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ARTICLE

“It’s having conversations that I like with people I like”: exploring the motivations of Australian science podcasters

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Abstract

Science podcasts have become an increasingly popular channel for science communication. Although podcasting has risen in popularity, little is known about why science podcasters choose to pursue this pathway for communication and how they set about achieving their goals for their podcast. Drawing on qualitative data from interviews with 20 science podcasters in Australia, our results reveal that the podcasters are mainly driven by personal factors such as their interest in, enjoyment of, and curiosity about science and that while they employ various tactics to achieve their goals, they do not consciously consider these tactics to be a form of strategic science communication.

Keywords

Public engagement with science and technology; Science and media

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1 ▪ Introduction

Podcasts are digital audio files that can be accessed via computers or mobile devices. Perhaps because they allow listeners to access programs of their choice at a time that suits them, rather than having to follow a broadcast schedule, the popularity of podcasts has grown in recent years; in a survey of around 2,000 people in each of 20 countries Newman et al. [2021] reported that around a third of respondents had listened to a podcast in the previous month.

Science podcasts are an important part of the ecosystem of informal science communication, alongside outlets such as science cafes, science blogs, and science festivals [MacKenzie, 2019; Yuan et al., 2022]. While different communication outlets have risen and fallen in popularity, science podcasting has continued to give science communicators an opportunity to reach large audiences [Yuan et al., 2022]. Individual podcasters, science organisations such as *NASA*, and science media such as *Scientific American* have all joined the world of science podcasting [Yuan et al., 2022].

2 ▪ Background

2.1 ▪ *Why do scientists want to communicate?*

Glerup et al. [2017, p. 9] argued that to maintain social trust in science and scientific information, scientists must reflect on the 'underlying purposes, motivations and potential impacts' of their work. Among scientists, communicating about their work with non-scientists — 'doing science communication' — is often seen as a way to discharge this social responsibility and duty; something they do for publics rather than themselves [Loroño-Leturiondo & Davies, 2018]. Scientists also believe that fostering high-quality communication can encourage positive attitudes towards science and research, although this may be motivated by a desire to ensure that the public continues to support science funding [Besley et al., 2019].

However, as Yuan et al. [2019] noted, although scientists often have positive attitudes about public engagement with science, the ways they go about communicating with publics tend to reflect the deficit models of communication that have historically dominated the field of science communication, with scientists making broad assumptions of publics' deficiencies in knowledge [Dawson, 2018; García-Marín, 2020; Simis et al., 2016].

2.2 ▪ *Strategic communication*

Besley et al. [2018] argue that effective science communication — communication that conveys a message that resonates with the intended audiences — requires deliberate planning. Yuan and Besley [2021] suggest that in planning, science communicators should consider their goals (their long-term aspiration), strategies (for implementation and evaluation), tactics (the choices they make to achieve desired outcomes) and objectives (immediate short-term outcomes) together.

However, scientists who want to engage audiences with their work come from a variety of disciplinary backgrounds, and may have little education or training in science

communication [Simis et al., 2016] and thus might be unaware of strategic approaches to science communication. As Yuan et al. [2022] found in their survey-based study, science podcasters frequently use communication tactics without linking these to a strategic science communication approach.

2.3 ▪ *What motivates those who want to communicate about science?*

Ranger and Bultitude [2016] suggested that science bloggers are often driven by personal motivations such as a love of writing and the desire to share their passion for science. Hill et al. [2022] also noted that science YouTubers were motivated by personal enjoyment, interest and curiosity. Fleerackers et al. [2022] identified the impetus of self-expression and self-improvement among creators of science art, allied with the desire to instil a 'sense of wonder' in their audiences [p. 5]. However, non-personal motivations undoubtedly also play a part. These range from increasing support for creators' scientific fields [Yuan & Besley, 2021] to financial motivations such as earning money from audience subscriptions [Hill et al., 2022; Ryan & Deci, 2000]. Velho and Barata [2020] showed a major motivation was the belief that people need to be educated about scientific issues and, as noted above, Loroño-Leturiondo and Davies [2018] identified a view of communication as a social responsibility.

