by Flesch [1948], FRES evaluates how easily readers can understand English-language passages. Although the use of FRES has been criticised for its superficial focus on linguistic information [Lin, Su, Lai, Yang & Hsieh, 2009; Hartley, 2016], it is considered the most suitable tool to measure reading ease compared to other methods [Zhou, Jeong & Green, 2017; Barbic et al., 2015]. FRES has been widely adopted across various disciplines to gauge text difficulty [Friedman, Hoffman-Goetz & Arocha, 2004; Hayden, 2007; Van Wesel, Wyatt & ten Haaf, 2013].

The FRES is particularly suitable for assessing the readability of longer texts or passages. It calculates reading difficulty based on the percentage of words in the text and the number of syllables in those words. The formula for calculating the reading ease (RE) score is as follows:

$$RE = 206.835 - 1.105\left(\frac{\text{total words}}{\text{total sentences}}\right) - 84.6\left(\frac{\text{total syllables}}{\text{total words}}\right)$$

A higher RE score indicates that a text is easier to read, while a lower score suggests that a text is more difficult. For example, texts with scores between 90 and 100 are considered very easy to read, similar to conversational English, while scores between 0 and 30 indicate very complex texts suitable only for advanced readers.

By applying the FRES, we can effectively compare the readability of the full text of academic press releases and the abstracts of research papers, offering insights into how accessible these documents are to a general audience.

3 ▪ Results

3.1 ▪ *Distribution over time*

In response to our first research question (i.e. the distribution of press releases on EurekAlert! related to basic and applied research over time), we found that, as shown in Figure 1, the overall number of EurekAlert! press releases increased from 2015 to 2022, with more than half reporting on academic papers related to basic research. Considering that only 25.9% of all research papers globally focus on basic research, according to Boyack et al. [2014], the proportion of press releases related to basic research is twice as high as expected. Furthermore, over time, the number of press releases pertaining to basic research increased at a faster rate compared to those related to applied research.

The relative decline in the share of press releases about basic research compared to applied research observed from 2021 to 2022 is noteworthy. We suggest that this drop reflects a greater focus on applied research and its media communication during the COVID-19 pandemic.

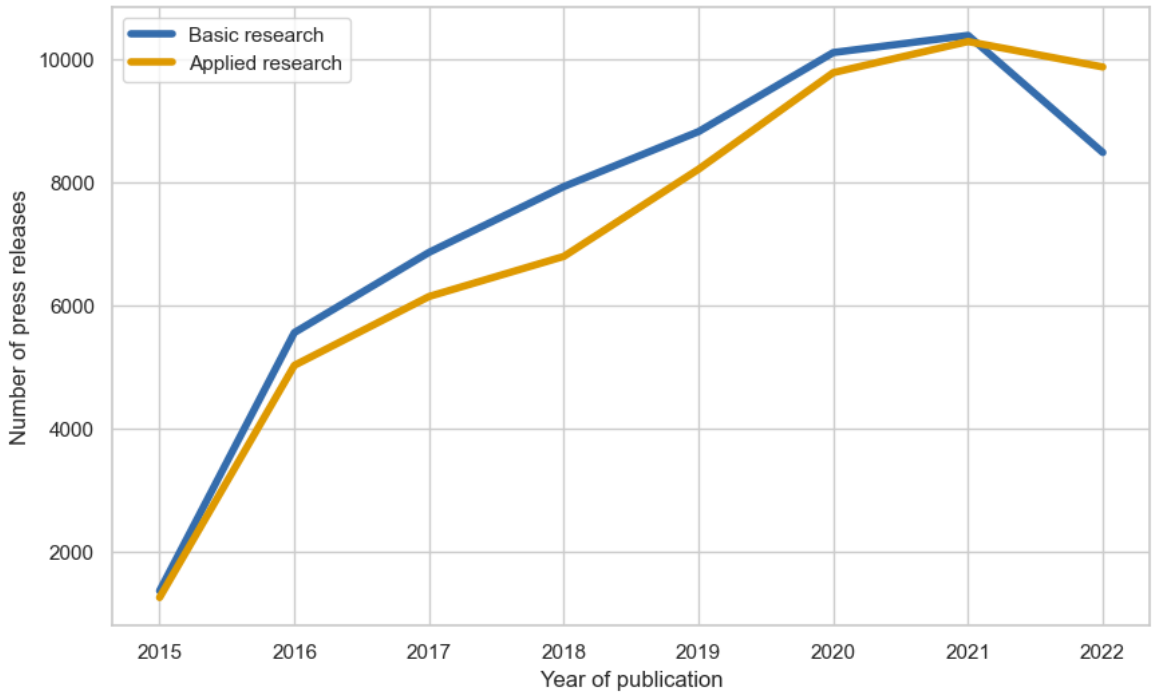


Figure 1. The number of EurekAlert! press releases reporting basic vs applied research from 2015 to 2022.

3.2 ▪ *Distribution of press releases on basic and applied research per broad research field and across scientific topics*

With our second research question, we aimed to explore how EurekAlert! press releases on basic and applied research are distributed across broad research fields and specific scientific topics.

Figure 2 illustrates the distribution of press releases focused on basic versus applied research from 2015 to 2022 across five broad research fields. The data reveal notable variations between basic and applied research press releases across these fields. The number of press releases increased in biomedical and health sciences, as well as social sciences and humanities, with a consistent focus on applied research. This suggests that press releases in these fields were more focused on practical applications. In contrast, the mathematical and computer sciences exhibited a similar upward trend in press releases for both basic and applied research, although there was a slight decline in press releases about basic research starting in 2020. In the physical sciences and engineering, as well as in life and earth sciences, basic research was more prominently featured than applied research. This indicates that press in these fields predominantly reported on fundamental scientific investigations. To provide more detail on the specific scientific topics covered in our press

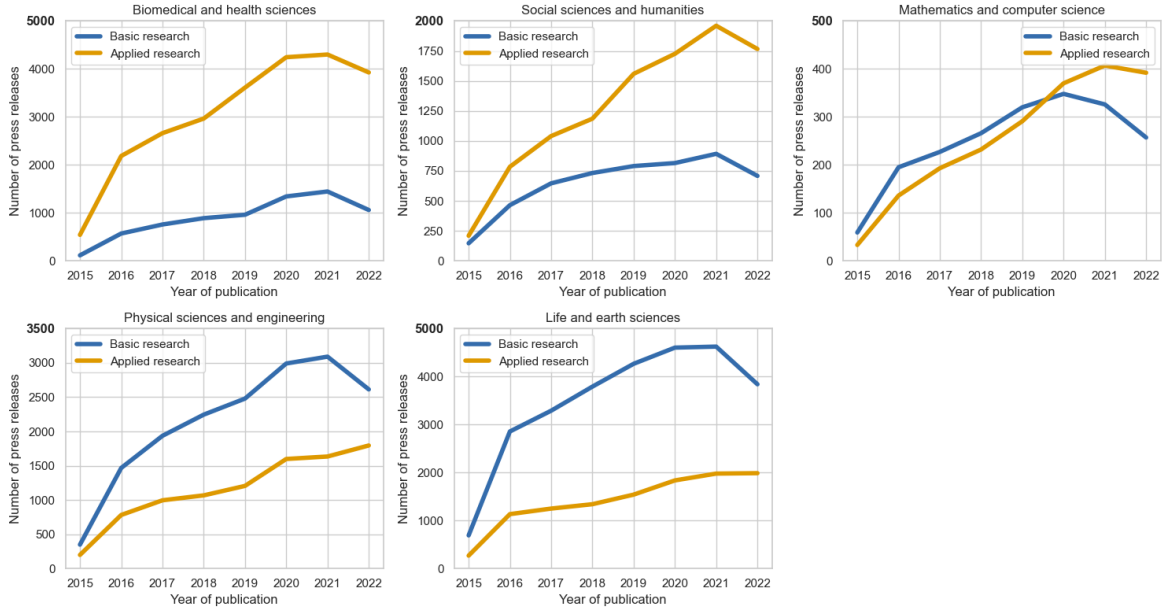


Figure 2. Number of EurekAlert! press releases reporting on basic versus applied research over time (2015 to 2022) and across five broad fields of research. This breakdown presents the total number of press releases from Figure 1 across these fields over time.

release dataset, we conducted an analysis of the keywords used in EurekAlert! press releases. EurekAlert! assigns a series of keywords to each press release. Figure 3 presents a co-occurrence map of these keywords, with colours indicating the average values of basic research (dark colours: 1 on the colour scale) and applied research (light colours: 2 on the colour scale) for each keyword.

The analysis shows that press releases related to physical and life sciences were more closely associated with basic research, while those focused on social sciences, health, and medicine, were more aligned with applied sciences. Notably, psychological science demonstrated a distinct orientation towards applied science but also included some components of basic science, such as brain structure and memory processes. When analysing keyword co-occurrence maps for each broad research field (Figure 4), we observed distinct patterns: biomedical and health sciences, as well as social sciences and humanities, showed a greater tendency towards applied research, as indicated by lighter colours on the

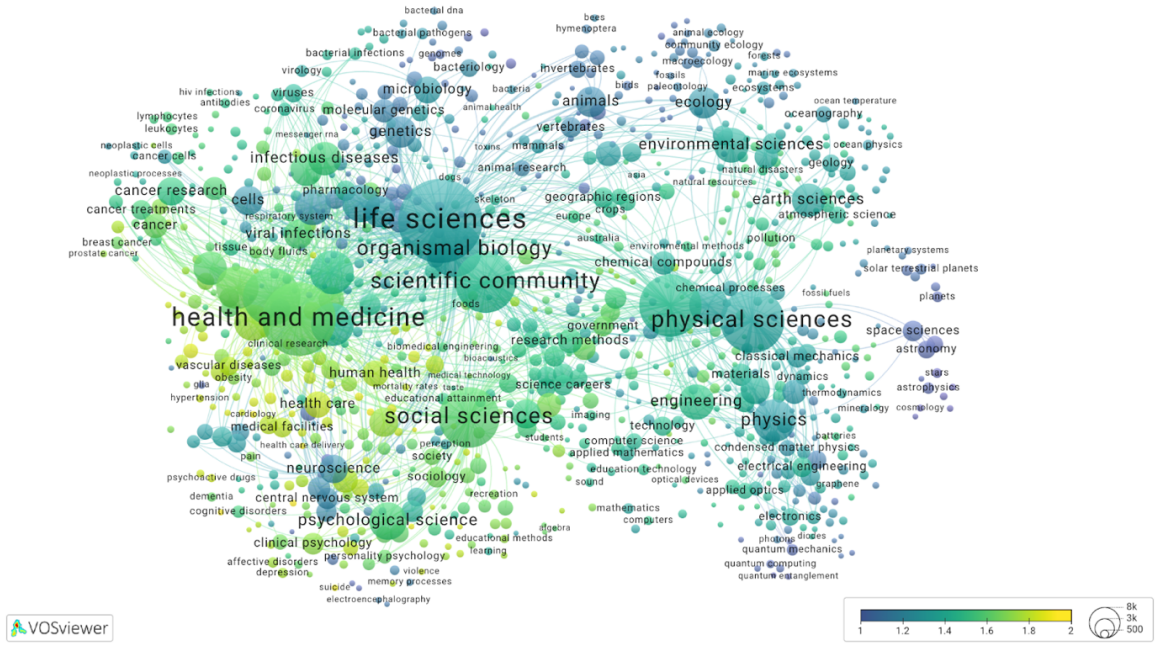


Figure 3. EurekAlert! keyword co-occurrence map (from 2015 to 2022). Colours indicate the average applied (light colours) or basic (dark colours) nature of the research papers reported in the press releases. More detailed information can be found on the interactive map, accessible via link or QR code: https://tinyurl.com/2cueaacw.

map. Life and earth sciences, and physical sciences and engineering, were more closely associated with basic research, represented by darker colours. Mathematics and computer sciences displayed a more balanced distribution between basic and applied research.

