

Not Just a Trick: A survey study exploring how ‘exposing’ exhibition visitors to science of magic concepts impacts their appreciation of magic

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ABSTRACT

The recent rise in scientific research on magic raises important issues about the impact that the dissemination of magic knowledge has on people’s appreciation of magic. Deception, secrecy, and mystery are inexorably intertwined with the idea of performance magic. Magicians traditionally do not reveal their secret methods to non-magicians. This study used a survey to assess how people’s appreciation of magic was impacted by a magic exhibition designed to highlight and reveal the psychological mechanisms that underpin magic. Visitors to the exhibition were asked to rate the impact of the exhibition on a range of measures assessing people’s interest and appreciation for magic. The results revealed significant positive impacts across multiple dimensions. We also conducted a qualitative analysis on people’s self-reports about things that they like and dislike about magic as well as the impact that scientific explanations have on people’s appreciation for magic. Despite magicians’ traditional fear that revelations related to magic secrets might rob magic audiences of their sense of wonder, our results indicate that an engaging exhibition about the science that underpins some magical experiences can actually enhance peoples’ stated appreciation of magic.

KEYWORDS

magic, secrets, exposure, aesthetics

INTRODUCTION

I thought good to discover it, together with the rest of the other deceitful Arts; being sorry that it falleth out to my lot, to lay open the secrets of this mystery, to the hinderance of such poor men as live thereby: whose doings herein are not only tolerable, but greatly commendable, so they abuse not the name of God, nor make the people attribute unto them his power; but always acknowledge wherein the art consisteth. (Scot, 1585, p. 262)

One of the first written English exposures of magic trick methods occurred in Reginald Scot's *The Discoverie of Witchcraft* (1584). The book was written to debunk the idea that society was threatened by supernatural powers, and Scot used the idea of performance magic to support his thesis that otherwise healthy and intelligent observers can be fooled into falsely believing they are witnessing diabolical or miraculous phenomena. He devoted a small portion of *The Discoverie* to a detailed breakdown of magic trick methods, exposing a variety of tricks ranging from vanishing coins to illusory decapitations. Notably, Scot prefaced these exposures with an explicit apology to performing magicians. He expressed regret that his writings might potentially harm the livelihood of honest entertainers, by which he meant those who presented their effects as trickery and did not claim to possess supernatural powers. Despite these reservations, Scot believed that his message was important enough to justify exposing some secrets of magic. This tension, between education and mystery, is echoed in the work of contemporary researchers who scientifically investigate the nature of performance magic.

Performance magic is an artform that seeks to create the experience of the impossible. Magicians have spent millennia developing techniques that allow them to induce powerful, sometimes seemingly supernatural, illusory experiences in the minds of their audiences. Magicians, of course, do not possess supernatural powers. Instead, they rely on naturalistic methods that allow them to manipulate their audience's conscious experiences of the world. Generally, magic illusions are most effective when the audience remains unaware of their precise nature (although some types of illusions can be cognitively impenetrable - e.g. Ekroll, Sayim, & Wagemans, 2017; Ekroll, De Bruyckere, Vanwezemael, & Wagemans, 2018). Misdirection, an umbrella term referring to various techniques used to disguise the true methods behind magic effects, and it is central to performance magic. Even outside of performance settings, magicians are notoriously averse to revealing their methods. Deception, secrecy, and mystery are inexorably intertwined with the idea of performance magic. Magicians rarely share their methods with non-magicians a.k.a. 'lay persons'. Most magic clubs and societies (e.g., The Magic Circle, Society of American Magicians, International Brotherhood of Magicians) require members to agree that they will never expose

magic secrets to the general public. Magicians who are deemed to have engaged in wilful exposure face expulsion and censure from such societies¹.