2.4 ▪ *Why choose to make podcasts?*

Given the range of opportunities open to those who want to communicate about science [MacKenzie, 2019; Yuan et al., 2022], why choose to make podcasts? One factor in the choice of tool might be the kind of motivations driving the communicators. Anecdotally, podcasters refer to technical factors such as podcasts being simple to create and needing relatively inexpensive equipment, yet having the potential to reach large audiences [Mailchimp, 2023] and also communication factors, such as the ability for podcasts to be entertaining as well as educational [Davies, 2023].

While the motivations of science bloggers [Jarreau, 2015], SciArt artists [Fleerackers et al., 2022], science YouTubers, and non-science podcasters [Hill et al., 2022] have been well-studied, with the exception of Yuan et al. [2022], little is known about the motivations, goals and strategies of science podcasters. Specifically, it remains unclear what drives science podcasters who use podcasts as a communication tool alongside their primary occupation, rather than as their main profession.

2.5 ▪ *Who are science podcasters?*

World-wide, MacKenzie [2019] catalogued 952 English-language science podcasts, 65% of which were hosted by scientists. Of these, 77% targeted non-expert audiences. Existing studies predominantly focus on international trends; only 5% (48) of the catalogued science podcasts originated from Australia. Thus, despite the global proliferation of science podcasts, there is a notable lack of research examining science podcasters in the Australian context, leaving a significant gap in understanding the unique characteristics and motivations of Australian science podcasters.

Historically, science has been a male-dominated domain, with women systematically under-represented, due to structural biases and sexism [Ceglie & Olivares, 2012; Dancy et al.,

2020; Kozlowski et al., 2022; White et al., 2021]. Science podcasting, as a form of science communication, presents an opportunity to examine gender representation within the field. AbiGhannam [2016] argues that women are often drawn to science communication careers because these roles provide alternative professional pathways within the science sector. While science communication is frequently characterised as female-dominated [Lewenstein, 2019], other science communication media — such as science blogging [Jarreau, 2015], SciArt [Fleerackers et al., 2022] and science-focused YouTube channels — reflect persistent gender inequalities in the sciences [Dancy et al., 2020; White et al., 2021]. Although MacKenzie [2019] identified that the majority of science podcasters are scientists, there is insufficient data to determine whether gender disparities observed in other science communication media also manifest in podcasting. This represents a critical area for further investigation.

MacKenzie [2019] also reported that only 24% of science podcast series generated financial income, with 62% affiliated with organisations. However, the motivations of the 76% of podcasters who receive no financial compensation, and who are not affiliated to an organisation, remain largely unexplored. Understanding why these podcasters continue to produce content despite the absence of monetary incentives could offer valuable insights into the personal and social drivers behind science podcasting. This remains an important avenue for research, particularly in the Australian context.

2.6 ▪ *Research questions*

In this study we aimed (i) to understand Australian science podcasters' motivations for making podcasts and (ii) the extent to which they use science communication strategies when creating their podcasts.

3 ▪ Methods

Our study employed a qualitative research design, which is appropriate for exploring subjective experiences and perceptions [Creswell, 2014]. It was guided by social constructivism, a methodology that allows researchers to journey with participants to understand and interpret the subjective truths that are part of their individual reality and as diverse as their lived experiences [Boyland, 2019]. We used semi-structured interviews to gain detailed insights into podcasters' perspectives, motivations, goals, objectives and strategies. Interviews using open-ended questions and a flexible structure allowed participants to provide answers in their own terms and permitted the interviewer to improvise in a thoughtful way in response to participants' insights [Groves et al., 2004].

3.1 ▪ *Sampling and recruitment*

The study was conducted in accordance with the ethical guidelines set out by the National Statement on Ethical Conduct in Human Research (2007). The research methods were approved by the UWA Human Ethics Committee (ref 2022/ET000912).