3.3 ▪ *Textual comparisons — comparing the abstracts of research papers and corresponding press releases*

3.3.1 ▪ *Similarity of titles*

Our third research question aimed to explore how EurekAlert! press releases adapt the titles and abstracts of the research papers they report on, and how this adaptation varies between basic and applied research.

Figure 5 illustrates the comparison of title similarities between press releases and the titles of the corresponding research articles, categorised by basic research (blue) and applied research (yellow) over time (2015 to 2022). The median and average title similarity for basic and applied research remained relatively stable, ranging from 0.2 to 0.4. The TF-IDF similarity model measures word overlap between press release titles and research paper titles rather than semantic similarity. A higher similarity score indicates a higher degree of word overlap between the two titles, while a 0.2 to 0.4 range indicates a relatively modest level of similarity.

Notably, titles of research articles focused on applied research were more similar to their corresponding press releases than those of basic research articles. This suggests that press releases for applied research maintain closer alignment with the original titles, whereas press

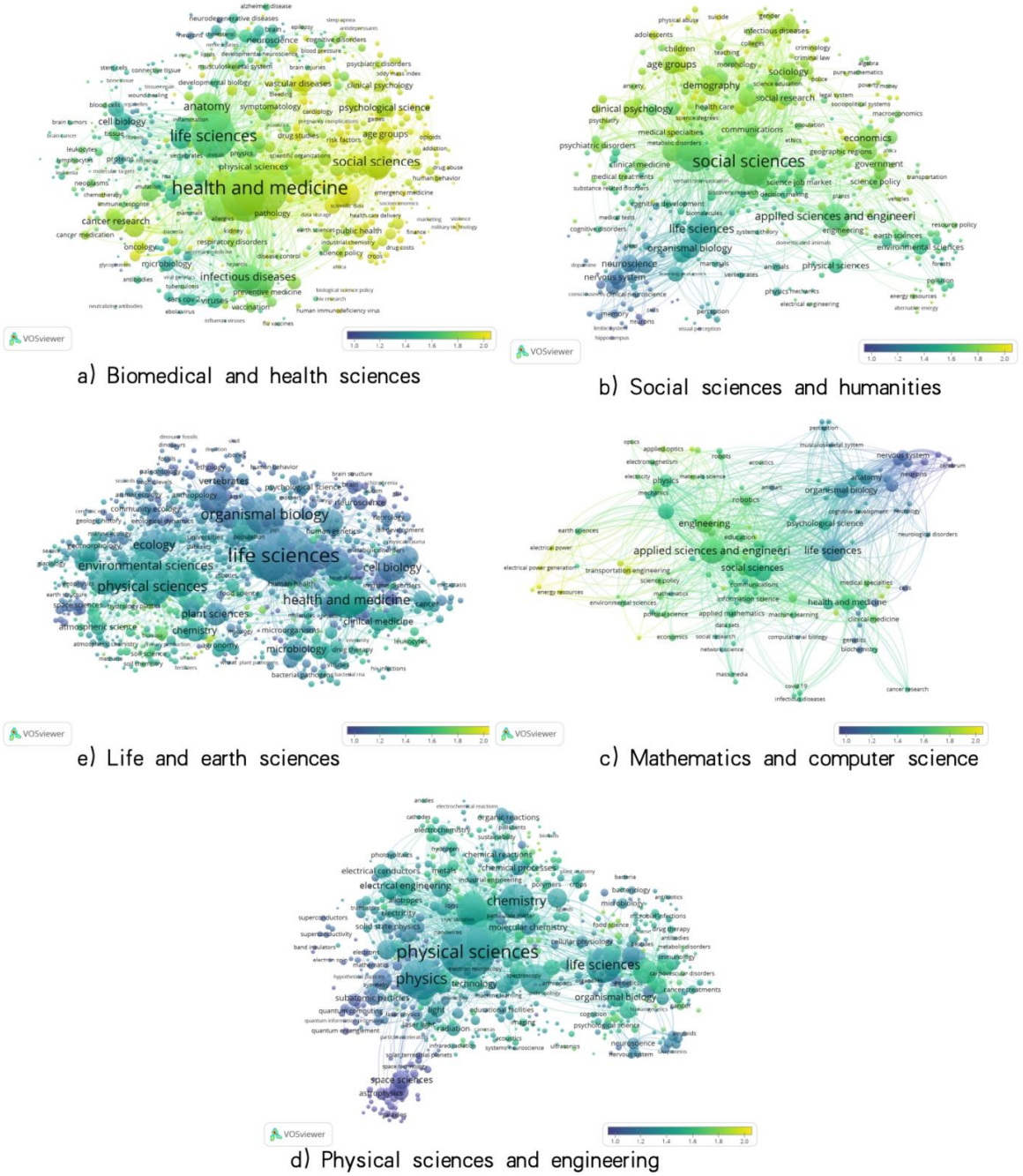


Figure 4. Co-occurrence maps of keywords in EurekAlert! press releases across five broad research fields (from 2015 to 2022). Colours indicate the predominant nature of the research papers associated with the press releases, from basic research (darker colours, towards blue) to applied research (lighter colours, towards yellow). For individual links to interactive maps, see Appendix B.

releases for basic research require greater adaptation (or 'translation') to make it accessible to non-expert audiences and to add an element of media appeal. This finding highlights the significant role of institutional press officers — the science communicators who write the press releases — in enhancing the media appeal and public accessibility of basic research.

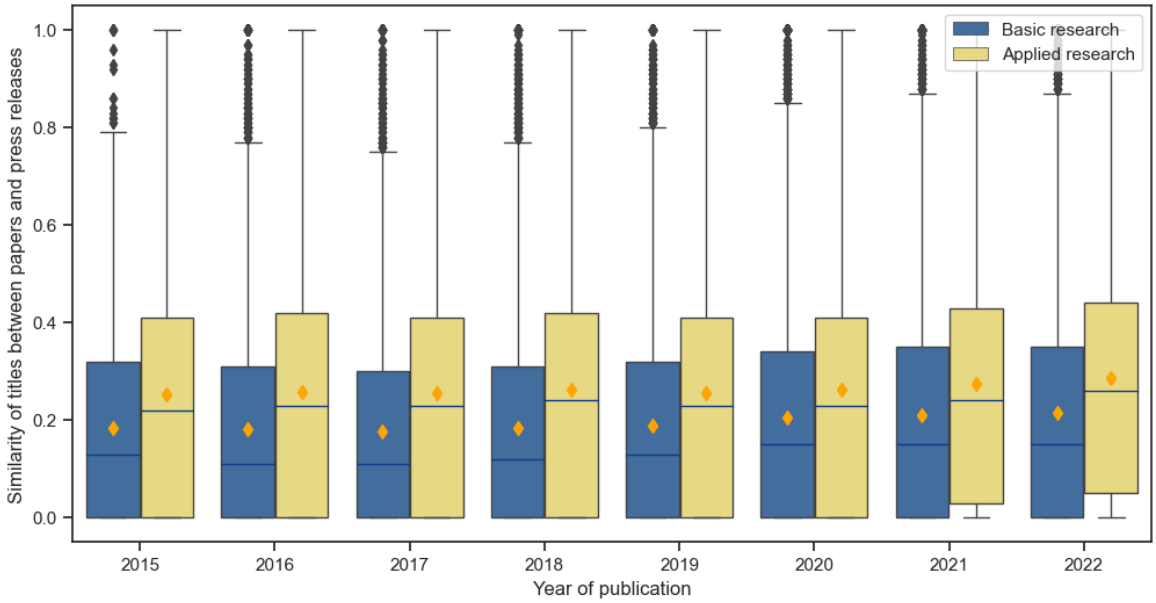


Figure 5. (Dis)similarity of titles between press releases and corresponding research papers over time (2015 to 2022), using the TF-IDF to infer similarity. Average values are marked by the rhombus symbol in orange.

Across all broad research fields, the titles of press releases on applied research were more similar to those of corresponding research papers compared to titles of press releases and research articles on basic research (see Figure 6). Notably, biological and health sciences (BHS) had the highest median and average title similarities for applied research. This indicates that press releases in this field tend to retain a closer alignment with the original research paper titles.

However, no category exceeded a similarity score higher than 0.4, indicating that press release titles are generally substantially different from the original research paper titles. This lower similarity underscores the frequent practice of adapting or rewriting titles to enhance their accessibility and appeal to a broader audience. Although there are instances where press release titles closely match the original paper titles, these cases are relatively uncommon.

3.3.2 ▪ *Reading ease*

To further explore the extent of adaptation from research paper to press release (RQ3), we compared the readability of press releases with the abstracts of associated research papers. Figure 7 illustrates that, across all research fields, the full texts of press releases are generally more readable than the abstracts of the corresponding research papers.

Lower readability scores indicate more difficult texts. Reading scores of 30–50 indicate a college student reading level, while scores of 50–60 indicate a high school student reading level. Notably, the abstracts of applied research articles generally have higher readability scores (or are easier to read) than basic research abstracts. However, there are significant differences between basic and applied research abstracts across broad research fields. For

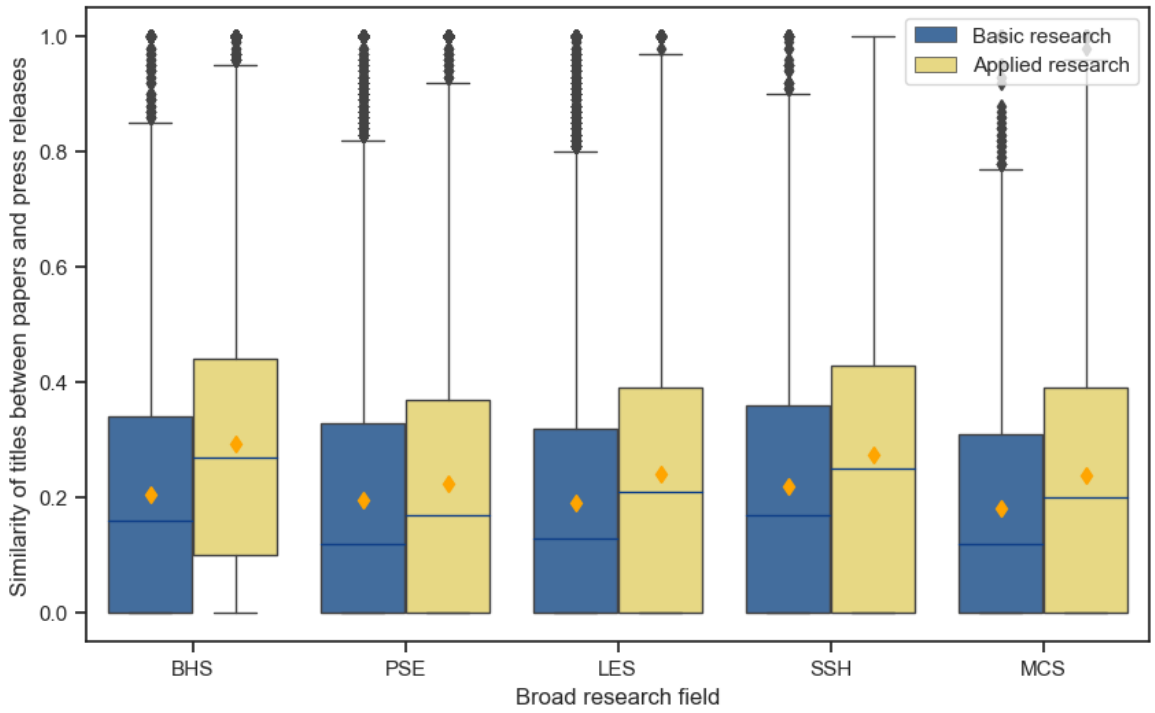


Figure 6. The distribution of title similarities (using the TF-IDF model) between press releases and research papers across broad research fields, differentiated by basic research (blue) and applied research (yellow) from 2015 to 2022. (BHS = biomedical and health sciences; PSE = physical sciences and engineering; LES = life and earth sciences; SSH = social sciences and humanities; MCS = mathematics and computer sciences). Average values are marked by the rhombus symbol in orange.

example, the average readability score for abstracts of papers related to basic research in biological and health sciences is 31, while for applied research in the same broad field it is 42. The differences in other fields are less marked. For example, the scores in life and earth sciences are 34 and 37, respectively.