While there is general agreement, particularly among professional magic organisations, that 'exposure' is bad for the art of magic, there is no formally agreed upon definition of exposure in magic. The idea that a 'Magician's Code' dictates that 'magicians can never reveal their secrets' *seems* simple, but complications quickly arise when this dictum is applied in the real world. The situation is further complicated by the fact that such a code can be used as a theatrical conceit by performers - either to foster a sense of mystery or to help create a sense of intimacy by offering audiences a 'peek behind the curtain' of performance magic. For example, certain magic routines do involve explicitly revealing the secrets to magic effects in order to set the stage for subsequent deceptions. One particularly iconic example is Dai Vernon's Cups and Balls routine, in which the performer genuinely explains a method to vanish a ball using sleight-of-hand before proceeding to use an entirely different method to produce a series of surprising new objects (e.g. Ganson, 1978). Outside performance contexts, many respected magicians have exposed magic methods in order to educate non-magicians about psychic frauds (e.g. Houdini, 1924), gambling cheats (e.g. Ortiz, 1984), or even espionage (Melton & Wallace, 2009). Many magical thinkers have grappled with the concept of exposure. For example, the magician Juan Tamariz has argued that the true mysteries of magic lie beyond basic understanding of magic methods (Tamariz, 2019). Teller (of the duo Penn & Teller) has argued that the principle of concealing magic methods is best conceptualized as an aesthetic choice, rather than a moral one (Pang, 2015). This situation has been further complicated by the rise of the Internet and the increasing prevalence of social media, which have fundamentally changed the ease by which magic secrets can be accessed (e.g. Rissanen et al., 2017). Moreover, magic methods are frequently applied to domains outside entertainment. These applications often rely on exposing ostensibly 'secret' magic methods to non-magicians. The 'Science of Magic' (e.g. Lamont & Wiseman, 1999; Macknik et al., 2008; Kuhn, Amlani & Rensink, 2008; Kuhn, 2019) can involve publishing magic methods in non-magic forums and disseminating these ideas to the general public. It can also involve, for example, teaching magic tricks to enhance students' wellbeing (Bagiński & Kuhn, 2019, 2020; Wiseman & Watt, 2018), and to facilitate creative thinking (Wiseman, Wiles, & Watt, 2021). Magic principles have also been applied to the process of video game design (Kumari, Deterding, & Kuhn, 2018), the study of deception (Hyman, 1989), and to the general study of human cognition (Kuhn, Amlani, & Rensink, 2008; Macknik et al., 2008; Rensink & Kuhn, 2015; Thomas, Didierjean, Maquestiaux, & Gyax, 2015). Many of these instances involve magic methods being taught or explained, at least partially, to non-magicians. These practices of teaching and explanation might be conceptualized as 'exposures' of magic

¹ Notable figures like David Devant, and more recently the late Anthony Owen or John Lenahan had their membership of the Magic Circle suspended for falling foul of this rule.

secrets and might be condemned by magicians who adopt a more conservative approach to the practice of 'The Magician's Code'. To date, despite the increasing prevalence of magic related academic research, little has been done to investigate how learning the scientific principles that underpin magic might affect non-magicians' appreciation of magic. As both researchers and magicians, we value the importance of magic in science, not only as a means to elucidate psychological mechanisms, but also in the role of magic as a playful tool for communicating scientific findings. At the same time, as magicians and magic enthusiasts, we are also concerned with the possibility that using magic in science could be detrimental to magic as an art form. Thus, it seems reasonable to attempt to empirically address some questions about certain types of exposure in magic.

Fears about magic exposure are often framed around concern for the audience's theatrical experiences as well as economic concerns of magicians. Unlike many other artforms, one aspect of magic is to actively deceive spectators in order to instil a sense of mystery and wonder. Learning the details of how a painter blended pigments on canvas to create a particular visual is unlikely to diminish one's appreciation of a painting. Knowing exactly how a musician moves their fingers on a piano is unlikely to diminish one's appreciation of their music. But the same does not necessarily hold for knowing how magic props are constructed or exactly what a magician does with their hands during their performance. Audiences in magic show *expect* to be deceived, and they can be disappointed when this fails to occur. By extension, disappointed audiences may be less likely to seek out (and pay for) magical experiences. Conventional wisdom and innumerable anecdotal experiences of magicians clearly indicate that some types of exposure can indeed diminish audiences' appreciation of magic. At first glance, a scientific understanding of magic principles would likewise seem to undermine magicians' aesthetic (and economic) aims by providing audiences with knowledge that makes them more difficult to deceive. However, one might also argue that gaining knowledge of magic at a broad cognitive or historical level might actually help create a stronger sense of wonder (e.g. Bulot & Reber 2013).

