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Predictors of media engagement: factors impacting materials scientists' intentions to communicate science

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This study examines the views on the public engagement of materials scientists in Germany and the determinants of their media interactions. It uses data from an online survey designed on the theory of planned behaviour (TPB). Results suggest that the scientists' willingness to interact with the media is remarkably low. Key TPB components—the scientists' attitudes, their perceived own skills and the opinions of relevant peers—are significant predictors across different models, with the latter showing the highest significance. Among the additional factors, reducing the workload surprisingly is less important to scientists than the institutional acknowledgment of science communication within their organisations. Younger scientists show the lowest degree of willingness to engage in communication activities and this group is about equally split between those intending to increase or decrease their communication efforts in the future. Thus, organisations aiming to foster their scientists' commitment to communication should adopt flexible and tailored strategies to suit the needs and priorities of their respective target groups.

KEYWORDS

media engagement, quantitative analysis, behavioural predictors, science
communication, theory of planned behaviour, materials scientists

1 Introduction

The gap between the internal scientific and external, meaning public, communication appears to be narrowing (Peters, 2013). And yet, with scientists being more open to engage with broad audiences (Rose et al., 2020; Entradas and Bauer, 2019; Rainie et al., 2015; Peters et al., 2008), the interaction between science and society remains under close scrutiny within the scholarly community (Gascoigne et al., 2020; Bonfadelli et al., 2017). International and national actors in the public arena have increasingly called on scientists to engage with wider audiences and communicate their research results beyond the scientific community (German National Parliament, 2019, 2020; Federal Ministry of Education and Research, 2019; Siggenger Kreis, 2014–2020). As a result of recent societal developments, including the proliferation of disinformation and misinformation and also the debates surrounding the climate change and global pandemics these calls have become more widespread. At the same time, driven by the emergence of diverse channels and evolving formats the communication of scientific information is undergoing changes.

In spite of a changing media landscape with increased digital media and social networking platforms (Hunter, 2020), the legacy media—referring to print, broadcast and their online versions—are equally used for science news (Dunwoody, 2021) and represent the channel through which most citizens are frequently reached with information on scientific novelties (Wissenschaft im Dialog [Science in Dialogue], 2021; Van Aelst et al., 2021; Weitkamp et al., 2021; Bucchi and Saracino, 2020; Metag, 2020).

In recent decades, the relationship between science and media has undergone changes. Traditionally, scientists have been described as being reluctant to engage with journalists with concerns about the likelihood of the inaccurate representation of scientific findings, the possibility of being misquoted and the risk of criticism from peers (Hartz and Chappell, 1997; Peters, 1995) being considered as the major reasons. These attitudes are deeply rooted in the professional culture of science (Russel, 2010), where direct interaction with the media and the dissemination of findings beyond the scientific community were often viewed as not being in accordance with established norms of scientific practice. Despite this, some scientists began to popularise science and to engage more actively with the media, though frequently at the expense of criticism from their peers (Russel, 2010). Such experiences reinforced the belief among many scientists that media engagement carried professional risks, further deterring them from participating in public communication (Hartz and Chappell, 1997).

Over time, increasing competition for public funding and the need to justify the funding of scientific research placed public engagement firmly on the agenda of science organisations. For instance, universities have sought to secure funding partly by improving their reputation (Autzen and Weitkamp, 2020), also through science communication initiatives. As a result, the number of professionals working in communications and public relations has expanded, reflecting the efforts of research organisations to institutionalise strategic communication as part of their operations (Autzen and Weitkamp, 2020; Trench, 2017; Kohring et al., 2013). These professionals serve as intermediaries between scientists and both, the media and the general public by facilitating the scientists' engagement and by their efforts to increase the visibility of research findings. Institutional science communication initiatives have been found to increase the scientists' media participation and to support their public engagement efforts (Marcinkowski et al., 2014). Furthermore, scientists' attitudes towards the media have changed. Although some scientists still point to the inaccuracy aspect of media coverage (Petersen et al., 2009; Carsten-Conner and Illman, 2002), several studies suggest that there is a general satisfaction among scientists regarding their interactions with journalists (Besley et al., 2018a; Dudo et al., 2014; Peters, 2013).

On the other hand, amid societal developments driven by scientific innovations and often marked by controversy and uncertainty, scientists have become increasingly aware of their role in explaining their research to the public as part of their professional duties (Peters et al., 2013). Many now see themselves as responsible for addressing the problem of disinformation by sharing their expertise and contributing to a broader societal discourse (Besley et al., 2019).