In general, across all broad fields of research, press releases demonstrate higher readability than the abstracts of the corresponding research papers. The readability gap between basic and applied research is less pronounced in press releases compared to the differences observed in research paper abstracts. This again reflects the efforts of those who write research-based press releases to make research findings more accessible to public and media audiences.

Both the abstracts and press releases for applied research tend to be more accessible, suggesting that its more practical and societal focus demonstrate the social and policy relevance of applied research findings.

3.4 ▪ *Institutional origins of press releases and the research featured in press releases on EurekAlert!*

Our final research question (RQ4) examined the institutional origins of press releases on EurekAlert! and their associated research papers. To answer this question, we considered three different entities: the journals in which press-released research has been published,

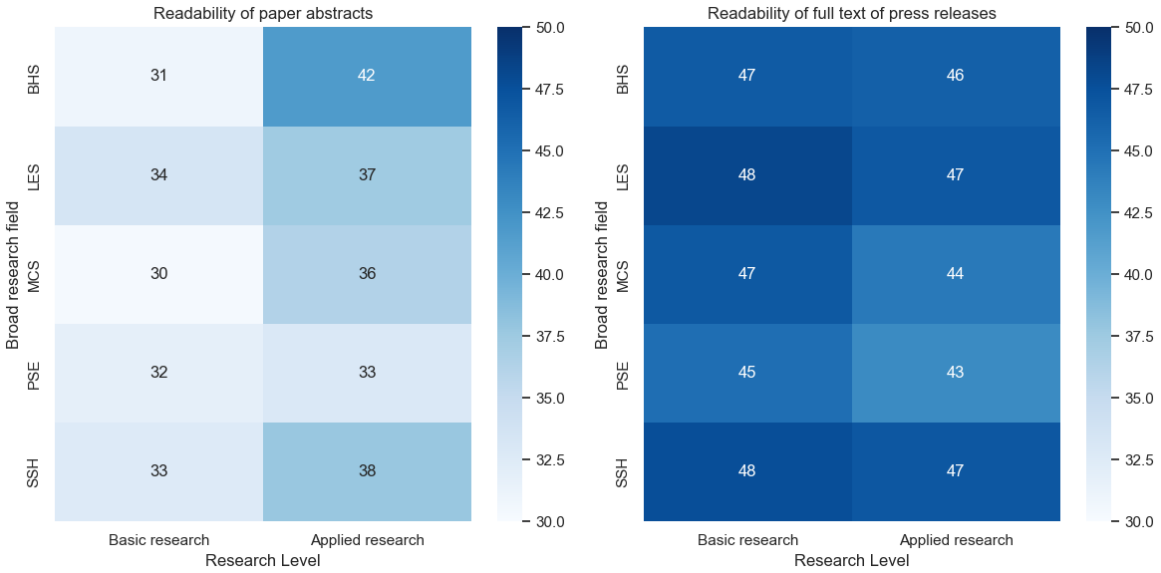


Figure 7. The average readability of press releases and abstracts of research papers across five broad research fields and levels (basic versus applied research) from 2015 to 2022. The average readability scores range from 30 to 48, with higher scores indicating texts that are easier to read. (BHS = biomedical and health sciences; LES = life and earth sciences; MCS = mathematics and computer sciences; PSE = physical sciences and engineering; SSH = social sciences and humanities).

the affiliations of the authors of press-release research papers, and the institutions issuing these press releases. Again, we distinguished between basic and applied research.

3.4.1 ▪ *Journals of research featured via press releases*

Figure 8 lists the 15 academic journals that most frequently published research papers resulting in press releases on EurekAlert!. It also shows the split between press releases focused on basic versus applied research. The journal with the highest number of press releases was *Nature Communications*, followed by *PNAS, Science, Nature* and *PLOS ONE*. Notably, most press releases from the journals featured in Figure 8 were about basic research (blue) rather than applied research (orange). The findings suggests that these high-impact journals prioritise promoting basic research to the mass media over applied research. This focus on basic research could stem from its foundational nature, which may elicit more interest from the scientific community and the public.

3.4.2 ▪ *Institutional affiliations of authors of research papers*

Figure 9 presents the top 15 author affiliations of the research papers featured in our dataset of EurekAlert! press releases. Most author affiliations are universities, and the press releases from these institutions show a fairly balanced representation of basic and applied research. However, some research institutes, such as the CNRS (*Centre National de la Recherche Scientifique*) and the Chinese Academy of Sciences, prominently feature basic research in its press releases.

In contrast, hospitals like Massachusetts General Hospital and Brigham and Women's Hospital primarily focus on applied research in their press materials, which aligns with their

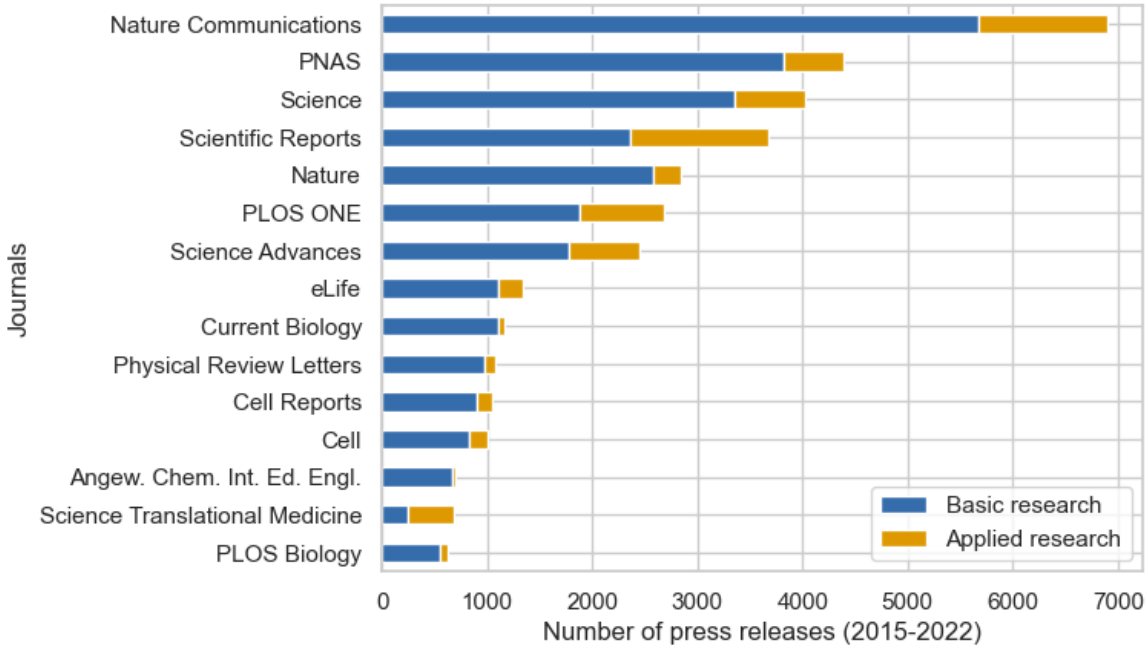


Figure 8. Top 15 journals according to the number of research papers mentioned in EurekAlert! press releases from 2015 to 2022, categorised according to basic research (blue) and applied research (orange).

medical and healthcare orientation. Our findings show that research institutions with strong reputations in both basic and applied research strive to make their work accessible and visible to the mass media to achieve media coverage. The emphasis on applied research across many institutions suggests that both the public and the media are particularly interested in research with direct practical applications and societal benefits.

3.4.3 ▪ *Institutions issuing press releases via EurekAlert!*

Figure 10 shows the fifteen research organisations that issued the most press releases between 2015 and 2022, confirming that most press releases originate from scientific associations and journals, followed by universities, hospitals and science academies. The American Association for the Advancement of Science (AAAS) tops the list with the highest number of press releases, with a predominant focus on basic research. Other significant contributors include PLOS, Wiley, and Cell Press, all of which have issued substantial numbers of press releases for both basic and applied research. Institutions like Massachusetts General Hospital, Brigham and Women's Hospital, and BMJ (British Medical Journal) were actively involved in issuing press releases, which likely reflects their emphasis on applied research in the medical and health sectors.

4 ▪ Discussion

This study presents a novel, data-driven approach to examining the public communication of basic and applied science through press releases. By combining scientometric methods with Natural Language Processing (NLP) and press releases, we can systematically classify,

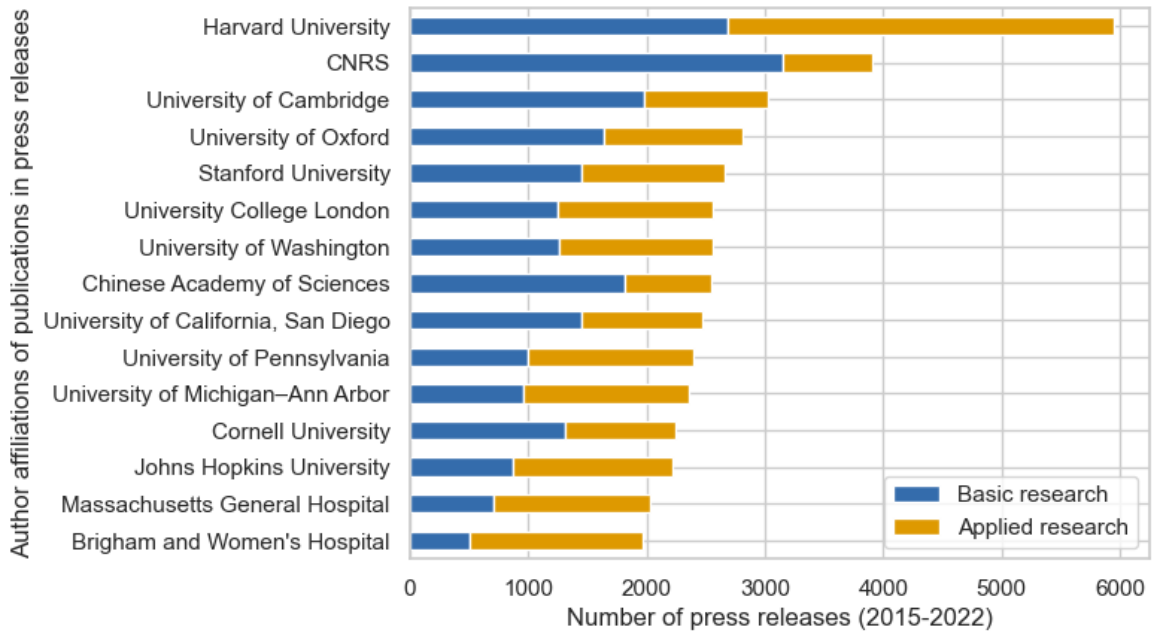


Figure 9. The top 15 author affiliations of research papers mentioned in press releases categorised into basic research (blue) and applied research (orange) from 2015 to 2022.