The current paper aims to empirically investigate how learning about scientific principles that underpin some secret magic methods might impact people's appreciation of magic. Our focus was not on the exposure of particular methods related to specific magic tricks, but rather on exposing broader ideas about the science of magic. In 2019, the Wellcome Collection (see Wellcome Collection, 2018; also Tompkins, 2019) put on an exhibition that examined the psychological mechanisms that contribute to the ways that people experience magic tricks. The exhibition explored historical ways in which magicians have contributed to debunking spiritualist mediums, and the psychological mechanisms that contribute to the formation of paranormal beliefs. Other sections examined the ease by which magicians manipulate people's conscious experience and contained exhibits that explained the psychological mechanisms that underpin visual misdirection and the

illusion of free will, a concept frequently exploited in the domain of mentalism. This section of the exhibition discussed several scientific findings from the science of magic literature which naturally exposed some scientific principles that might be conceptualized as secret magic methods pertaining to the tricks used for the studies. For example, one exhibit revealed that magicians can make objects vanish by surreptitiously (but in full view of the audience) dropping them behind the edge of a table top (Kuhn & Tatler, 2005), another exhibit explained the disappearance of an object by the magician concealing an object in his palm while pretending to throw it up in the air (Kuhn & Land, 2006). Other exhibits explored magic methods like memory misdirection (Ortega, Montañes, Barnhart, & Kuhn, 2018), forcing (Olson, Amlani, Raz, & Rensink, 2015; Olson, Amlani, & Rensink, 2012), and cold reading (Lan, Mohr, Hu, & Kuhn, 2018; Lesaffre et al., 2020; Olson, Demacheva, & Raz, 2015) can help induce illusory experiences. In these instances, the exhibition revealed the psychological mechanisms that underpin these principles, and in doing so arguably 'exposed' these methods to the exhibition visitors.

The six-month free exhibition was attended by nearly 190,000 visitors and attracted favourable media attention (e.g. Ings, 2019; Khan, 2019; Saville, 2019). However, the exhibition generated controversy within some parts of the magic community – among magicians who were concerned that the exhibitions' exposure of secret magic methods would have long-lasting negative impact on their artform. One particular concern was that by informing exhibition visitors (most of whom would be considered 'lay people') about how easy it is to be misdirected, this might prevent them from enjoying magic in the future, akin to 'spoiling' the end of a mystery novel. For some magicians with conservative views on magic exposure, the exhibition was considered to be a direct threat to the art of magic.

Very little is formally known about how people's appreciation for magic is affected by their learning about psychological mechanisms that underpin magic. Indeed, there has been relatively little formal study of what people like and dislike of magic in general (two notable exceptions include Jay, 2016; Silva et al., 2020). The science of magic often relies on exposing such psychological mechanisms, and within the research community, there is a general acknowledgement that this should be achieved without negative impact on the magic community. It is therefore important to consider the impact of this public exposure of 'magic secrets' on the public's appreciation and perception of magic.

The *Smoke and Mirrors* exhibition provided an opportunity for us to examine the impact that this particular kind of exposure had on people's appreciation of magic. We took advantage of the exhibition to survey exhibition visitors. Our survey directly asked them how viewing the exhibition influenced their feelings about magic. We aimed to investigate whether learning about the psychological mechanisms behind magic tricks would spoil or enhance the exhibition visitors' reported appreciation of

magic. One possible outcome was that, the exhibition might have led visitors to re-frame magic as a collection of simple psychological tricks, leading them to underestimate the skills necessary to perform a magic routine, or perhaps they might simply consider magic to be obvious and uninteresting after acquiring a new understanding of the science of magic. Alternatively, knowing the different layers and mechanisms that can take place in a magic trick might make exhibition visitors more conscious of and, consequently, more capable of appreciating the magician's efforts. Finally, learning about the science of magic may not have had any discernible impact on visitors reported magic appreciation.

To address this question, we developed a survey containing both quantitative and qualitative questions assessing exhibition visitors' views on how the exhibition changed their appreciation for the art of magic as well as the magic community more generally. Given the relative dearth of formal research on what people like and dislike about magic, our survey also sought to address these general questions, and then to explore how these attitudes might have been influenced by the exhibition. We also used qualitative data to gain a better understanding of what the exhibition visitors reported enjoying about magic, and how the exhibition changed their views of magic. Given the traditional concerns related to exposure, secrets, and 'The Magicians Code', we were particularly interested gathering data on how learning about the psychological principles that underpin magic might influence the exhibition visitors' reported appreciation of magic.

METHOD

We administered a qualitative-quantitative survey to visitors who had attended the Welcome Collection's *Smoke and Mirrors: The Psychology of Magic* exhibition. The exhibition took place from 11th April 2019 and 15th September 2019, and it also included six live performances a week with a different performer each week on Tuesdays, Thursdays, and Saturdays. The performances, ranged from scientific lectures to close-up magic shows, varied between the performers.