However, this trend is not consistent across all scientific disciplines, and the observed differences cannot be attributed solely to individual scientists (Jensen, 2011). As with other formats of public engagement, and even more so in the case of media interactions, a scientist's intention to communicate with the general public is constrained by multiple external factors. Whether or not media engagement occurs often depends on editorial agendas or the journalists' assessment of the newsworthiness of a topic (Badenschier and Wormer, 2012).

In the case of science, disciplinary differences are considerable, as some fields receive substantially more media attention than others.

Media content analyses (Boykoff et al., 2025; Peters et al., 2013; Rödder and Schäfer, 2010) show that disciplines related to health, such as genomics and neuroscience or socially critical issues like climate research, tend to receive broader coverage than more specialised or basic research areas, such as particle physics.

This difference in media attention can, in turn, influence the scientists' willingness to engage with the public, as researchers in highly visible fields may perceive stronger incentives or face higher expectations with regard to communicating their work beyond the academic community.

2 Theory of planned behaviour (TPB)

The scientists' willingness to participate in various public engagement activities has been associated with social and psychological variables (Dudo et al., 2018) as conceptualised in the TPB (Ajzen, 1991). This theoretical model has proven its predictive capability, hence its usefulness in predicting human intentions and behaviours across a large body of research works including health, environment and communication-related activities (Bosnjak et al., 2020).

The TPB posits that an individual's intention represents a central determinant for certain behaviours. And this intention can be predicted by three factors, provided the behaviour is non-habitual and under volitional control: (1) attitudes towards the behaviour, (2) subjective norms and (3) perceived behavioural control (Conner and Armitage, 1998; Ajzen, 1991). This conceptual framework has been applied by many communication scholars to study the engagement behaviours of scientists across disciplines (Besley et al., 2018a; Yuan et al., 2018; Dudo, 2013; Poliakoff and Webb, 2007).

2.1 TPB predictors

Scholarship posits that individuals form positive or negative attitudes towards a behaviour is based on the evaluation of the results of that behaviour (Armitage and Conner, 2001; Ajzen, 1991). In the context of science communication, researchers who perceive personal or academic benefits of engagement activities and develop a positive attitude towards such activities are more likely to participate in public communication (Besley et al., 2018a; Poliakoff and Webb, 2007). The present study specifically considers the researchers' attitudes towards the media presentation of their work, as these perceptions are likely to influence their willingness to interact with journalists.

Subjective norms, also known as the social factor (Ajzen, 1991: 188), refer to the perceived pressure associated with performing or avoiding a specific behaviour. This determinant is measured on two levels: what relevant others think about a particular behaviour (injunctive norm) and whether relevant others actually engage in such a behaviour (descriptive norm). The reference group is the scientific community, representing the respondents' peers.

Scientists operate according to specific rules and codes (Weingart, 2022; Hartz and Chappell, 1997) and science is often considered relatively closed off from the outside world. In this context, the question is whether the scientists' visibility in the public arena is reflected positively or negatively in their careers and reputations. This ambivalence has been identified as a barrier to the scientists'

engagement intentions, partly due to examples of how media participation can adversely affect their careers [for example the so-called “Sagan effect” (Besley et al., 2018a; Hartz and Chappell, 1997, p. 41)]. Empirical evidence shows generally weak correlations between subjective norms and the scientists’ willingness to participate in different types of public engagement (Dudo et al., 2018; Besley, 2015). Nevertheless, considering the growing calls on scientists to engage more actively with the public, it is likely that researchers now adopt a more discerning view regarding their public engagement. As a result, the effect of this variable may be more pronounced within the TPB framework.

A further TPB determinant is the perceived behavioural control which reflects the individuals’ perceived skills in performing certain activities. Individuals who believe they have good communication skills express a greater intention to participate in engagement activities with the public (Dudo et al., 2014; Besley et al., 2013; Poliakoff and Webb, 2007), particularly through interactions with the media (Peters, 2013; Dunwoody et al., 2009).

Besides these three main components, the survey collected data on additional determinants which presumable were likely to add an explanatory value to the research question. One such determinant is organisational support. Since most scientists operate within institutional structures characterised by specific regulations, cultures and strategic objectives, the way these organisations relate to engagement can affect a scientist’s position on this issue (Marcinkowski et al., 2014).