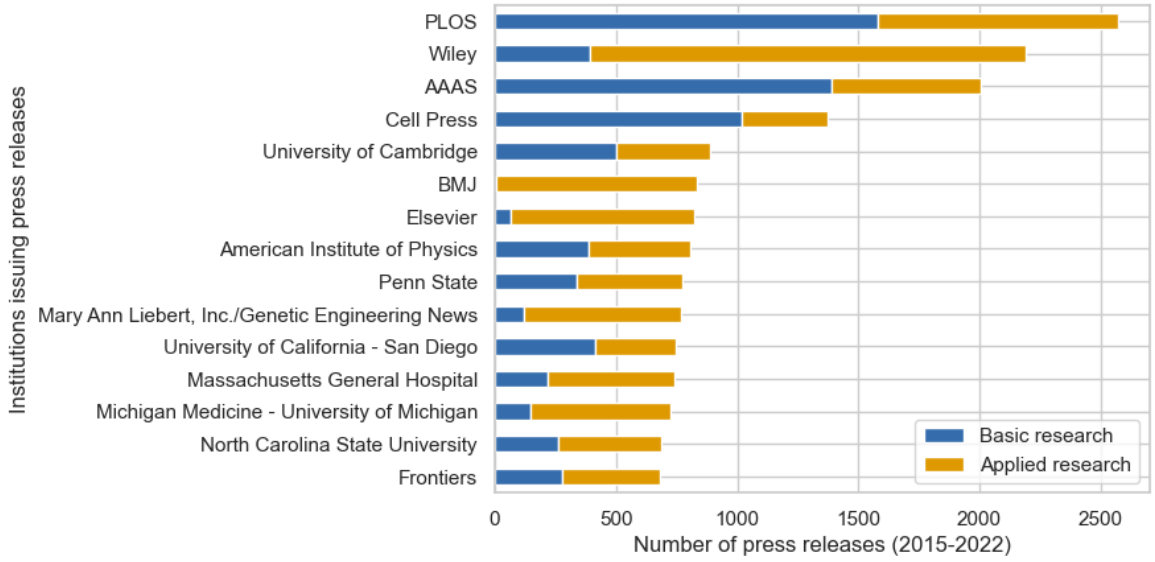


Figure 10. The number of press releases issued on EurekAlert! by the top 15 contributing institutions from 2015 to 2022. The data is categorised into basic research (blue) and applied research (orange).

analyse and compare the content and readability of academic and media-oriented communications. Consequently, our study serves as an example of quantitative analysis in science communication research.

Our analysis revealed a roughly 50/50 split between basic and applied research in the public communication of research papers via press releases, indicating an overall balance in

disseminating both types of research to the mass media. However, Boyack et al. [2014] report that only 25.9% of the global scientific output is dedicated to basic research. This suggests that research-based press releases are more inclined towards highlighting basic research and prioritise promoting basic research findings. This finding is noteworthy given our initial expectation that press officers might favour applied research for media promotion, considering that applied research often has more direct societal relevance and may align better with journalistic news values [Bartlett, 2002; Harcup & O'Neill, 2017].

There are notable differences across broad research fields in the number of press releases reporting on basic versus applied research. In the biological and health sciences, as well as in the social sciences and humanities, press releases on applied research consistently outnumbered those of basic research. In contrast, in the physical sciences and engineering, as well as in life and earth sciences, basic research was more frequently featured than applied research. Applied research in the biological and health sciences often addresses pressing health issues, medical treatments, and public health interventions, which are highly interesting and relevant to public and policy audiences, as well as to research funders.

Previous studies have also found that research papers in the social sciences and humanities are more closely aligned with applied research [Boyack et al., 2014]. This finding supports the notion that research in these fields often addresses practical solutions to social, economic, and educational challenges, making it more likely to be highlighted in press releases to inform public discourse and influence policy decisions [Sumner et al., 2014]. Conversely, basic research dominated press releases in the physical sciences and engineering, as well as in life and earth sciences, reflecting the prevalence of basic research in academic papers in these fields [Boyack et al., 2014]. Basic research in the physical sciences and engineering often involves groundbreaking work in physics, chemistry, and materials science. While not immediately applicable, this type of research lays the foundation for future applied research and technological applications [Van Raan, 2004].

The readability of the full texts of press releases generally surpassed that of paper abstracts, a trend consistent across all research fields. This finding underscores the effort involved in crafting science-based press releases to present research findings in an accessible manner for a broad audience beyond the scholarly community [Sumner et al., 2014]. However, it is important to note that while press releases are more readable, their readability scores (typically ranging from 40 to 50) correspond to a reading level suitable for high school to college. This suggests that, despite being more accessible than academic abstracts, press releases may still pose challenges for some non-specialist audiences.

Press releases play a crucial role in bridging the gap between scientific communities and the public, facilitating broader understanding and engagement with research. While some studies suggest that making research easier to understand can enhance its citation impact [Porwal & Devare, 2024], our study does not provide direct evidence linking press release readability with citation impact. Further research is needed to specifically evaluate the potential effect of press release readability on the dissemination and influence of scientific papers.

The dissemination of basic research through press releases presents unique challenges that are not as pronounced in the case of applied research. Despite the equal representation of basic and applied research in press releases, basic research often requires more 'translation' to make it understandable and appealing to journalists (including news editors) and public audiences. This is because basic research, which often explores underlying mechanisms and

fundamental theories of natural phenomena, is inherently complex and abstract, making it more challenging for science communicators to present these results in an accessible and engaging manner [Bubela et al., 2009]. This challenge is evident from the lower readability scores of abstracts in basic research compared to those in applied research. Nevertheless, our study demonstrates that press release authors make considerable efforts in this regard and that there is little difference in the readability of academic press releases between basic research and applied research.

It is important to note that while readability scores (e.g., 30 vs. 48 on a scale of 100) do differ, these differences should be interpreted within the broader context of readability, keeping in mind that press releases are primarily targeted at journalists, who further re-package (or rewrite) the news to make it relevant to the readers, viewers or listeners of their specific media outlets. Effective communication strategies, such as connecting complex scientific ideas to everyday experiences, can effectively bridge the gap between expert knowledge and public understanding, making abstract concepts more relatable [Brownell, Price & Steinman, 2013].

High-impact journals and institutions are the primary sources and producers of research-based press releases disseminated via EurekAlert! Leading journals like *Nature Communications* and *PNAS* predominantly publish press releases on basic research, while *Scientific Reports* and *PLOS ONE* issue a more balanced mix of press releases featuring basic and applied research. This underscores the significant role high-impact journals play in communicating basic research. In addition to journals, research institutions and universities are key contributors to research-based press releases. Institutions such as PLOS, CNRS, and the University of Cambridge are among the top organisations with the highest number of press releases. These institutions have dedicated communication teams that work closely with researchers to craft press releases that accurately represent their work while making it accessible to a broader audience [Baram-Tsabari & Lewenstein, 2017].

It is important to note that resources allocated for communication vary across institutions, influencing both the frequency and quality of their press releases. While press releases are designed to be accessible to the general public, their immediate audience is often journalists, who selectively translate and disseminate this information. The ultimate impact on public understanding depends on how effectively these press releases are picked up and reported by media outlets. Consequently, the effectiveness of press releases in reaching a broader audience is contingent on both the quality of the content and the practices of media coverage and dissemination.

The processes through which science becomes news involve multiple steps and are influenced by various role players, including the researchers themselves. At research-intensive universities and leading scientific journals, media officers (or public information officers, PIOs) play a crucial role in selecting journal articles for press releases and adding media appeal to science stories. Research has shown that well-equipped and active institutional PR offices can enhance scientists' media efforts and interactions [Entradas & Bauer, 2016; Marcinkowski et al., 2014]. PIOs, by selectively promoting certain journal articles to the media, act as gatekeepers of science news. Given the observed balance and differences in the promotion of basic versus applied science stories, further research into the selection criteria and processes used by institutional media officers would be relevant and useful.

5 ▪ Study limitations and future research

Despite the considerable insights derived from our study, there are several limitations to consider. Firstly, our research relies on press releases sourced exclusively from EurekAlert!. While EurekAlert! is a widely used platform for academic press releases, it does not encompass all press releases from research institutions or journals. Consequently, our dataset may be biased towards entities that utilise this specific platform [Sumner et al., 2014]. Secondly, we focused exclusively on press releases that included a DOI. This criterion may have excluded significant research communicated in press releases lacking DOI information. As a result, this selective approach could lead to an incomplete representation of the overall research landscape.

Another limitation is the use of Boyack et al.'s [2014] classification system for distinguishing between basic and applied research. Although this classification system provides a structured approach for categorising, it may oversimplify the complex and nuanced nature of scientific research. The binary classification into 'basic' and 'applied' research does not account for interdisciplinary research or research efforts that fall between these categories. While this statistic provides a historical reference, it falls outside of the range of years (2015 to 2022) that our study focuses on. Therefore, it may not accurately reflect the current distribution of basic versus applied research in recent scientific output.

Future research could aim to expand the initial dataset beyond EurekAlert! to include multiple press release platforms and sources. Additionally, incorporating press releases that lack specific DOI information could further enhance the comprehensiveness of the study. Adopting more sophisticated classification systems that accommodate the interdisciplinary nature of modern science could improve the accuracy of the research categorisation. Finally, the successful integration of scientometrics, quantitative analysis, and science communication in this study highlights the potential benefits of combining these approaches in future research endeavours.

Acknowledgments

The authors would like to thank Kevin Boyack for sharing the dataset of research papers classified into applied and basic research levels based on Boyack et al. [2014]. Jingwen Zhang is financially supported by the China Scholarship Council (Grant No. 202206190142). Rodrigo Costas is partially funded by the South African DSI-NRF Centre of Excellence in Scientometrics and Science, Technology and Innovation Policy (SciSTIP).

Data availability.

The data for our study is available at https://zenodo.org/records/12622403. All scripts are available at https://github.com/Yvonne-jw/Basic-Applied-research.

A ▪ Analysis at four research levels

A.1 ▪ *Distribution over time (2015–2022)*

Our preliminary results indicate that more than 50% of the press releases in our dataset report on basic research papers. This is twice as much as expected, given that only 25.9% of all papers globally are classified as basic research [Boyack et al., 2014]. Over time, the number of press releases on EurekAlert! reporting on basic research publications has grown more rapidly than those on applied research (Figure 11), with variations across five broad fields of research (Figure 12).