As we intended to focus on exploring the motivations of podcasters who have an interest in science podcasting, our selection criteria were: first, scientists or science-interested people;

second, people who make science podcasts; third, people who created their podcasts as individuals or teams of no more than two people (if the podcasting team had two members, we interviewed each person separately); fourth, people who were actively podcasting at the time of the research (podcasters who only had podcasts published before 2021 or after 2022 were not included); fifth, participants over eighteen years old. Finally, podcasters had to be based in Australia, as we had identified a lack of research on this community [MacKenzie, 2019]. To make the most effective use of resources, we used convenience sampling to recruit science podcasters [Creswell & Plano Clark, 2007; Etikan et al., 2015]. We emailed professional networks, including but not limited to national science institutions, universities across Australia, science and technology organisations such as the Australian Science Communicators, Australian Academy of Science, Science and Technology Australia, and science communication departments at Australian National University (ANU), The University of Melbourne and University of Western Australia. Emails included invitations to share images on the institution's social media channels (Instagram, Twitter, Linkedin and Facebook).

People who responded with an expression of interest and who were accepted as participants were contacted via email with a participant information form and participant consent form to read, sign and return. Although we were primarily interested in those who were unaffiliated with a media organisation and were not receiving an income through the podcast, we accepted all expressions of interest.

3.2 ▪ *Data collection*

CN conducted twenty one-on-one interviews with science podcasters between February and April 2023. The interview was in three parts. First, we asked questions to explore participants' motivations for podcasting, with a focus on their attitudes and intentions. Second, we explored participants' goals and objectives. Third, we asked about participants' awareness of strategies and tactics and whether they view them as part of science communication.

The interviews took place between February and April 2023, either online (via Microsoft Teams or Zoom) or face to face at University of Western Australia (UWA). Online interviews were recorded using the software's recording function and transcribed using an auto-transcription service. Interviews conducted in person were recorded and transcribed through Otter AI software.

3.3 ▪ *Thematic analysis*

We used thematic analysis [Clarke & Braun, 2018] to analyse the interview transcripts, using Nvivo software to support the analysis. We used constant comparative analysis [Denzin & Lincoln, 1994] to compare the data from new interviews with previously-analysed data until we reached data saturation; when new data no longer created new insights or revealed new properties [Charmaz, 2006], at which point we halted the interview series. To increase interpretative validity, CN and AG separately coded a common set of four interviews, then discussed and re-discussed the results until we had reached agreement on a coding frame. Through this thematic analysis, we were able to gain a deeper understanding of the various factors that drive science podcasters to create and produce science podcasts. It also allowed for the exploration of the complex and multifaceted nature of podcasters' motivations and their awareness of strategic science communication in their practice, while

remaining open to the diverse perspectives of the podcasters themselves and capturing the nuances and complexities of their experiences and perspectives.

4 ▪ Results

4.1 ▪ *Podcasters' diversity*

Science communication is a heavily female-dominated field and practice [Lewenstein, 2019], so one might expect that women would make up a large proportion of podcasters. However, most of the people who volunteered to be interviewed identified as male; in all, seventeen of our interviewees identified as male, two as female, and one as non-binary (see Table 1).

Our twenty podcasters came from diverse disciplinary backgrounds. Half had a background in the sciences (such as astronomy, medicine, anatomy, and physics) and were currently practising scientists. Six were science communicators who had a degree in science communication and worked in that field. Two were science journalists who held qualifications in journalism or radio. The remaining two participants had disciplinary backgrounds outside these categories.

Podcasters' experience of creating their podcast channel ranged from less than one to seventeen years.

Table 1. Background of science podcasters interviewed.