With the rise of professional communications and public relations teams within scientific institutions, organisational support has gained more prominence on internal agendas (Trench, 2017; Kohring et al., 2013) and is often associated with positive effects for researchers (Rodrigues et al., 2023). Yet these structures can also act as barriers to public engagement: for example, when communication strategies set by public relations staff clash with a scientist’s individual preferences, or when the institutional leadership does not actively endorse public engagement, a scientist’s intentions to participate may be negatively affected (Calice et al., 2022).

Understanding how scientists perceive this factor could provide valuable insights for institutions and enable them to cultivate supportive environments that motivate researchers to share their work with broader audiences.

The second additional determinant is the scientists’ perception of the general public. Researchers have specific drivers for their communication efforts, one of which involves how the public can benefit from the communication of research results (Besley, 2015). Evidence suggests that scientists often view the public as according a low level of priority to scientific knowledge especially as they are considered to be reluctant to engage with complex information and to expect overly simplified explanations (Besley and Nisbet, 2013).

Despite these generally negative perceptions, the public remains a factor impacting scientists’ communication behaviours. Those who feel a sense of responsibility to their audiences (particularly taxpayers who indirectly fund research) are more likely to participate in outreach activities (Besley et al., 2013; Martín-Sempere et al., 2008). Scientists are often motivated by the opportunity of educating and informing the public (Kurath and Gisler, 2009) and contributing knowledge to public debates. This particular point is a strong predictor of the scientists’ willingness to engage in communication efforts (Besley, 2015). Specifically, the perception that their work has a positive impact on the public

increases the scientists’ willingness to interact with journalists (Tiffany et al., 2021).

While these studies provide valuable insights into public engagement, they also confirm that there is a disciplinary culture shaping the scientists’ intentions and practices in this regard (Bao et al., 2023; Entradas et al., 2019; Dudo et al., 2018). Natural scientists tend to participate less in engagement activities than their counterparts in the humanities and social sciences (Entradas and Bauer, 2016; Ivanova et al., 2013; Kreimer et al., 2011; Kyvik, 2005). These disciplinary differences can be traced to differences in epistemological frameworks, motivations and norms within the scientific communities, which ultimately influence the researchers’ approaches to public engagement.

2.2 Focus of this study

The present study focuses on a discipline that has not yet been examined as a single subject of investigation in the context of media engagement, namely materials science. This is a key field and a driving force in the development of environmentally friendly technologies, sustainable energy solutions and the improvement in the quality of life. Given that materials research addresses fundamental technical challenges with ultimately high societal impacts, effective communication of its findings and technological applications is essential to fostering public understanding and societal acceptance of these innovations (Petersen et al., 2009).

The objective of this study is to examine the factors that may lead scientists to engage with journalists. It measures the predictive power of these factors for their intention to communicate research findings to the public via the media and treats the interaction with the media as planned behaviour. The results should point to barriers scientists encounter in their media engagement and show ways to address these challenges in order to reinforce the interaction with the media.

The term ‘media interaction’ or ‘media engagement’ refers to any form of dialogue or exchange between scientists and journalists aimed at the publication of research findings in different formats of legacy media such as print and broadcast including their online versions.

The hypotheses resulting from the conceptual framework to be tested here are as follows:

The scientists’ willingness to start a media interaction will increase if

H1: Scientists have more positive attitudes towards the media coverage of science;

H2: Scientists perceive themselves as having stronger communication skills;

H3a: Scientists perceive their peers as supportive and encouraging media interactions;

H3b: Scientists have more examples of peers that interact with journalists;

H4: Organisational support is associated with increased willingness to interact with the media;

H5: There is a more positive perception of the public.

3 Method

3.1 Data collection

The data were collected by means of a web-based survey conducted between October 2020 and February 2021. The surveyed population comprised researchers working in the field of materials science at universities, non-university research institutions and governmental research departments in Germany, totalling 84 departments across 22 institutions. The university category dominated the sample, since there is a higher number of respondents and their email addresses are more publicly available compared to those in other organisation types. A purposive sampling approach was used to ensure that different types of organisations and geographical regions were covered and that the survey population was suitably varied.