Participants

A total 397 exhibition visitors participated in the study by completing our survey (66.4% women). Ages ranged from 11 to 87 (mean = 40.2; SD = 18.4). The data collection occurred over three days in May, Tuesday 14th, Thursday 16th (129 participants), and Friday 17th (104 participants) from 11:00am to 18:00pm and Thursday (164 participants) from 11:00am – 20:00. No significant differences were found for any measure amongst the different exhibition days.

One of the researchers (GM) approached as many people as possible as they were exiting the exhibition. This study was conducted following a protocol approved by the University of London, Goldsmiths Research Ethics Committee, and in accordance with the ethical standards laid down in the 2008 Declaration of Helsinki.

Survey

Our survey consisted of a series of paper-and-pencil self-report survey questions, which took around 5 to 10 minutes to complete. The questions included two demographic measures, (gender and age), eight quantitative questions, and three open ended qualitative questions. For all quantitative questions, participants responded by indicating their answers on five-point Likert Scales. For question 1 the scale was anchored at 1 – “terrible” and 5 – “excellent”. For question 2 the scale was anchored at 1 = I very much do not like watching magic and 5 – I very much enjoy watching magic. For questions 3 to 8 the scales were anchored at ‘1 - strongly decreased’ and ‘5- strongly increased’. For all qualitative questions, participants responded by writing their answers in a provided text box. All questions are listed in Table 1 while the full survey can be found in the supplementary material.

Table 1 – Questions on the survey

Quantitative-questions (participants responded using 5-point Likert Scales)	
1	Overall, how would you rate the exhibition?
2	How much do you enjoy watching magic tricks?
3	How has the exhibition changed your appreciation of magic as an art form?
4	How has the exhibition changed your interest in magic?
5	How do you think the exhibition will change the wonder you experience when watching magic in the future?
6	How has viewing the exhibition changed your interest in watching magic on TV?
7	How has viewing the exhibition changed your interest in watching live magic?
8	How has viewing the exhibition changed how you respect magicians?
Qualitative - questions (participants responded by writing their answers in a text box)	
1	What do you like about magic?
2	What do you dislike about magic?
3	How has learning about the psychology of magic changed the way you feel about magic?

Analysis

The quantitative questions were analysed in terms of frequency distributions. We used One-Sample t-Tests and Fisher’s Exact Tests to assess whether the exhibition changed participants’ reported attitudes. We also compared differences between participants reported gender and across the different days that the survey was administered. We used Spearman’s Rank-Order Correlation to assess correlations between questions.

Qualitative questions were coded and analysed using content analysis (Krippendorff, 2004) Each question was analysed alone, comparing all the respondents' answers in that question and grouped into meaning categories in order to compare all respondents. Some participants pointed to more than one aspect for one or more qualitative questions, and each aspect was coded into the appropriate category for the corresponding question. We grouped these categories into macro categories based on post-hoc assessments of shared meaning. These macro categories are first presented in this paper, followed by more in-depth descriptions using the meaning categories. We did this to better present the similarities and differences between all the categories.

RESULTS

Quantitative analysis

The first set of analysis examined the participants' overall ratings for the exhibition. Table 2 shows mean ratings of participant responses to the 5-point Likert Scale corresponding to each of the questions along with the lower and upper interval from their 95% confidence interval. Any value above 3 represents a positive response. We used One Sample Wilcoxon Signed Rank test to examine the ratings significantly differed from 3, which would indicate a significant positive or negative impact on participants' views on magic. The vast majority of participants rated the exhibition positively, and the One Sample Wilcoxon Signed Rank test revealed that all medians were significantly greater than 3 (all $p < .0001$). Participants also indicated that they generally enjoyed watching magic. Overall, participants reported that attending the exhibition had a positive impact across all our measures.

We found moderate correlations between interest in magic X interest in watching live magic, interest in magic X appreciation for magic, appreciation for magic X respect for magicians, and interest in watching live magic X wonder evoked, all $p < 0.001$ and the largest Spearman's rank correlation coefficient was $\rho = 0.432$. Table 3 presents the correlational matrix with all Spearman's rank correlation coefficient, p-value and sample-size for each correlation between two variables in the survey.