De-identification no.	*Disciplinary background*	*Gender*	*Podcasting experience (years)*
P1	Scientist	Male	3
P2	Scientist	Male	2.5
P3	Science Communicator	Male	13
P4	Scientist	Male	2
P5	Scientist	Male	<1
P6	Scientist	Male	5
P7	Other	Male	12
P8	Scientist	Male	5
P9	Science Communicator	Male	<1
P10	Science Communicator	Male	12
P11	Scientist	Male	17
P12	Scientist	Male	7
P13	Other	Male	10
P14	Science Communicator	Male	13
P15	Journalist	Female	5
P16	Science Communicator	Male	6–7
P17	Journalist	Female	4
P18	Scientist	Male	3
P19	Science Communicator	Male	3
P20	Scientist	Non-binary	4

4.2 ▪ *Podcasters' motivations*

Most of our participants discussed personal motivations such as interest and curiosity about creating podcasts, enjoying talking about science and affording opportunities to network with professionals. Some used their podcast to tackle personal challenges, such as improving their communication skills or to "entertain [their] own brain" (Participant 4). Other factors mentioned included the ease of starting a podcast, and having a background in science, science communication or performance.

4.2.1 ▪ *Talking and learning about science*

Most podcasters were motivated by their interest in and enjoyment of talking, and especially talking and sharing stories about science. Podcasters who had co-hosts enjoyed meeting to talk together about their scientific interests. Those who enjoyed talking felt that podcasting was a more 'natural' form of communication than other forms of media; that the informal and conversational style of podcasts is an 'instinctive' form of communication that humankind has been using in social settings for millennia:

> I love the fact that it feels very natural. It's having conversations that I like with people I like and share interests with (Participant 5)

Some podcasters used their podcasts to boost their careers, especially those who were at the beginning of their careers, had recently graduated from university or were starting Ph.D. research, who used their podcasts to network with other professionals, which helped them see alternative career pathways and futures:

> I thought [podcasting] might be a great way to meet people in academia (Participant 18)

Some saw their podcast as a platform where experts could share their knowledge and expertise and for one podcaster, a space to showcase the research of lesser-known scientists:

> It's not always the big names. It's not always the person who got their name in the scientific paper. It's not always the person with their name at the front or the person who is head of the department. There are other people within the research team that might have as much knowledge but also a different perspective. (Participant 9)

The podcasters enjoyed learning by listening to their guests talk about their work, in the same way they enjoyed listening to other podcasts. Others liked to learn about the new topics they researched for their podcast:

> Would I keep doing it if only one person listened? I hope I would, because it educates me to do it. (Participant 4)

Several podcasters commented that they had chosen podcasting over other tools for its accessibility; that podcasting offered a swift route to dissemination to listeners, and as a tool that does not incur great financial burdens, offered a low barrier to entry for podcasters:

> It's fast to get a quality product out and a low barrier to entry. I think I spent 240 bucks on a podcast kit, and that was enough to get me started. I could publish, which is a great thing about the Internet. I didn't need to… hire a venue. I could just put down that initial outlay and get going (Participant 7)

Others were motivated by the challenge of enhancing their communication skills and producing brief, time-constrained yet informative episodes. Additionally, they used the podcast to showcase those skills:

> I mean my background is science communication, so it allowed me to hone those skills and bring them across the podcast. (Participant 10)

In summary, podcasters were likely to be motivated to start a podcast by their personal curiosity, interest, and belief in the value of a conversation between interviewers and interviewees as a communication tool.

4.2.2 ▪ *Making science accessible*

Podcasters also discussed motivations that related to listeners, including educating, improving listeners' knowledge, giving their work a wider reach, and gaining national and international recognition for their podcasting.

One participant expressed this as about making a human connection between people and science:

> [I want] to humanise the data and the science (Participant 4)

Several interviewees commented that they thought science could seem 'dry' or 'stale' (Participant 7) to non-specialists. They sought to use humour to create an informal atmosphere in which they could challenge this perceived assumption about listeners:

> [podcasts allow me] to make some pretty dry content a bit more fun (Participant 12)

Podcasters who were scientists often said that they were motivated to improve listeners' knowledge, seeing their podcast as an educational tool. By sharing their expert knowledge, they hoped to help people make decisions, make better choices for their health, improve their analytical skills or change their political standpoints. These participants also mentioned

their belief that scientists have a moral responsibility to enable access to science as a way of giving back to society:

> Not everybody is as privileged as me to have had however many years of education gaining science literacy. I've had several huge cheques and years of education at top universities, learning how to read and write papers. I recognise that not everyone is lucky enough to have that. Despite that, everybody's taxes fund science. So, I almost have a responsibility to help increase the accessibility of some of that content. (Participant 20)

However, Participant 11, who believed that mainstream media news reporters had little understanding of science and how to report it accurately and fairly, had been challenged by friends and colleagues to do better, using their podcast to prove their point.

In summary, most science podcasters pursued their craft as a passion project, enjoying it as a personal challenge that allows them to have interesting conversations that bring listeners into the world of science. For most podcasters money was not a primary motivation for starting; they podcast to help non-scientists access science or to network with other professionals.

4.3 ▪ *Podcasters' use of strategic science communication*

Our second research question sought to understand podcasters' use of strategic science communication in their practice. The results suggest that while podcasters' goals, which are focused on the future, might differ from their motivations, which are rooted in the past, there are still common themes.

A strategy is a guide to achieving a desired outcome, involving research, planning, implementation, evaluation, and tactics to attain a goal. Surprisingly, many of our participants did not have long-term strategies for their podcast development or to enable them to measure the effectiveness of their efforts. Rather than strategic planning, implementation and evaluation, podcasters often associated planning with the dot points they create for interview questions.

Even though most podcasters acknowledged that audience engagement is crucial to achieving their goals, very few had a clear understanding of their target audience, saying they aimed to reach "the public" or "lay" people. None had established a plan to measure listeners' engagement. Rather, they seemed to assume that people would listen if they talked. Some used metrics, comments, and feedback from their audience to measure listenership, using these as proxies for engagement. Most did not ask listeners for their input or evaluate the impact of their efforts.

4.3.1 ▪ *Goals (long-term aims)*

The podcasters who were science communicators, or did not have a background in the life sciences, identified goals such as wanting to entertain their audience, to make science fun and to foster warm feelings about a cold subject. One participant wanted to create a safe, positive space for their listeners:

> I want people when they are faced with science to go 'I love science, I listen to science, I laugh, and I have a good and fun time with science, so I'm going to be more open to it'. (Participant 7)

Some podcasters, who perceived gaps in listeners' knowledge, set goals to use their podcast to educate their listeners. Scientists mentioned aiming to include diverse content and perspectives to create easy-to-digest, jargon-free learning opportunities for listeners:

> [my main goal] is for the podcasts to increase the amount of freely available, easily accessible, relatively jargon-free science content. (Participant 20)

> We want to bring [the audience] behind the scenes and give our audience members [the sense that] we are real people who are just trying to figure out the questions like them. (Participant 1)

Several podcasters had an ambition to do their podcast in front of a live audience:

> The roar of the crowd is very good fuel… When you get an audience going off about what you're doing. It's a nice feeling. (Participant 16)

As well as the thrill of live interactions with listeners, they saw this format as allowing listeners to ask questions and engage in the conversation.

For some podcasters, the moral obligation to increase access to science results in negative attitudes toward earning money from their podcast. These participants believed that academia is not a "money-making venture" and money should not be a motivation for creating their podcast One podcaster referred to feeling "dirty" about receiving monetary backing for their podcast:

> It took us six years to monetise… We felt a little bit uncomfortable with the monetisation process… You don't want to feel dirty about it… I think a lot of the public think, you're a scientist, you should be doing this out of the kindness of your own heart. (Participant 12)

However, two described positive attitudes to monetising their podcast, believing it justifies the time they spend working on it and allows them to continue.

> What I want to get out of it is to continue it for as long as possible. What I need to do is to be able to monetise it. (Participant 5)

Although most podcasters do not aim to earn money from their podcasting, sustainability was a goal, and for some that demanded financial sustainability.