Institutions were basically identified in two ways. First, the publicly available 2019 membership list of the German Society for Materials Science was used to identify relevant research organisations. Second, supplementary internet searches were conducted using keywords such as “Material,” “Werkstoffe” and “Metall” combined with terms like “Institut,” “Fakultät,” “Lehrstuhl,” “Forschung” and their English equivalents. Lists of research staff and their email addresses were also compiled manually from relevant departmental websites. All researchers listed, from PhD candidates to professors, were included, excepting clearly identified technical staff.

To increase the response rate, the email invitations to the 1835 scientists were personalised and sent in batches, with a follow-up reminder approximately 2 weeks after the initial contact. The survey was closed at the beginning of March 2021.

Furthermore, the survey was conducted anonymously with no tracking possibilities of the respondents. The survey completion time was approximately 15 min on average. A total of 70 emails bounced. Of the surveys received, 225 were completed either fully or at a rate of 90% or higher. This corresponds to a response rate of 12.3% which is consistent with other online science communication surveys conducted among expert communities (Rose et al., 2020; Entradas et al., 2019; Besley et al., 2018b; Dudo and Besley, 2016).

3.2 Measurement

The survey questions were developed in accordance with standardised instruments addressing public engagement (Besley et al., 2018a; Peters, 2009; Royal Society, 2006) and were structured around variables derived from the TPB. The questions offered various statement options for responses.

The first group of questions evaluated the researchers’ perceptions of media coverage and focused on how they view the portrayal in the media of science generally and materials science in particular. Another set of questions addressed the issue of perceived behavioural control, meaning the degree of confidence researchers have in their own ability and skills to communicate research effectively through media channels.

To assess social influences, the survey included questions about norms within the scientific community. These items explored questions such as what researchers believe their peers think about engaging in science communication and whether those peers actually participate in such activities. Regarding organisational support, the survey asked how researchers perceive their institutions’ stance on

providing resources, training and encouragement for scientists to engage with the media.

Past experiences with the media were examined through questions about the researchers’ previous engagement, their impressions of these interactions and any consequences those encounters had on their careers. Lastly, the survey asked researchers about their views on the public understanding of and interest in materials science, which can affect the researchers’ motivation to engage with the media and communicate their findings.

Most survey statements were measured using the five-point Likert scales which range from negative to positive values (see [Supplementary File](#) for the complete survey).

The statistical analysis of the survey data was performed using the software SPSS 29. [Table 1](#) provides an overview of the variables included in the regression analysis.

4 Results

4.1 Descriptive results

Demographically, 70% of the respondents in the sample were male and 24% female, a ratio largely consistent with the surveyed population (85% male, 15% female). Almost half of the respondents were doctoral researchers. Regarding scientific productivity, the publication output is closely linked to career seniority. Two-thirds of the respondents, primarily non-professorial staff, had published up to 20 scientific articles. In contrast, one-third of the sample, predominantly professors, had published more than 20 articles.

In terms of institutional affiliation, 60% of the respondents are working in public universities, 30% are affiliated with public research organisations and approximately 8% are working in governmental institutes. This distribution is broadly reflected in the two key sources of research funding reported: 87% of the respondents received public funding, 28% EU funding, 23% industrial funding and 4% support from private foundations.

Research types were nearly evenly split, with 56% of respondents engaged in applied research and 44% in basic research.

4.2 Willingness to engage with the media

Scientists across all age categories demonstrate a low level of willingness to interact with the media. Only 9% of the participants indicated that they were very likely to engage with the media, with the middle-aged group (ages 35–44) making up the largest proportion of those willing to do so. In contrast, the youngest group showed the highest level of reluctance, with three-quarters unlikely to engage with the media.

Fewer than a quarter of the population surveyed have had contacts with journalists in the last 5 years. This group consists predominantly of middle-aged and older scientists. They are more willing to interact with the media and are likely to spend the same or a greater amount of time on public engagement activities in the future ([Table 2](#)). This may be due to the reported positive impact on their career development such as increased attention from decision-makers (32%) and appreciation from peers (49%) ([Table 1](#)).

TABLE 1 Descriptive statistics of independent and dependent variables.