Table 2 – Descriptive and confidence intervals

	Exhibition rating	Enjoy magic	Appreciation for magic	Interest in magic	Wonder evoked	Interest watching TV magic	Interest watching live magic	Respect for magicians
Mean	4.20	3.98	3.74	3.62	3.46	3.28	3.62	3.90
Std. deviation	0.621	0.811	0.688	0.684	0.809	0.663	0.731	0.800
Lower interval	4.14	3.90	3.67	3.56	3.38	3.21	3.55	3.82
Upper Interval	4.26	4.06	3.80	3.69	3.54	3.34	3.70	3.98

Table 3 – Correlational Matrix

		1. Exhibition Rate	2. Enjoy watching magic tricks	3. Changed your appreciation of magic	4. Changed your interest in magic	5. Change the wonder you experience in magic	6. Changed your interest in watching magic on TV	7.Changed your interest in watching live magic	8. Changed how you respect magicians
1. Exhibition Rate	Correlation Coef.	1.00	.235*	.227*	.193*	.204*	.170*	.160*	.238*
	Sig. (2-tailed)	0
	N	397	396	397	397	396	394	396	396
2. Enjoy watching magic tricks	Correlation Coef.	.235*	1.00	.145*	.191*	.190*	.209*	.342*	.193*
	Sig. (2-tailed)	.000	.	.004	.000	.000	.000	.000	.000
	N	396	396	396	396	395	393	395	395
3. Changed your appreciation of magic	Correlation Coef.	.227*	.145*	1.00	.425*	.391*	.297*	.381*	.432*
	Sig. (2-tailed)	.000	.004	.	.000	.000	.000	.000	.000
	N	397	396	397	397	396	394	396	396
4. Changed your interest in magic	Correlation Coef.	.193*	.191*	.425*	1.00	.325*	.330*	.417*	.360*
	Sig. (2-tailed)	.000	.000	.000	.	.000	.000	.000	.000
	N	397	396	397	397	396	394	396	396
5. Change the wonder you experience in magic	Correlation Coef.	.204*	.190*	.391*	.325*	1.00	.425*	.369*	.347*
	Sig. (2-tailed)	.000	.000	.000	.000	.	.000	.000	.000
	N	396	395	396	396	396	394	396	396
6. Changed your interest in watching magic on TV	Correlation Coef.	.170*	.209*	.297*	.330*	.425*	1.00	.381*	.314*
	Sig. (2-tailed)	.001	.000	.000	.000	.000	.	.000	.000
	N	394	393	394	394	394	394	394	394
7.Changed your interest in watching live magic	Correlation Coef.	.160*	.342*	.381*	.417*	.369*	.381*	1.00	.372*
	Sig. (2-tailed)	.001	.000	.000	.000	.000	.000	.	.000
	N	396	395	396	396	396	394	396	396
8. Changed how you respect magicians	Correlation Coef.	.238*	.193*	.432*	.360*	.347*	.314*	.372*	1.00
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.
	N	396	395	396	396	396	394	396	396

** . Correlation is significant at the 0.01 level (2-tailed).

Qualitative analysis

We analyzed participants' responses to the qualitative questions to explore what participants liked and disliked about magic. These questions also allowed us to examine how their views on magic changed by experiencing the exhibition. Each subsection contains the macro categories identified in each question. Those macro categories are presented in order of relevance, starting with those that were reported more frequently. The first groups of macro categories are aimed at describing the nomothetic approach of the analysis (*i.e.* the overview of the topics reported by every participant), focusing on what is shared about the phenomenon of experiencing magic and the exhibition.

After this overview of macro categories, we present an in-depth description of each category, highlighting the different ways in which each macro category was referred to. This second part of the qualitative analysis focuses on the idiographic approach, which aims to highlight the subtle differences in the experience of the phenomenon in an attempt to identify *sui generis* aspects of the experience, which may not be common, but could nevertheless help us gain insight on the subject (e.g. Moustakas, 1994).

Finally, Figure 1 presents the graphics on the macro categories for each subsection while Tables 4, 5 and 6 present all the codes that compose each macro category with the absolute number and percentage of people that referred to it in each question, respectively.