4.3.2 ▪ *Tactics*

All participants identified tactics that they used to make podcasts more enjoyable for their audience, such as using an informal conversational tone, music, spontaneity, diverse perspectives and storytelling techniques. While many podcasters employed different tactics, most had no long-term strategy for enhancing their podcast or increasing engagement with their audience.

Those who wanted to entertain the audience used their background in communications or performance to capture their audience's attention, often including storytelling elements over a wide variety of science topics. Some sought to evoke positive attitudes through the use of humour and comedy, while others used "quirky" analogies to convey their message.

Most podcasters chose to use an informal, conversational tone. Participants said they often used similar tactics to those used on the podcast channels they listened to. Participant 20, who podcasts with a co-host, felt that using an informal conversation tone allowed listeners to feel they were part of the conversation:

> We need it to… feel like… I'm having a conversation with [co-host] so then listeners can feel like they're passively taking part in that conversation as well. (Participant 20)

Participant 7 also had a co-host; they used their pairing to give the listeners a sense of surprise:

> My co-host and I swap who is organising a topic, and there's a bit of a reason that we don't tell each other what the topic is, so there's a surprise in the delivery. (Participant 7)

Podcasters who work alone often preferred to do an interview-style podcast, using diverse voices to offer the listener insights into multiple perspectives:

> I like to try to represent diverse voices where I can because it presents many different opinions and perspectives. (Participant 15)

Creating in an audio medium, podcasters often used music, sound bites and sound effects to help audiences feel as if they are part of the story, to evoke emotion, build tension, suspense, or humour, separate segments and hook the listener to their podcast:

> I often find that putting music behind allows you to set the emotional stakes while they're [the interviewee] setting the intellectual stakes. (Participant 19)

Many podcasters described having a loose script or semi-structured script to guide them through their episodes. Using a semi-structured script helped hold them to the main

discussion points of the episode, while allowing them to add personal jokes to increase the informality of their podcast.

However, others believed that a free-flowing, open-ended conversation achieved more than a structured interview:

> I used to be very structured… I'd give those questions to the person who's interviewing so they'd be prepared. But I found that listening back to those episodes, they sounded stilted… I'm happy to just leave it as a conversation, leave it quite open because sometimes it will take a turn that you didn't even think of taking because they brought up a particular tangent. You go down that tangent, and that ends up being a really interesting one. It is far more interesting than what you originally would ask anyway. (Participant 11)

Storytelling was a very common tactic. Podcasters with a science communication or journalism background were most likely to use storytelling for its ability to engage:

> A story is an incredibly manipulative thing that we've designed [so] that we can capture someone else's brain. (Participant 14)

Participant 16 felt that without elements of emotion or story, they would become an "explainer" or "just a list of things". Podcasters described a variety of storytelling techniques, such as emotional manipulation, analogies and humour. Those who used storytelling to capture listeners' attention often chose stories that were "shocking", "disturbing", "hilarious", or "mind-blowing" to evoke emotion in the listener. Several podcasters used analogies to help listeners visualise their message, for example by comparing technical objects to everyday items.

5 ▪ Discussion

5.1 ▪ *Podcasters' motivations*

The podcasters in this research were largely driven by their existing interest in science, curiosity and personal challenge. They derived satisfaction and enjoyment from talking about science, networking, learning from others, and breaking down barriers to understanding, such as jargon and inaccessible language. This was often combined with a desire to educate their listeners, increase the exposure of science in the public and policy domains and demonstrate the economic, social, and cultural benefits of research [Chubb, 2017; Loroño-Leturiondo & Davies, 2018]. For many of the podcasters, communicating science and enabling publics to engage with science was a social duty and responsibility; a way of giving something back to the publics that fund their work.

Podcasters were influenced by their past experience. They liked listening to other people's podcasts (although more often comedy than science podcasts) and creating educational and entertaining content of their own. In this, podcasters show similar motivations to people who communicate via other online media platforms [Fleerackers et al., 2022; Hill et al., 2022;

Ranger & Bultitude, 2016]. However, the podcasters also appreciated the medium's ease of use and low start-up costs, which allowed them to pursue podcasting as a hobby. Others mentioned the ease with which publics can access podcasts, as opposed to the difficulties of accessing information that sits behind paywalls [Roche et al., 2020].