Independent variables	
Attitudes towards the media (M 2.74, SD 0.67) 1 = strongly disagree -> 5 = strongly agree	Agree + strongly agree
Simplify and distorts scientific information (reversed)	63%
Provide accessible scientific information	44%
Present an appropriate image of research	23%
Subjective norms (M 2.36, SD 0.73) 1 = not at all -> 5 = very much	Rather much + very much
Descriptive Other researchers of my department are supportive towards people who engage with mass media	12%
My colleagues, who do similar research and are in similar academic position to mine, take part in activities related to media	7%
I came across media reports about the work of my researchers of my field	11%
Injunctive My peers, whose opinions are important to me, think that I should engage with the media	9%
My advisors expect me to engage with the media whenever I have relevant research results	13%
Perceived behaviour control (M 3.67, SD 0.75) 1 = not at all -> 5 = very much	Rather much + very much
I would be able to convey my excitement for science to the audience	66%
I would be able to adapt my language to a non-specialist public	58%
I would be able to make use of techniques of storytelling to present my topic	48%
Organisational support (M 3.65, SD 0.80) 1 = not important -> 5 = very important	Rather important + very important
Science communication is a constituent part of the organisation	70%
Motivation by advisors	60%
Participation in trainings for communicating science to a non-specialist public	57%
Regular exchange with the Communications Office	51%
Reduction of usual workload	51%
Perception of the public—(M 2.79, SD 0.85) 1 = strongly disagree -> 5 = strongly agree	Agree + strongly agree
The public is generally suspicious of experts' opinions (reversed)	22%
Impact of science communication on the public (M 4.11, SD 0.65) 1 = not important -> 5 = very important	Important + very important
To provide knowledge in decision-making processes	87%
To educate the public	80%
To contribute to the public and political debate	80%
To inform about the current state of scientific research	70%
Past engagement: 57 yes 1 = strongly disagree -> 5 = strongly agree	Agree + strongly agree
Peers appreciated my media presence	49%
My career was positively influenced	37%
Dependent variable	
Willingness to interact with the media (M 1.41, SD 0.65) 1 = not likely, 2 = somewhat likely, 3 = very likely	
I consider starting an interaction with the media in the next 6 months	

Percentages are rounded to the nearest integer. An exploratory factor analysis (EFA) was conducted on the items for each construct to assess their internal structure and consistency. Items that loaded on a separate factor were not considered for the regression analysis. Further, reliability analyses were performed for each scale and items were removed where necessary to improve internal consistency (Cronbach's alpha). The constructs used in the binary logistic regression achieved the following reliability coefficients: attitude ($\alpha = 0.54$), perceived behavioural control ($\alpha = 0.75$), subjective norms ($\alpha = 0.73$) and organisational support, except for the item "reduction of workload" ($\alpha = 0.70$). For the engagement in the past, only responses indicating earlier interaction with the media were included in the analysis. For the perceptions of the public, a single item reflecting the most negative statement was retained.

TABLE 2 Media engagement behaviour of different age groups.

Age	Past engagement	Involvement in the future			Media engagement assessment			Willingness to start media interaction		
	Yes	More	No change	Less	Easy	Neutral	Difficult	Not likely	Somewhat likely	Very likely
Under										
25–34	14%	35%	30%	35%	18%	70%	12%	74%	22%	4%
35–44	45%	31%	41%	28%	20%	66%	14%	57%	23%	20%
45–65 +	48%	26%	51%	23%	23%	71%	6%	61%	23%	16%
N	57	221–225								

Values for each age group calculated in percent.

In contrast, only 1% of scientists without prior media interaction express a clear intention to engage in media-related activities, compared to 32% of those with previous experience (see [Supplementary Figure 1](#)). Past media engagement was included as a control variable, as it applied to only a quarter of the respondents.

4.3 Regression results

Binary logistic regressions were conducted to assess the impact of different variables on the intention to engage with the media. The first model included the three primary components of the TPB framework: attitude, subjective norms and perceived behavioural control. This model was extended with additional constructs to provide a more comprehensive explanation of the scientists' intentions. [Table 3](#) illustrates the relationship between the independent variables and the dependent variable.

The regression analysis examines predictors of the scientists' willingness to engage with the media across three models. Attitudes towards media coverage and perceived behavioural control are positively correlated with the intention to engage in media communication (H1 and H2). Although the respondents express confidence in their ability to convey messages in an understandable language and to bring over the excitement for science ([Table 1](#)), perceived behavioural control is significant in the first model; but there is a decline in significance, when new factors are added.

The belief that their fellow scientists expect them to engage in communication shows the strongest significant relationship with the outcome variable. This value indicates that each unit increase in this predictor more than doubles the odds (114%) of participating in media interactions ([Peng et al., 2002](#)) (H3a). Unlike attitudes and behavioural control, the significance of this predictor remains stable despite the inclusion of further constructs in the model. In contrast, subjective descriptive norms do not significantly predict willingness (H3b). The respondents only have a few examples of colleagues who communicate their research in the media, and this lack of peers' exposure does not positively influence their own decision to engage in media contacts.