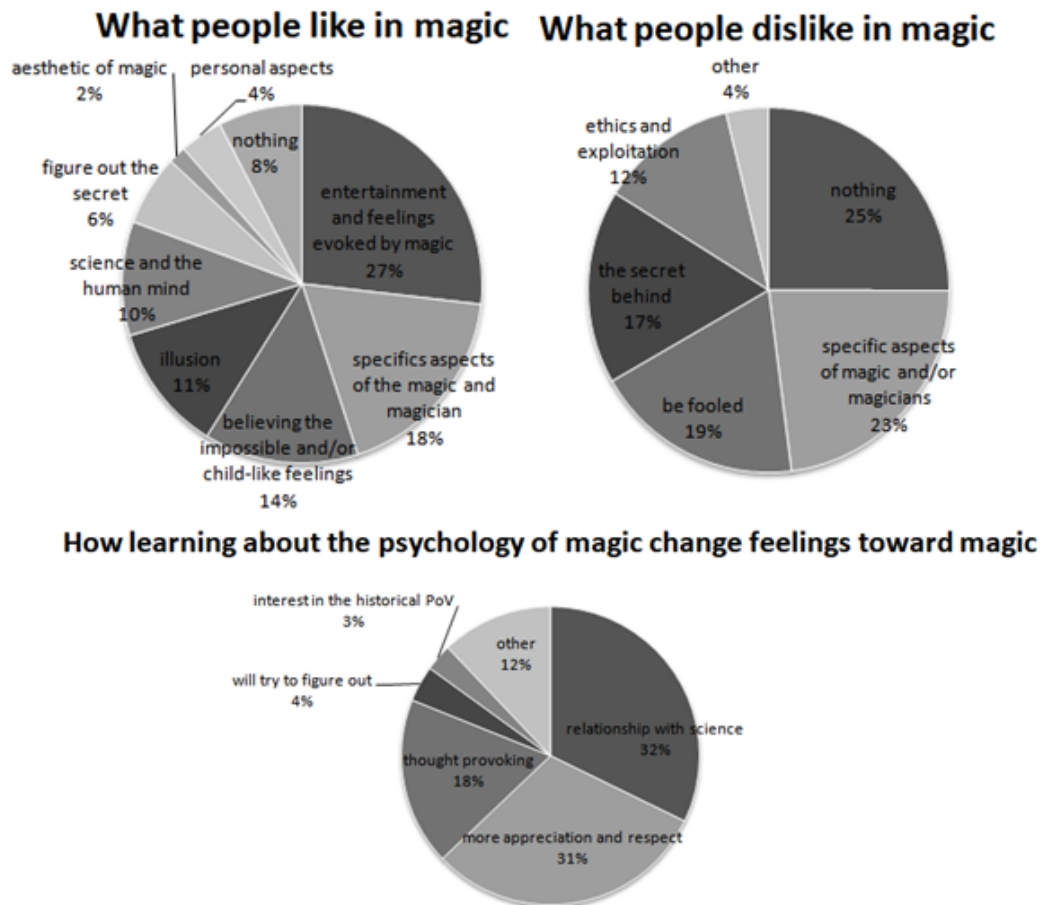


Figure 1. Macro categories division in each question

What People Like about Magic

The first qualitative question asked: “What do you like about magic?”. The majority of participants’ answers contained content relating to the fact that they liked the *entertainment and feelings that magic evoked* (26.8% of respondents), followed by some *specific aspects of the magic and magician* (18.2%) and the sense of *believing the impossible and/or child-like wonder* while watching magic (13.9%). The *illusion* itself was mentioned by 11.5% of participants as what they liked about magic, and the relation to *science and the human mind* was reported by 10.3% of people. 6.3% of respondents affirmed they like to *figure out the secret*, 1.6% mentioned aspects related to *aesthetics of magic and/or its styles* and another 3.9% of participants mentioned more *personal aspects*. Finally, 7.6% of all the respondents in this question either explicitly answered there is nothing they liked in magic (2.65%) or did not provide any written response to this question (4.94%).

Entertainment and feelings evoked by magic: Of the participants whose answers were coded into this category (N= 152), 25% of them explicitly answered that the entertainment elicited by magic was the thing they liked, also mentioning that magic is cool, fun and has a wow factor. 114 participants mentioned different emotions

evoked by magic. The most frequently mentioned emotions were wonder (29.0% whose answers were coded into this category), surprise and the unexpected (27.0%), amazement (8.6%) and mystery (7.9%); other feelings reported by participants were happiness, excitement, curiosity, bafflement, suspense, intrigue, puzzlement, shock, thrill, confusion, joy, and astonishment.