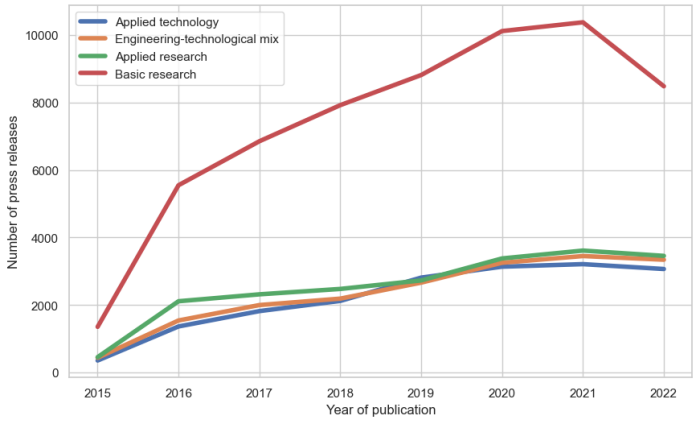


Figure 11. Timeline (2015–2022) showing the number of EurekAlert! press releases reporting on basic research compared to other applied research typologies.

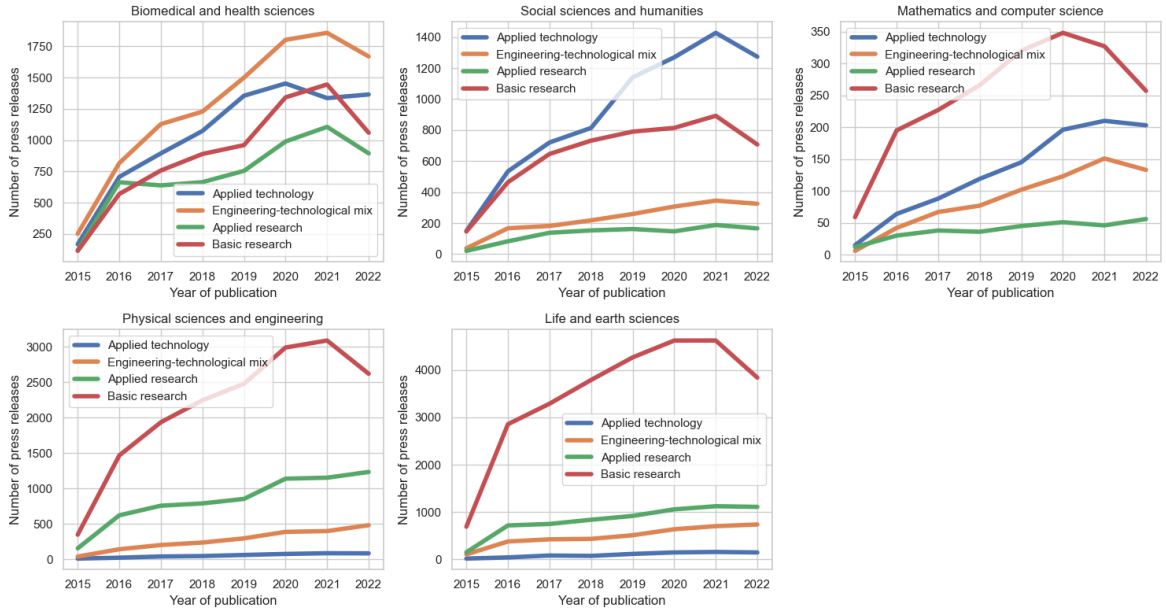


Figure 12. Timeline (2015–2022) of the number of EurekAlert! press releases reporting on four research typologies and across five broad fields of research.

A.2 ▪ *Topics covered*

Figure 13 shows a co-occurrence map of the keywords in EurekAlert! press releases, with colours indicating average values of basic (lighter colours — 4 on the colour scale) and applied research (darker colours — 1 on the colour scale) per keyword. Press releases in the physical and life sciences are more closely associated with basic research, while those in the social sciences and health and medicine are more closely aligned with applied sciences. Notably, psychological science has a distinct orientation towards applied science, though it includes some basic science components such as brain structure and memory processes.

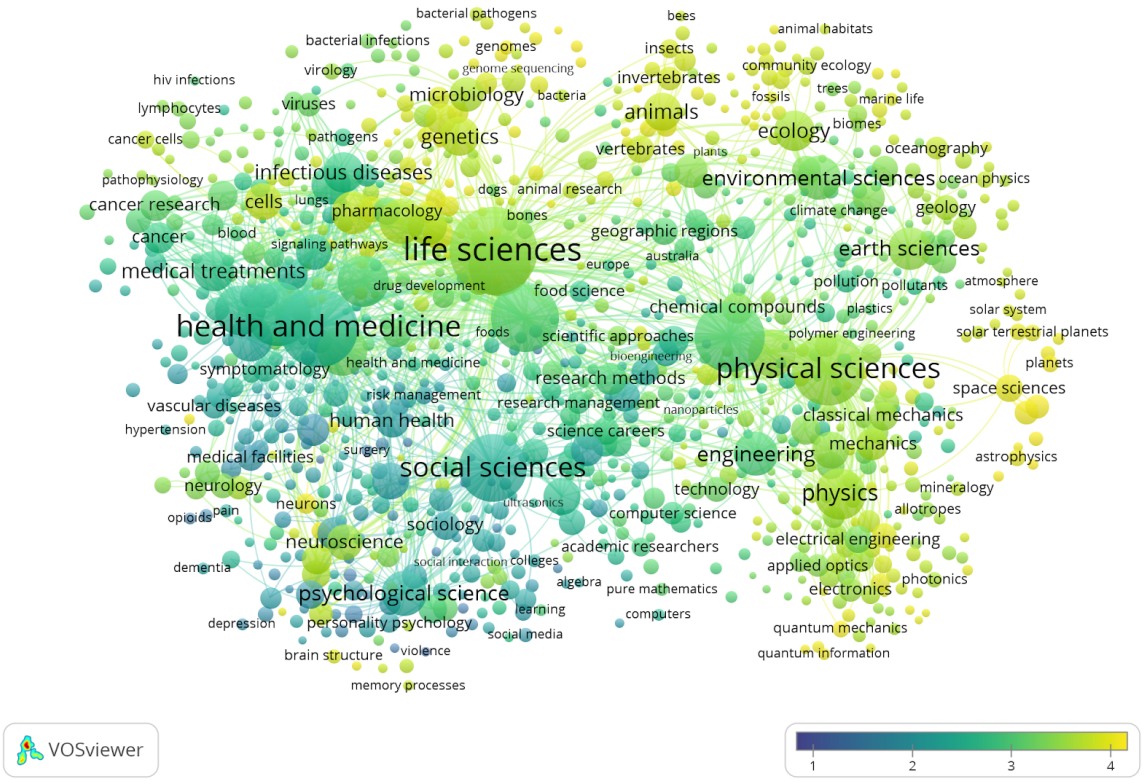
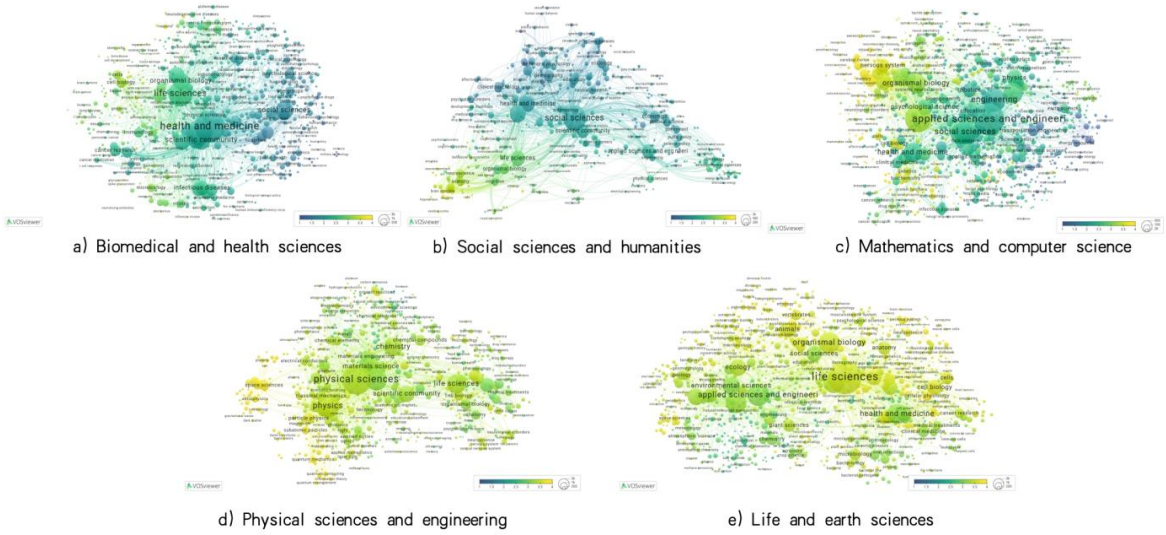


Figure 13. EurekAlert! keyword co-occurrence map. The colours indicate the average applied (dark colours) or basic (light colours) nature of the scientific articles reported in the press releases (more methodological details in the full paper). Interactive map: https://app.vosviewer.com/?json=https://drive.google.com/uc?id=1RAGQoFflwXLah_fwdsQ_gbU0aWuMZQu8.

Figure 14 presents the analyses of keyword co-occurrence in press releases across five broad fields of research.



a) Biomedical and health sciences b) Social sciences and humanities c) Mathematics and computer science

d) Physical sciences and engineering e) Life and earth sciences

Figure 14. Co-occurrence maps of keywords in EurekAlert! press releases across five broad research fields. Colours indicate the average orientation from basic (lighter colours, towards yellow) to applied (darker colours, towards blue) research of the scientific articles linked to the press releases. Biomedical and health sciences: https://app.vosviewer.com/?json=https://drive.google.com/uc?id=1E_GrZTXawg5iofNmDuuXGjPpA7I9GV64. Life and earth sciences: https://app.vosviewer.com/?json=https://drive.google.com/uc?id=1HkN-rvjwtZ_jIIQHcEDesUWw1fWpRYxf. Mathematics and computer sciences: https://app.vosviewer.com/?json=https://drive.google.com/uc?id=1Ud-OEJckUz2eUVnUoQEE9y2zdYCdXfaj. Physical sciences and engineering: https://app.vosviewer.com/?json=https://drive.google.com/uc?id=1mwP7Gb7fw1GvVB2a_b7OOY5NYsv9jyHa. Social sciences and humanities: https://app.vosviewer.com/?json=https://drive.google.com/uc?id=1QwawdI6YcSp_T9soRydavT9c7Ty7_oqW.

A.3 ▪ *Similarity of titles*

In Figure 15, we compare the titles of press releases with the titles of the corresponding research articles, categorised by their level of research (from basic to applied). The titles of applied research articles tend to be more similar to the titles of corresponding press releases than basic research articles (median values closer to 1). This may indicate that basic research results require more adaptation (or 'translation') for media appeal and public audiences, reinforcing the role of science communicators (in this case, those who write the press releases) in making the findings from basic research relevant and accessible to audiences outside the academic terrain.

Figure 16 compares the similarity of titles between research-based press releases and their corresponding research papers across broad fields of research, while Figure 17 presents the comparative readability of full-text press releases and the abstracts of corresponding research papers across five broad research fields and four research levels (from basic to applied).