The effects of the three main TPB constructs declined in the second model, indicating that additional factors of interest such as organisational support and the perception of the public contribute to explaining the decision to interact. These two new predictors are positively related to the probability of initiating interaction with the media, with higher scores on these predictors increasing the

willingness to engage in such activities by approximately 50% (H4, H5). The odds of scientists expressing their willingness to engage are 57% higher for those who perceive their organisations as supportive; similarly, favourable views of the public are associated with 53% higher odds of the willingness to engage.

Past media engagement points to a substantive relationship with the scientists' willingness to engage again. The coefficient suggests that scientists having experienced professional media contacts in the past 5 years have 184% higher odds of interacting with the media in the future.

The inclusion of the three further variables, i.e., organisational support, perception of the public and past engagement, into the first model makes a significant contribution to the prediction of behavioural intentions and results in an improvement in the Pseudo- R^2 , which increases to 0.32 (NK). This indicates that the final model is useful to explain about one third of the variance in the outcome variable. Perceived behavioural control loses its significance, suggesting that, among the TPB factors, it has the weakest relationship with the dependent variable, namely with the willingness to interact with the media.

5 Discussion and practical implications

This study aims to examine how different factors affect the intention of materials scientists to share their research work with the public and make use of the media to do that. Understanding these factors can help stakeholders who advocate for greater research dissemination to design more effective strategies for science communication.

The relationships between the predictors examined here and the intention of scientists to communicate generally confirm research results presented in earlier publications. Attitudes towards media coverage and perceived behavioural control are positively correlated with the willingness to engage in communication, consistent with existing findings of behavioural intentions for public engagement ([Cople et al., 2020](#); [Dudo, 2013](#)) and strategic science communication ([Besley et al., 2019](#)).

The communication activities of peers do not seem to be a strong predictor of scientists' own intention to communicate, a trend also observed in previous studies ([Tiffany et al., 2021](#); [Entradas and Bauer, 2019](#)). However, the respondents' perceptions of what their fellow researchers expect from them regarding science communication emerged as a significant predictor in this study, whereas in other cited

TABLE 3 Binary logistic regression for the willingness to start media interaction.

Predictors	Model 1			Model 2			Model 3		
	B	Wald	Exp(B)	B	Wald	Exp(B)	B	Wald	Exp(B)
Attitude	0.59	5.57	1.81**	0.60	5.33	1.83*	0.67	6.09	1.95*
Perceived behavioural control	0.62	7.05	1.85**	0.55	5.33	1.74*	0.43	3.14	1.54
Subjective norms injunctive	0.76	13.56	2.14***	0.72	11.49	2.07***	0.65	8.88	1.92**
Subjective norms descriptive	0.25	0.93	1.29	0.28	1.08	1.33	0.23	0.68	1.26
Organisation				0.45	4.43	1.57*	0.45	4.29	1.57*
Public				0.43	4.83	1.53*	0.40	4.14	1.50*
Past engagement							1.04	7.60	2.84**
Model evaluations									
Chi-square (df) ^a		42.15 (4)			50.01 (6)			56.79 (7)	
Hosmer-Lemeshow ^b		6.47			5.82			7.87	
Pseudo-R ² (NK)		0.24			0.29			0.32	
N		216			214			213	

The following criteria are reported: estimated coefficient, Wald test value and exponential of the coefficient for each predictor. * $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$ (two-tailed). Further tests for binary logistic regression were examined and met, including the checks for multicollinearity, outliers and model fit. No data points were excluded. Full diagnostics are reported in the [Supplementary File](#).

^aFor all models chi-squares are significant at $p < 0.001$.

^bFor all models Hosmer-Lemeshow are insignificant at $p > 0.05$ indicating that the model fits to the data well.

studies this factor showed little relationship with their intention to engage in science communication (Besley et al., 2018a, 2018b; Dudo et al., 2014; Poliakoff and Webb, 2007). The reason may lie in the increased intensity of the debates in recent years about the role of scientists in engaging with the public, although these discussions largely remain at the level of opinion rather than practice. According to the values of the descriptive norms, peers in materials science were perceived as having very low levels of public engagement.