Specifics aspects of the magic and magicians: Among participants whose answers included references to specific aspects of magic or magicians (N = 103), the magicians' skill was the most frequently mentioned aspect, being mentioned 50.5% of the time, these answers included aspects like magicians' 'speed, dexterity, ability to convince, creativity and control. This was followed by the cleverness of magic tricks (18.5% of those); the performance and interaction of the magician (16.5%) in which included showmanship, the charisma, and the theatrical ability of the magicians as well as the public reaction; and the logic and rationality behind the magic tricks (14.6%). This last aspect (logic and rationality) was also related to the idea that magic can be intellectual stimulating and could help audiences to think about things that exist outside their perceptions, challenging their assumptions and exercising their minds.

Believing the impossible and/or a child-like sense of wonder: In this category (N = 79), 65.8% of participants mentioned they liked how magic allowed them to 'experience the impossible', creating a different reality, and 32.9% mentioned that magic could provide an escape from reality, being able to create different realities that make us temporarily forget our real lives. Other aspects mentioned were: suspension of disbelief (25.3% of respondents in this category), and believing in magic or believing that everything is possible even the most seemingly impossible things. Eleven participants (13.9%) answered that watching magic tricks evoked feelings of wonder and excitement that they associated with positive memories of their own childhood.

Illusion: Among participants who reported that they liked the illusion itself (N = 65), 53.9% reported that they liked the secrets and the mystery behind magic tricks. Not knowing the methods used and not being able to explain what they saw were the most common expressions used for those who reported liking the secrets. 24.6% only mentioned the illusion as the thing they liked about magic and the other 21.5% described the feeling of being fooled by a magician (as a way to be deceived in a safe environment) as the being most entertaining thing about magic.

Science and the study of human mind: In this category (N = 58), the relation between magic and science and the use of an intuitive psychology by magicians was mentioned by 69.0% of the participants whose answers were coded into this category. It was also relevant to the susceptibility of the human mind, reported by the other 31.0%, under the form of how easily people are fooled and manipulated and how human perceptions are very fragile and susceptible.

Figuring out the secrets: In contrast to those who preferred not to know the methods used in magic tricks, 36 participants reported that they liked magic because of they enjoyed the challenge of discovering how the trick was done. From those, 19 people (52.8% of them) only reported this ‘challenge’ aspect as the element they liked in magic, while others also referred the surprise, the illusion, and to enjoying the process of *failing* to figure out the methods behind a trick.

Aesthetics of magic and/or its styles: Five participants’ answers included references to the aesthetic aspects of magic. Their responses included references to objects designed by magicians (mentioned three times), and rabbits (mentioned twice). Lighting, sound, fireworks, posters, and graphics were each mentioned once. There were also two mentions of a preference for a more antique/’old-fashioned’ aesthetic of magic relative modern styles magic. Card magic was specifically mentioned by two participants who also mentioned mentalism, which both participants explicitly associated with the British mentalist Derren Brown.

Personal (subjective) aspects that contributed to participants’ appreciation of magic: Among participants who mentioned personal aspects that made them like magic, the relation of magic with their belief systems, and their personal relationships with magicians (often their own relatives who had performed amateur magic for them) were the most frequently mentioned aspects. Among participants who stated that they did not like magic, 25 did not provide any additional details, 3 affirmed that they thought magic was only for children, and 15 said they were neutral about magic or that they liked very little or nothing about magic.

Table 4. What participants reported liking about magic

Macro Categories	Categories	Number of segments coded (%of the macro category)	TOTAL (% of the question)
Entertainment and feelings evoked by magic	Wonder	44 (28.95)	152 (26.8)
	Surprise and the unexpected	41 (26.97)	
	The entertainment itself – magic is cool	38 (25.00)	
	Amazement	13 (8.55)	
	Mystery	12 (7.89)	
	Other similar feelings	4 (2.63)	
Specifics aspects of the magic and magician	Magician’s skill	52 (50.49)	103 (18.17)
	Cleverness of magic tricks	19 (18.45)	