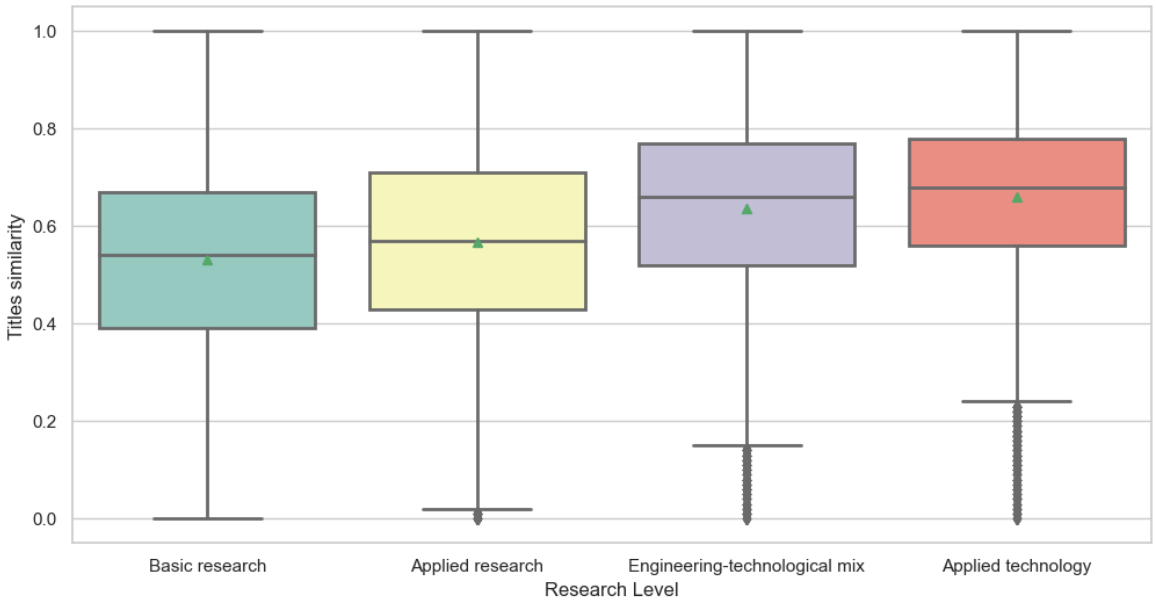


Figure 15. (Dis)similarity of titles between press releases and corresponding research papers. Similarity was inferred using the Python algorithm SBERT (https://www.sbert.net/).

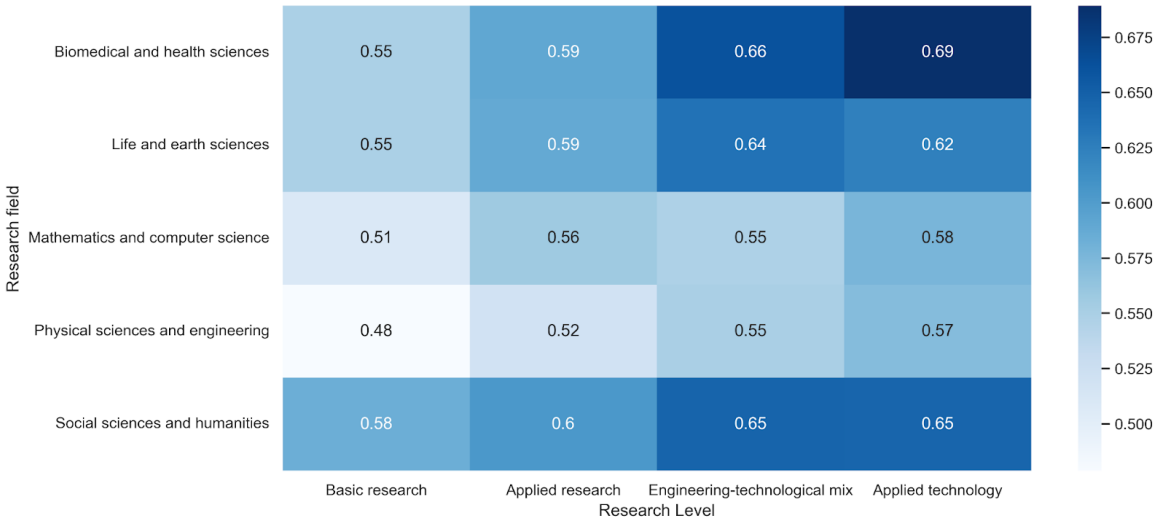


Figure 16. The distribution of title similarities between press releases and corresponding research papers across broad fields of research. Similarity was inferred using the Python algorithm SBERT (https://www.sbert.net/).

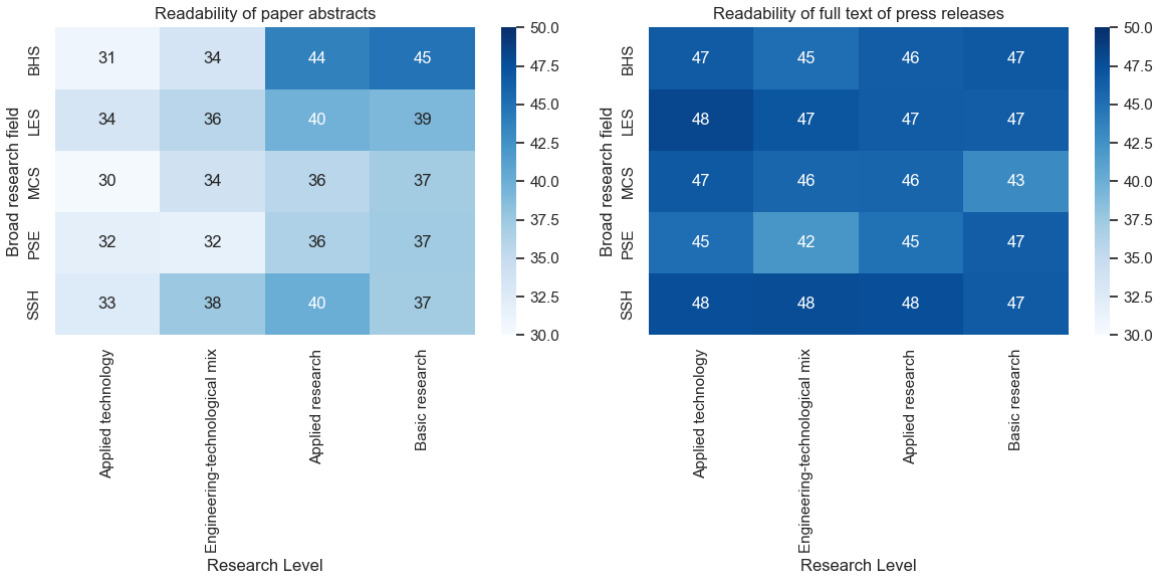


Figure 17. Readability of full-text press releases and paper abstracts across five broad research fields and four research levels.

B ▪ Detailed figures and tables

B.1 ▪ *Keywords map*

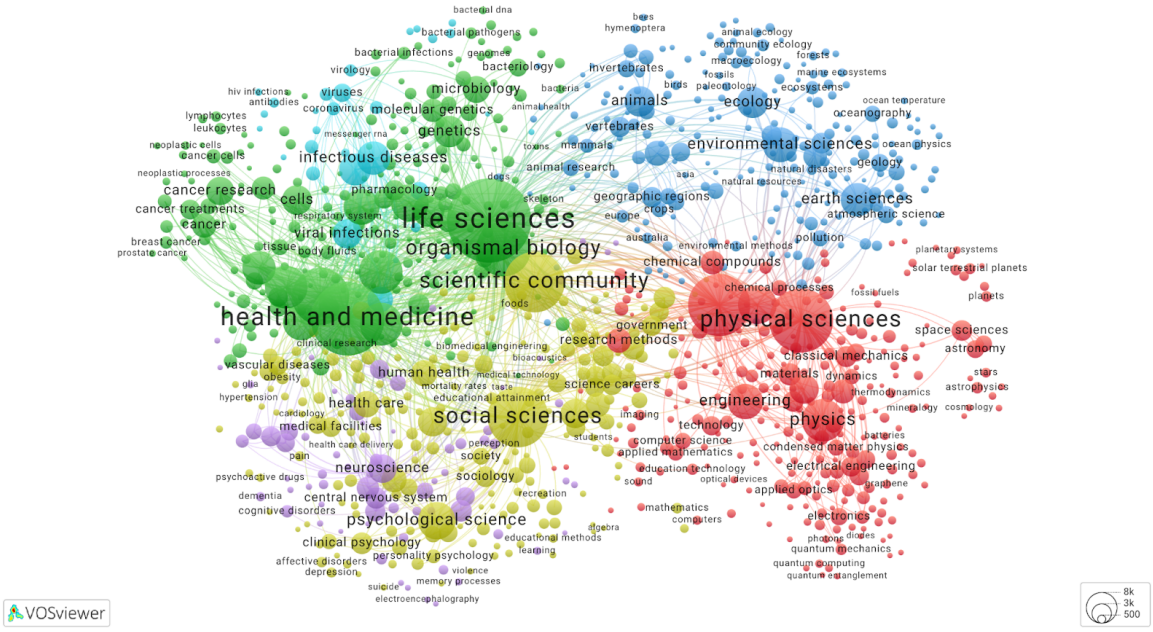


Figure 18. Cluster map showing the co-occurrence of press release keywords on EurekAlert!. Interactive map: https://tinyurl.com/2cueaacw.

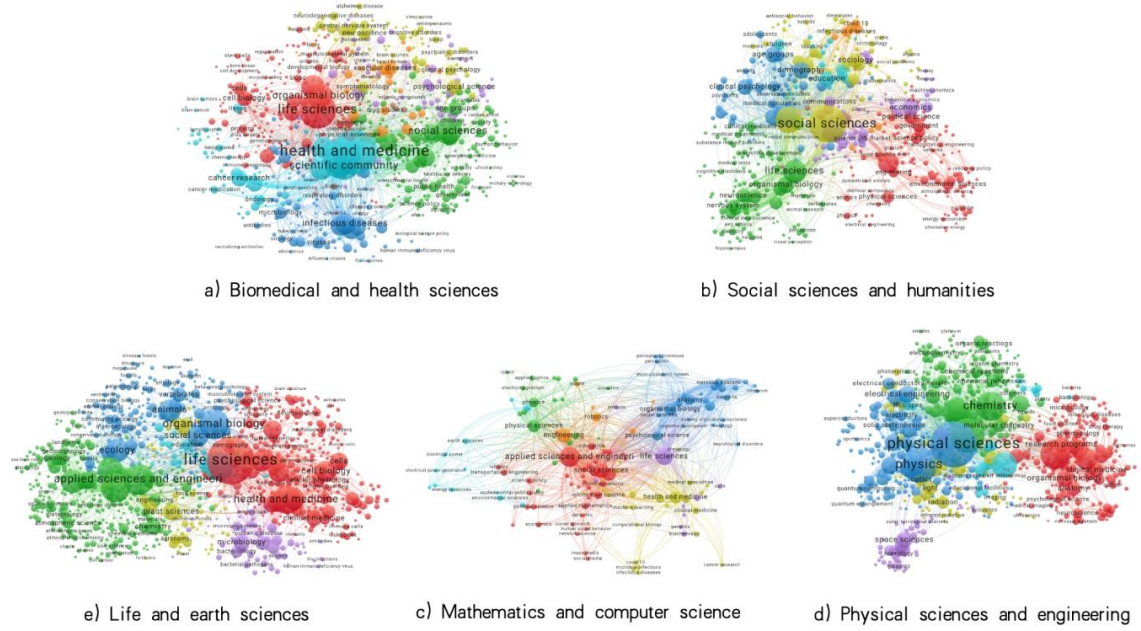


Figure 19. Cluster maps of co-occurrence of press release keywords on EurekAlert! across broad research fields. See interactive maps at: Biological and health sciences: https://tinyurl.com/247dkk2m. Life and earth sciences: https://tinyurl.com/27ko4gqn. Mathematics and computer sciences: https://tinyurl.com/23mdesua. Physical sciences and engineering: https://tinyurl.com/25xwoboo. Social sciences and humanities: https://tinyurl.com/22mr976f.