Contrary to previous findings (Wilkinson et al., 2022; Hamlyn et al., 2015; Royal Society, 2006), the reduction of the workload was rated the least important among the measures scientists expect their employers to take to compensate researchers for their media engagement. However, the low workload scores reported here may possibly reflect the current situation, which is characterised by limited engagement activity. It remains to be seen whether workload will remain a minor factor once communication activities increase in volume and a more established communication framework develops within an organisation. A first, relatively straightforward step for institutional leaders aiming to increase public engagement of their staff is to clearly articulate the importance of science communication within organisational structures. Raising awareness of available support at the micro- or macro-level (department, faculty or university) is another measure institutions can take to encourage a more active science communication culture.

The general reluctance of materials scientists to communicate research results observed in the sample may be explained by several reasons. First, the subject matter of this field is inherently complex and highly technical (Bensaude-Vincent, 2001) and requires specialised knowledge that cannot easily be translated into concise, media-friendly narratives. Scientists may therefore struggle to

simplify the presentation of their findings without losing critical nuances or risking misinterpretation. Moreover, some areas of materials science remain subjects of debate and uncertainty, e.g., the sustainability of materials, the use and supply of rare-earth metals and the long-term environmental impact of energy storage technologies. In this context, the risk of misrepresentation or politicised coverage may further discourage scientists from engaging with broader audiences.

Despite their reticence about media engagement, the respondents remain motivated to ensure the effective communication of science-related topics to the general public. While many surveys highlight the fact that scientists prioritise the objectives of educating and informing the general public through science communication (Rose et al., 2020; Dudo and Besley, 2016; Hamlyn et al., 2015), the findings at hand show that, at least in the context of legacy media, materials scientists consider empowering the public in decision-making processes as the most important goal of their communication.

Although the focus of this study was not to provide a thorough investigation of communication objectives, the shift observed here can reflect the intention of scientists to adhere to the principles of the dialogue model of communication, according to which scientists and the public interact and exchange ideas rather than simply provide information to address a perceived knowledge deficit (Bucchi, 2008). Furthermore, societal challenges of recent decades which are closely linked to scientific developments and expertise may have contributed to greater awareness among scientists of their role as experts responsible for supporting evidence-based decisions at both individual and policy-making levels (Scheufele et al., 2021).

Designing communication activities with clear objectives and structuring communication around them has become an important

and motivating stimulus for scientists to engage in research-related communication (Besley et al., 2018a) and should be implemented by organisations to emphasize the societal benefits of outreach activities.

Considering the scarce media engagement of scientists in the past, it appears that their attitudes towards the media, as shown in this survey, stem from their experiences as media consumers rather than from personal interactions with media professionals. This finding is in line with previous research, indicating that individuals with greater communication experience are more likely to repeat such activities (Dudo et al., 2014; Ajzen, 2011; Conner and Armitage, 1998). This implies that the gap between scientists with media experience and those without may widen, especially when age is also considered. Junior scientists with little publication output obviously have fewer media contacts than their more experienced senior peers. Middle-aged and more senior scientists show greater willingness, with nearly half of them indicating their intention to initiate media interactions (Table 2). Nevertheless, as observed in other disciplines (Jensen, 2011; Kyvik, 2005), those who are intending to engage in communication activities still constitute only a small proportion of the total sample.

As for the media interaction this result can be interpreted from two perspectives. First, scientists with senior academic rank possess extensive expertise and visibility within their communities, making them more attractive to the media which, above all else, seek the opinions of renowned experts (Jensen, 2011). Second, senior researchers have earned a certain reputation within their scientific community and enjoy greater autonomy in deciding their actions (Dudo, 2013). This autonomy is particularly relevant in media interactions, as the messages they disseminate can reach wide audiences and, in some cases, may trigger public debates with repercussions for their institutions.

To counterbalance engagement patterns linked to past experience and seniority, efforts should target scientists without media experience who remain undecided or are open to change their engagement behaviour. According to the results of this survey, researchers at the beginning of their career in particular should be approached with tailored measures. They reported a higher readiness to change their communication frequency. However, this group is roughly evenly divided between those intending to increase and those intending to decrease the time they devote to engagement activities.

Materials scientists exhibit weak intentions to participate in media interactions, particularly when compared to the more intense media activity observed in other scientific communities. Astronomy provides a striking example, with half of an international sample engaging in at least nine outreach activities per year, 26% of which involved mass media (Entradas and Bauer, 2019). Climate scientists also show relatively high levels of interaction, with two thirds of the sampled German scientists reporting at least one professional contact with the media per year (Ivanova et al., 2013).