Unlike the science YouTubers studied by Hill et al. [2022], who sought financial rewards, most of the participants in this study believed that creating the podcast was reward in itself, without the desire for monetisation. While this may be attributed to our deliberate recruitment of people who produced podcasts in addition to their main, paid, job, the belief that it is their social duty to make science more accessible might also contribute to podcasters' reservations about receiving financial compensation. This belief in their social responsibility aligns with the insights of the survey research by Yuan et al. [2022] into the motivations of podcasters.

5.2 ▪ *Strategic science communication*

Several podcasters described using tactics such as storytelling, avoiding jargon and infusing humour and emotion into their podcasts but most had no longer-term strategy for evaluating the development of the podcasts or engagement with their listeners. Communicating strategically in a manner that connects with diverse audiences can reinforce positive attitudes, opinions, and feelings toward science and the scientific community [Besley et al., 2019; Blanchard, 2011; Yuan & Besley, 2021], which many of the podcasters aimed to do. However, there are barriers to implementing strategic plans. Most of our participants were pursuing their podcasts as a passion project alongside full-time jobs and family commitments. Their limited resources of time and money made it difficult to justify anything beyond the production of the regular podcast.

The impact of lacking strategic direction shows in the persistence of the deficit model [Kouper, 2010; Simis et al., 2016] in the podcast setting. Simis et al. [2016] argue that there are multiple systematic, empirical reasons why the deficit model persists. These include tertiary education in Science, Technology, Maths, and Engineering (STEM), scientists' lack of training in communication, lack of awareness of the developments in the epistemology and methodologies of strategic science communication, their conceptualisation of a 'general public' but ultimately, the deficit model's simplicity.

Several podcasters in this study said they wanted to fill what they described as a 'public' knowledge gap around science; implying that they believe the public has a deficit in knowledge [Lewenstein, 2017; Simis et al., 2016] and they wanted to educate them. Allied to the concept of a public deficit is the belief that providing scientific knowledge to the audience will lead to behavioural changes in line with scientific thinking and positive thinking about science topics, as noted by Hill et al. [2022]. However, many science communication scholars agree that educating and informing is insufficient to change behaviours [Yuan & Besley, 2021]. García-Marín [2020] highlights the importance of using participatory engagement approaches in podcasting to improve the development and connections between podcasters and listeners. This includes active and creative participation between creator and listener, which fosters a non-hierarchical relationship and signals a power shift in viewing publics as being equal to podcasters, scientists and policymakers [García-Marín, 2020; Metcalfe, 2019].

Not all podcasters, especially those with a background in science communication, aim to educate the 'public'. Many simply want their listeners to enjoy themselves. Some podcasters want to demystify science by revealing the behind-the-scenes aspects of their work. They want to show that they are real people, just like their audience. However, in itself, this suggests a perception that scientists are considered different or superior, and are not perceived as real or relatable and there is a disconnection between scientists and the public [Dawson, 2018].

5.3 ▪ *Podcasters' diversity*

5.3.1 ▪ *Gender*

The dominance of people identifying as male among our participants is consistent with known gender inequalities in science [Dancy et al., 2020; White et al., 2021]. Although AbiGhannam [2016] and Johnson et al. [2014] argued that women are attracted to careers in science communication, the predominance of women in science communication is similarly not reflected in other online platforms, such as YouTube and blogging. AbiGhannam [2016] suggests that women are attracted to careers in science communication because it provides them with alternative opportunities. Furthermore, societal pressure often encourages women to seek jobs that benefit the community [Johnson et al., 2014]. Many women in science are also promoted on the basis that they will use their time to create activities to encourage more girls and young women to participate in science [AbiGhannam, 2016].