B.2 ▪ *Textual comparisons*

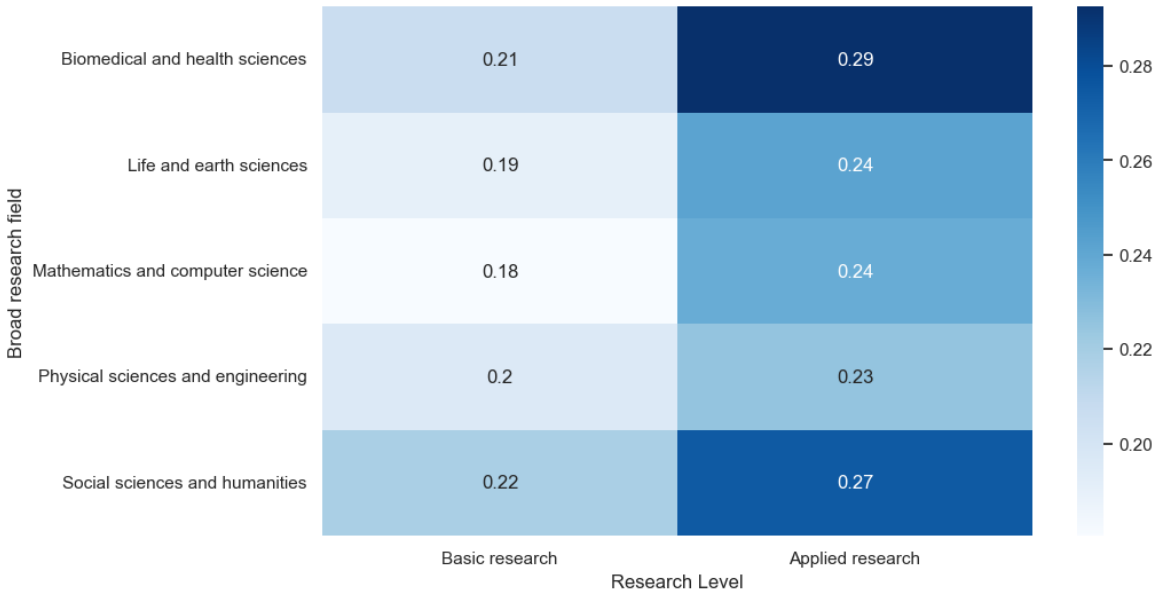


Figure 20. The similarity of titles across broad research fields, categorised according to basic and applied research.

B.3 ▪ *Tables*

Table 2. The top 15 academic journals according to the number of research papers mentioned in EurekAlert! press releases (published from 2015 to 2022) categorised according to basic and applied research.

	Biomedical and health sciences		Life and earth sciences		Mathematics and computer science		Physical sciences and engineering		Social sciences and humanities		Total
Journals	Applied	Basic	Applied	Basic	Applied	Basic	Applied	Basic	Applied	Basic	
Nature Communications	307	652	377	2562	42	216	470	2028	39	259	6952
PNAS	137	484	195	1979	19	150	101	803	120	412	4400
Science	157	347	229	1753	31	92	160	959	88	209	4025
Scientific Reports	349	308	409	1236	69	107	406	459	100	271	3714
Nature	77	301	103	1220	6	62	64	901	12	99	2845
PLOS ONE	373	302	164	968	28	90	30	84	207	437	2683
Science Advances	106	160	240	846	21	60	231	607	76	111	2458
eLife	110	195	96	622	2	64	17	98	12	122	1338
Current Biology	11	67	34	806	0	49	2	42	12	145	1168
Physical Review Letters	0	4	2	22	2	31	93	928	0	3	1085
Cell Reports	61	229	75	521		31	5	66	1	60	1049
Cell	89	172	73	511	3	36	13	74	1	37	1009
Angewandte Chemie International Edition	1	19	4	37	1	0	32	609	0	2	705
Science Translational Medicine	256	120	114	76	11	6	61	28	4	10	686
PLOS Biology	29	88	15	340	5	28	0	27	13	72	617

Table 3. The top 15 author affiliations of publications in press releases categorised according to basic research and applied research, for press releases issued from 2015 to 2022.

	Biomedical and health sciences		Life and earth sciences		Mathematics and computer science		Physical sciences and engineering		Social sciences and humanities		Grand Total
Author affiliations	Applied	Basic	Applied	Basic	Applied	Basic	Applied	Basic	Applied	Basic	
Harvard University	2123	551	481	1333	52	112	250	475	374	217	5968
French National Centre for Scientific Research	156	202	335	1756	10	55	186	1009	70	151	3930
University of Cambridge	419	249	235	1052	31	47	124	433	249	201	3040
University of Oxford	612	180	289	876	26	42	65	353	181	195	2819
Stanford University	621	181	234	639	40	61	142	412	189	162	2681
University College London	759	209	190	542	20	39	94	244	252	223	2572
University of Washington	723	168	286	745	29	34	90	240	180	77	2572
Chinese Academy of Sciences	61	95	339	901	32	22	293	746	16	59	2564
University of California, San Diego	533	270	224	764	19	45	115	264	139	113	2486
University of Pennsylvania	925	214	157	468	31	20	90	155	193	145	2398
University of Michigan–Ann Arbor	969	148	130	516	18	15	68	210	222	73	2369
Cornell University	407	158	239	772	37	33	92	260	169	94	2261
Johns Hopkins University	946	178	157	369	24	33	78	200	154	94	2233
Massachusetts General Hospital	976	201	150	300	24	30	69	106	114	69	2039
Brigham and Women's Hospital	1118	168	151	239	15	9	110	71	80	16	1977

Table 4. The number of research-based press releases issued by the top 15 institutions from 2015 to 2022, categorised according to press releases based on basic research and applied research.

	Biomedical and health sciences		Life and earth sciences		Mathematics and computer science		Physical sciences and engineering		Social sciences and humanities		Total
Institution	Applied	Basic	Applied	Basic	Applied	Basic	Applied	Basic	Applied	Basic	
AAAS	1587	1484	1382	7828	108	176	366	1746	355	647	15679
PLOS	2599	1433	1764	4052	65	225	88	284	784	777	12071
Wiley	5968	94	500	579	40	8	239	607	903	61	8999
Cell Press	565	628	838	3577	60	183	200	393	128	648	7220
University of Cambridge	693	796	355	1430	86	62	131	583	605	435	5176
Massachusetts General Hospital	2458	521	341	614	28	30	161	263	283	144	4843
BMJ	3508	0	389	0	73	0	151	0	518	2	4641
Chinese Academy of Sciences headquarters	61	337	370	1734	4	50	230	1360	14	112	4272
Brigham and Women's Hospital	2217	305	271	427	45	11	186	176	111	55	3804
University of California — San Diego	872	365	301	1076	21	80	102	275	216	144	3452
CNRS	56	166	232	1452	20	69	37	1085	52	187	3356
Fundação de Amparo à Pesquisa do Estado de São Paulo	645	174	492	1131	21	20	159	357	121	112	3232
Elsevier	1712	26	398	69	24	2	126	10	689	121	3177
University of Exeter	317	62	629	1389	7	24	42	155	324	189	3138
University of Helsinki	605	349	507	1142	6	14	52	73	146	108	3002

References

Álvarez-Bornstein, B., Díaz-Faes, A. A. & Bordons, M. (2019). What characterises funded biomedical research? Evidence from a basic and a clinical domain. *Scientometrics 119* (2), 805–825. doi:10.1007/s11192-019-03066-3

Autzen, C. (2014). Press releases — the new trend in science communication. *JCOM 13* (03), C02. doi:10.22323/2.13030302

Autzen, C. (2018). *Academic press releases caught between theory and practice: making sense of a contested science communication practice* (Ph.D. thesis, University of Southern Denmark, Odense, Denmark). Retrieved from https://research.cbs.dk/en/publications/academic-press-releases-caught-between-theory-and-practice-making

Baram-Tsabari, A. & Lewenstein, B. V. (2017). Preparing scientists to be science communicators. In P. Patrick (Ed.), *Preparing informal science educators*. doi:10.1007/978-3-319-50398-1_22

Baram-Tsabari, A., Wolfson, O., Yosef, R., Chapnik, N., Brill, A. & Segev, E. (2020). Jargon use in Public Understanding of Science papers over three decades. *Public Understanding of Science 29* (6), 644–654. doi:10.1177/0963662520940501

Barbic, S. P., Roberts, K., Durisko, Z., Lee, C., Yachouh, R., Guriel, J. & McKenzie, K. (2015). Readability assessment of psychiatry journals. *European Science Editing 41* (1), 3–10. Retrieved from https://europeanscienceediting.org.uk/articles/readability-assessment-of-psychiatry-journals/

Bartlett, C. (2002). What is newsworthy? Longitudinal study of the reporting of medical research in two British newspapers. *British Medical Journal 325* (7355), 81–84. doi:10.1136/bmj.325.7355.81

Bentley, P. J., Gulbrandsen, M. & Kyvik, S. (2015). The relationship between basic and applied research in universities. *Higher Education 70* (4), 689–709. doi:10.1007/s10734-015-9861-2

Besley, J. C. & Dudo, A. (2022). *Strategic science communication: a guide to setting the right objectives for more effective public engagement*. Baltimore, MD, U.S.A.: Johns Hopkins University Press.

Besley, J. C., Dudo, A., Yuan, S. & Ghannam, N. (2020). The (very limited) evidence base for basic-science-specific science communication in key communication journals. *Frontiers in Communication 5*, 41. doi:10.17605/OSF.IO/UECXN

Borchelt, R. E., Sawyer, K. & Smith, B. (2022). *Charting a path for public engagement in basic science: a prospectus*. Report for the Department of Energy Office of Science and The Kavli Foundation as part of the Science Public Engagement Partnership. Retrieved from https://scipep.org/wp-content/uploads/SciPEP-Prospectus.pdf

Boyack, K. W., Patek, M., Ungar, L. H., Yoon, P. & Klavans, R. (2014). Classification of individual articles from all of science by research level. *Journal of Informetrics 8* (1), 1–12. doi:10.1016/j.joi.2013.10.005

Broer, I., Lemke, S., Mazarakis, A., Peters, I. & Zinke-Wehlmann, C. (2023). Editorial: the science-media interface — on the relation between internal and external science communication. In *The science-media interface* (pp. VII–XVIII). doi:10.1515/9783110776546-202

Brownell, S. E., Price, J. V. & Steinman, L. (2013). Science communication to the general public: why we need to teach undergraduate and graduate students this skill as part of their formal scientific training. *Journal of Undergraduate Neuroscience Education 12* (1), E6–E10.