These comparisons should be viewed as points of orientation rather than definitive benchmarks, as disciplines differ in their public appeal and perceived relevance. Moreover, the sample studied has its specific characteristics. As outlined by Marcinkowski et al. (2014), scientists at German universities are not formally expected to engage in communication beyond their disciplinary communities. Therefore, their orientation towards media engagement is less pronounced compared to peers in other countries, for example the United States, where communicating research results to the public is increasingly recognised as a core responsibility of scientists, anchored in scientific

culture and closely linked to political communication and broader social debates (Scheufele, 2014; Peters et al., 2009, p. 27).

6 Conclusion and limitations

Despite the proliferation of public relations and the support provided to scientists' for their engagement in communication activities, institutional culture can also act as a barrier to such engagement. In the present survey, interactions with public relations professionals were identified as the least important factor compared to other communication measures. Since the scientists' interactions with journalists are often mediated by these professionals (Marcinkowski et al., 2014; Ivanova et al., 2013), a closer examination of the scientists' experiences and perceptions of these teams could yield valuable insights into the relatively low level of media engagement observed in this sample. Could the absence of such communications teams or difficulties in maintaining productive relationships with them explain the scientists' low level of interest in communication activities? From the perspective of Bandura's (2001) concept of proxy efficacy, this point becomes even more relevant as scientists who perceive public relations staff as ineffective proxies for their communication goals may feel discouraged from seeking media exposure altogether, whereas those with high proxy efficacy in public relations professionals are more likely to actively seek cooperation and support in their communication activities. Thus, limited confidence in the proxy role of communications teams may be an overlooked barrier to the scientists' media engagement. This line of inquiry could guide further in-depth research and enrich the findings of the study at hand.

A second limitation and a starting point for further investigation, may be seen in the need to examine other communication channels and determine whether the materials scientists' low level of willingness applies to the legacy media only or whether they may be more inclined to use alternative channels such as social networking platforms or face-to-face engagement.

Findings from studies of scientists in Portugal, France and Argentina highlight disciplinary differences in the preferred channels for communicating with the public (Entradas and Bauer, 2016; Jensen, 2011; Kreimer et al., 2011). In the Portuguese context, researchers in the natural sciences are primarily involved in non-mediated educational activities, such as open days, science festivals, fairs and school talks. In contrast, scientists in the medical and health sciences more frequently engage with mass media and journalists (Entradas and Bauer, 2016). Furthermore, funding availability was found to be a factor in facilitating media engagement. These results suggest that future research should consider not only individual-level factors, such as attitudes and skills, but also institutional-level influences, a distinction also supported by the findings of the present study (Table 3).

The relatively low degree of internal consistency of the scale measuring attitudes towards media reports on science may be considered as another limitation (Cronbach's $\alpha = 0.54$). This may indicate that the concept of media comprises distinct dimensions, reflecting the complexity of how respondents evaluate different media sources. Variations in the respondents' media use and preferences across the broad age range (under 25–65+ years) could also contribute to this low level of internal consistency. Yet, the results still provide a

preliminary picture of how science coverage is perceived. Future research could address this limitation by refining the measurement of attitudes towards the media, e.g., by developing separate survey items for specific media types or channels and by examining whether scientists' attitudes vary with consumption patterns across these distinct media.

Notwithstanding avenues for further research, this study advances the theoretical understanding of scientists' media engagement and its behavioural determinants by extending the TPB to a single national and disciplinary setting, namely materials scientists in Germany. It shows the usefulness of TPB in identifying trends in intentional behaviour considering also factors of within the norm-driven institutional environments. The framework reveals how peer expectations, disciplinary culture and institutional organisational support shape the scientists' intentions to engage with the media by highlighting important distinctions between descriptive norms (what peer groups do) and injunctive norms (what peer groups expect). Therefore, organisations should prioritise supporting public engagement, as a strong culture of science communication within organisations appears to positively impact the researchers' participation in these activities.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. Written informed consent from the [patients/participants OR patients/participants legal guardian/next of kin] was not required to participate in this study in accordance with the national legislation and the institutional requirements.

Author contributions

DV: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Validation,

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Supplementary material

The Supplementary material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fcomm.2025.1568771/full#supplementary-material>

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