Several researchers have reported on the gender disparity between male and female creators [AbiGhannam, 2016; Amarasekara & Grant, 2019; Kouper, 2010; Shema et al., 2012; Welbourne & Grant, 2016; Yang et al., 2022]. It is then unsurprising that the podcasters in this study mostly identified as male, given the predominance of men on other online communication channels. Amarasekara and Grant [2019] found that male science YouTubers are more popular than female YouTubers, while science channels hosted by women were more likely to receive critical, appearance-based, and sexist comments.

This disparity raises concerns about gender expectations in podcasting and warrants further investigation of how we can shift the conversation to invite broader discussions about participation across the gender spectrum.

5.3.2 ▪ *Disciplinary background*

Like the podcasters studied by MacKenzie [2019] and Yuan et al. [2022], the podcasters in this study came from a range of disciplinary backgrounds, including various sciences, science communication, media and journalism and other fields. Most were scientists, researchers or educators who created podcasts in addition to their regular work. However, less than half had a science communication background, meaning that most participants were unaware of how they could use science communication strategies to plan, evaluate and understand the effectiveness of their podcasts in achieving their goals. Such lack of awareness can result in unevidenced conclusions about the impact of podcasts as a communication tool [Yuan et al., 2022].

Formal disciplinary education also plays a role in shaping podcasters' beliefs and goals. Our findings show that while podcasters with a science communication and journalism

background aimed to entertain their audience, scientists tended to want to educate the public, often using deficit model communication strategies. Vasquez-Muriel and Escobar-Ortiz [2022] suggest that if scientists continue to communicate using a deficit model, it will become the norm and reinforce traditional views of science communication. Moreover, making scientific information more accessible does not necessarily lead to more diversity and inclusiveness in science.

6 ▪ Limitations

There are a number of limitations and potential biasses in this study, chiefly arising from the possibility that our group of participants does not faithfully represent the whole community of Australian science podcasters. We primarily recruited participants by contacting universities and national science institutions, resulting in most of the participants being academics from higher education institutions. Most of the science podcasters we interviewed created their podcasts outside their main job, driven by passion, and a desire to share their enjoyment in learning and talking about science; science podcasters who are employed by large media organisations might have different opinions. Moreover, this study examined the opinions of science podcasters in Australia and therefore did not include any viewpoints of science podcasters from countries with different cultural, political, and social backgrounds. Also, the study had a high proportion of male-identifying participants. The low degree of cultural and gender diversity might have favoured a Western, male perspective in the results. Finally, using semi-structured interviews adds an additional potential for bias, in that participants tend not to offer views and attitudes they think the interviewer would find socially undesirable and over-offer socially desirable [Grimm, 2010]. Therefore, while we were able to reflect the presence of themes in participants' responses, the absence of themes does not necessarily indicate absences in participants' experience.

7 ▪ Conclusion

Our results show that the podcasters were mainly driven by their interest in, enjoyment of, and curiosity about science, the desire to use skills derived from their disciplinary background and their positive experiences as podcast listeners. They have a sense of social responsibility and see podcasts as a tool for communicating science that has low barriers to entry, being both relatively easy and affordable to create and easy for listeners to access, affording them the potential to reach wide audiences.

Although the podcasters said they used certain tactics and had goals and objectives for their podcasts, they mostly do not link these with principles of strategic science communication. Most podcasters had no longer-term strategy for evaluating the development of the podcasts or listeners' engagement. Without a strategy, podcasters might struggle to measure the effectiveness of their efforts.

We suggest that a number of useful directions for future research to improve the practice of science communication and public engagement through podcasting arise from this work. First, it would be useful to investigate why podcasters do not approach their work strategically, for example whether it is due to the extra effort involved in devising a strategy or to lack of training in strategic science communication. Second, given how many

podcasters aim to use humour and similar tactics in their podcasts, it would be helpful to know how these tactics affect listeners' engagement, enjoyment and education. Third, it would be valuable to understand whether there are barriers to entry into podcasting for people from under-represented and historically excluded communities.

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