Bubela, T., Nisbet, M. C., Borchelt, R., Brunger, F., Critchley, C., Einsiedel, E., … Caulfield, T. (2009). Science communication reconsidered. *Nature Biotechnology 27* (6), 514–518. doi:10.1038/nbt0609-514

Budenholzer, L., Sawyer, K., Borchelt, R. & Smith, B. (2023). *Science communication training: what is needed for basic science and basic scientists?* Synthesis report of a SciPEP workshop. Retrieved from https://scipep.org/wp-content/uploads/Synthesis-Report-of-May-2023-SciPEP-Workshop_FINAL-PDF.pdf

Bush, V. (2020). *Science — the endless frontier: a report to the President on a program for postwar scientific research*. 75th anniversary edition. Washington, DC, U.S.A.: National Science Foundation. Retrieved from https://www.nsf.gov/about/history/EndlessFrontier_w.pdf

Carver, R. B. (2014). Public communication from research institutes: is it science communication or public relations? *JCOM 13* (03), C01. doi:10.22323/2.13030301

Comfort, S. E., Gruszczynski, M. & Browning, N. (2022). Building the science news agenda: the permeability of science journalism to public relations. *Journalism & Mass Communication Quarterly 101* (3), 637–656. doi:10.1177/10776990211047949

Donner, P. & Schmoch, U. (2020). The implicit preference of bibliometrics for basic research. *Scientometrics 124* (2), 1411–1419. doi:10.1007/s11192-020-03516-3

Dudo, A. (2015). Scientists, the media and the public communication of science. *Sociology Compass 9* (9), 761–775. doi:10.1111/soc4.12298

Entradas, M. & Bauer, M. M. (2016). Mobilisation for public engagement: benchmarking the practices of research institutes. *Public Understanding of Science 26* (7), 771–788. doi:10.1177/0963662516633834

Entradas, M., Bauer, M. W., Marcinkowski, F. & Pellegrini, G. (2024). The communication function of universities: is there a place for science communication? *Minerva 62* (1), 25–47. doi:10.1007/s11024-023-09499-8

Entradas, M., Bauer, M. W., O'Muircheartaigh, C., Marcinkowski, F., Okamura, A., Pellegrini, G., … Li, Y.-Y. (2020). Public communication by research institutes compared across countries and sciences: building capacity for engagement or competing for visibility? *PLoS ONE 15* (7), e0235191. doi:10.1371/journal.pone.0235191

Flesch, R. (1948). A new readability yardstick. *Journal of Applied Psychology 32* (3), 221–233. doi:10.1037/h0057532

Friedman, D. B., Hoffman-Goetz, L. & Arocha, J. F. (2004). Readability of cancer information on the internet. *Journal of Cancer Education 19* (2), 117–122. Retrieved from https://pubmed.ncbi.nlm.nih.gov/15456669/

Harcup, T. & O'Neill, D. (2017). What is news? News values revisited (again). *Journalism Studies 18* (12), 1470–1488. doi:10.1080/1461670x.2016.1150193

Hartley, J. (2016). Is time up for the Flesch measure of reading ease? *Scientometrics 107* (3), 1523–1526. doi:10.1007/s11192-016-1920-7

Hayden, J. D. (2007). Readability in the British Journal of Surgery. *British Journal of Surgery 95* (1), 119–124. doi:10.1002/bjs.5994

Hendricks, R. & Fond, M. (2023). *Basic and beyond: next steps on the path to effective and meaningful science communication*. Retrieved from https://scipep.org/wp-content/uploads/Basic_and_Beyond_Report_Abridged.pdf

Hess, D. J. (1997). *Science studies: an advanced introduction*. New York, NY, U.S.A.: New York University Press.

Heyl, A., Joubert, M. & Guenther, L. (2020). Churnalism and hype in science communication: comparing university press releases and journalistic articles in South Africa. *Communicatio 46* (2), 126–145. doi:10.1080/02500167.2020.1789184

Lane, E. (2016, May 18). EurekAlert! Celebrates 20 years at the forefront of science communication. Retrieved October 5, 2024, from https://www.aaas.org/news/eurekalert-celebrates-20-years-forefront-science-communication

Leydesdorff, L. & Milojević, S. (2012). Scientometrics. arXiv: 1208.4566

Lin, S.-Y., Su, C.-C., Lai, Y.-D., Yang, L.-C. & Hsieh, S.-K. (2009). Assessing text readability using hierarchical lexical relations retrieved from WordNet. *Computational Linguistics and Chinese Language Processing 14* (1), 45–84. Retrieved from https://aclanthology.org/O09-3003.pdf

Lo, Y.-Y. & Peters, H. P. (2013). Taiwanese life scientists less "medialized" than their Western colleagues. *Public Understanding of Science 24* (1), 6–22. doi:10.1177/0963662513513863

Lynch, J., Bennett, D., Luntz, A., Toy, C. & VanBenschoten, E. (2014). Bridging science and journalism: identifying the role of public relations in the construction and circulation of stem cell research among laypeople. *Science Communication 36* (4), 479–501. doi:10.1177/1075547014533661

Marcinkowski, F. & Kohring, M. (2014). The changing rationale of science communication: a challenge to scientific autonomy. *JCOM 13* (03), C04. doi:10.22323/2.13030304

Marcinkowski, F., Kohring, M., Fürst, S. & Friedrichsmeier, A. (2014). Organizational influence on scientists' efforts to go public: an empirical investigation. *Science Communication 36* (1), 56–80. doi:10.1177/1075547013494022

Meredith, D. (2021). *Explaining research: how to reach key audiences to advance your work* (2nd ed.). Oxford, U.K.: Oxford University Press.

Narin, F., Pinski, G. & Gee, H. H. (1976). Structure of the biomedical literature. *Journal of the American Society for Information Science 27* (1), 25–45. doi:10.1002/asi.4630270104

Nelkin, D. (1995). *Selling science: how the press covers science and technology*. Freeman.

Newman, T. P., Brossard, D., Scheufele, D. A., Chen, K., Qian, Y. & Cate, A. (2021). *Assessing the scholarship of public engagement with basic science*. Report for The Kavli Foundation as part of the Science Public Engagement Partnership. Retrieved from https://scipep.org/wp-content/uploads/Newman-et-al_-KavliDOE_Final-Report_DOI.pdf

Orduña-Malea, E. & Costas, R. (2023). A scientometric-inspired framework to analyze EurekAlert! press releases. In I. Broer, S. Lemke, A. Mazarakis, I. Peters & C. Zinke-Wehlmann (Eds.), *The science-media interface: on the relation between internal and external science communication* (pp. 1–28). doi:10.1515/9783110776546-001

Peters, H. P. (2013). Gap between science and media revisited: scientists as public communicators. *Proceedings of the National Academy of Sciences 110* (Supplement 3), 14102–14109. doi:10.1073/pnas.1212745110

Polino, C. & Castelfranchi, Y. (2012). The "communicative turn" in contemporary techno-science: Latin American approaches and global tendencies. In B. Schiele, M. Claessens & S. Shunke (Eds.), *Science communication in the world: practices, theories and trends* (pp. 3–18). doi:10.1007/978-94-007-4279-6_1

Porwal, P. & Devare, M. H. (2024). Scientific impact analysis: unraveling the link between linguistic properties and citations. *Journal of Informetrics 18* (3), 101526. doi:10.1016/j.joi.2024.101526

Salton, G. & Buckley, C. (1988). Term-weighting approaches in automatic text retrieval. *Information Processing & Management 24* (5), 513–523. doi:10.1016/0306-4573(88)90021-0

Salton, G., Wong, A. & Yang, C. S. (1975). A vector space model for automatic indexing. *Communications of the ACM 18* (11), 613–620. doi:10.1145/361219.361220

Sawyer, K., Church, M. & Borchelt, R. (2021). *Basic research needs for communicating basic science*. Technical report. doi:10.2172/1836074

Sawyer, K. & Smith, B. (2024). Communication and engagement for basic science: insights and practical considerations. *JCOM 23* (07), Y01. doi:10.22323/2.23070401

Schauz, D. (2014). What is basic research? Insights from historical semantics. *Minerva 52* (3), 273–328. doi:10.1007/s11024-014-9255-0

Shipman, M. (2014). Public relations as science communication. *JCOM 13* (03), C05. doi:10.22323/2.13030305

Shulman, H. C., Dixon, G. N., Bullock, O. M. & Colón Amill, D. (2020). The effects of jargon on processing fluency, self-perceptions and scientific engagement. *Journal of Language and Social Psychology 39* (5–6), 579–597. doi:10.1177/0261927x20902177

Stockton, N. (2016). Inside EurekAlert, the news hub that shapes the science you read. *Wired*. Retrieved from https://www.wired.com/2016/05/internet-hub-science-news-shaping-world-20-years

Sumner, P., Vivian-Griffiths, S., Boivin, J., Williams, A., Venetis, C. A., Davies, A., … Chambers, C. D. (2014). The association between exaggeration in health related science news and academic press releases: retrospective observational study. *BMJ 349*, g7015–g7015. doi:10.1136/bmj.g7015

Väliverronen, E. (2021). Mediatisation of science and the rise of promotional culture. In B. Schiele, M. Claessens, S. Shi & P. R. Maric (Eds.), *Routledge handbook of public communication of science and technology* (3rd ed.). Routledge.

Van Eck, N. J. & Waltman, L. (2024). An open approach for classifying research publications. *Leiden Madtrics*. doi:10.59350/qc0px-76778

Van Raan, A. F. (2004). Measuring science: capita selecta of current main issues. In *Handbook of quantitative science and technology research: the use of publication and patent statistics in studies of S&T systems* (pp. 19–50). doi:10.1007/1-4020-2755-9_2

Van Wesel, M., Wyatt, S. & ten Haaf, J. (2013). What a difference a colon makes: how superficial factors influence subsequent citation. *Scientometrics 98* (3), 1601–1615. doi:10.1007/s11192-013-1154-x

Vogler, D. & Schäfer, M. S. (2020). Growing influence of university PR on science news coverage? A longitudinal automated content analysis of university media releases and newspaper coverage in Switzerland, 2003–2017. *International Journal of Communication 14*, 3143–3164. Retrieved from https://ijoc.org/index.php/ijoc/article/view/13498

Waltman, L. & Van Eck, N. J. (2012). A new methodology for constructing a publication-level classification system of science. *Journal of the American Society for Information Science and Technology 63* (12), 2378–2392. arXiv: 1203.0532

Weingart, P. & Joubert, M. (2019). The conflation of motives of science communication — causes, consequences, remedies. *JCOM 18* (03), Y01. doi:10.22323/2.18030401

Willoughby, S. D., Johnson, K. & Sterman, L. (2020). Quantifying scientific jargon. *Public Understanding of Science 29* (6), 634–643. doi:10.1177/0963662520937436

Zhang, J., Dudek, J., Orduña-Malea, E. & Costas, R. (unpublished). The EurekAlert! dataset: development of an open database for research in science communication.

Zhou, S., Jeong, H. & Green, P. A. (2017). How consistent are the best-known readability equations in estimating the readability of design standards? *IEEE Transactions on Professional Communication 60* (1), 97–111. doi:10.1109/tpc.2016.2635720

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