	Performance and interaction of the magician	17 (16.50)	
	Logic and rationality behind the magic tricks	15 (14.56)	
Believing the impossible and/or child-like wonder	Magic makes the impossible	52 (65.82)	
	Magic gives us some escape from reality	26 (32.91)	
	Magic makes people believe everything is possible	20 (25.32)	79 (13.93)
	The wonder reminds childhood	11 (13.92)	
Illusion	The secret and not knowing how it is done	35 (53.85)	
	The illusion itself	16 (24.62)	65 (11.46)
	Being fooled by a magician	14 (21.54)	
Science and the study of human mind	Relation to science and psychology	40 (68.97)	
	Susceptibility of human mind	18 (31.03)	58 (10.23)
Figuring out the secret	Figure out the secret	36 (100)	6.35
Personal aspects	Personal aspects	22 (100)	3.88
Aesthetic of magic and/or its styles	Aesthetic of magic and/or its styles	9 (100)	1.59
Nothing	Nothing	43 (100)	7.58
TOTAL			567 (100)

What participants reported disliking about magic

The second qualitative question asked: 'What do you dislike in magic?'. 106 participants (26.7% of the total sample) did not report anything in particular that they disliked about magic: 48 explicitly answered 'nothing', 55 participants left the question blank, and three participants mentioned wishing that they had more opportunities to watch magic. To better assess the answers from this question, these 106 participants were not considered in the percentage of the respondents in this question. The

proportion of aspects disliked in magic reflects only those who had something to point out about this question.

Of the participants who reported what they disliked about magic, the most common answers were about *specific aspects of magic and/or magicians* (32.2% of the valid answers to this question), people that answered they *dislike being fooled*, even as an entertainment (26.3%), *the secret behind the trick* (24.3%) and the *ethics and exploitation* involved in magic or the possibility of it (17.3%).

Specific aspects about magic and/or magicians: Among those aspects, the most frequently reported was how repetitive magic can be (18.6%), being considered by many to rely on few principles used by all magicians over the years. The second most reported aspect in this category is related to different issues about the performance (16.5%) such as over-performance, over-commercialization, magicians performing badly, too fast or dramatic, or those magicians trying to make the audience believe what they do is really magic. Obviousness and easy to figure out the trick was the third most frequently mentioned category (12.4%); followed by critics about the magicians themselves (10.3%), considered to be arrogant and condescending; and critics about how simple and poor some tricks are (also 10.3%), citing that sometimes they are not sufficiently interesting, use cheap devices and tricks that do not seem to be realistic to create the magical atmosphere. Aesthetic issues such as vulgar surroundings, outdated styles, and poor music were mentioned seven times as well as offending and making people feel or look foolish mentioned seven times. Other issues reported in this category were about violence and danger in tricks such as those sawing people in half (6.2%), sexism in magic (5.2%), TV magic (3.1%) and 3.1% of participants answered there is no aspects in magic that attract them.

Being fooled: Different from those who answered to like the illusion or even being fooled as an entertainment, 70.9% of those whose answers were coded in this category complained that magic is a way to make them feel foolish and that they do not like magic because it is just a trick and not a real thing, associating magic with words like fake, lies, fraud, deception and falseness. The other 29.1% reported fear of being manipulated or being uncomfortable with that possibility.

Discovering secrets behind the tricks: Similar to those who do not like to be fooled, 61 participants (83.6% of those whose answers were coded in this category) claimed that not knowing the methods was the central aspect they disliked about magic and that they found that frustrating. A further seven participants reported that they did not like how difficult it is and how long it takes to learn tricks and develop the skills to perform magic tricks, and two people regretted that they paid more attention trying to figure out how tricks were done rather than to the magic effect itself. In the same category, but in a different perspective, three people reported that the exposure of methods and people trying to figure out the methods was disliked.

Ethics and exploitation: The vast majority of participants whose responses were assigned to this category (96.2%) highlighted their worries about the possibility of exploiting people’s faith and gullibility, in cases where magicians (especially mentalists) pretend what they are doing is real, mystical and not a trick; or even worse, in cases where magic tricks are used by televangelists or fake mediums claiming to have a contact with a spiritual world. The other two participants in this category raised concerns about the ethics of manipulating subjects; in both cases the participants were specifically concerned about the performances of the British mentalist Derren Brown.

Minor aspects reported: Other reported issues related to disliking magic were each reported once, respectively. These included: considering magic useless, or disturbing, or having an uncomfortable implication about the psychology of magic; anxious in case the magic trick goes wrong, expensive and showy magic, and how magic tricks often rely on lack of attention or knowledge from public were just mentioned once.

Table 5. What participants reported disliking about magic

Macro Categories	Categories	Number of segments coded (% of the macro category)	TOTAL (% of the question)
Specific aspects of magic and/or magicians	Magic can be too repetitive	18 (18.56)	97 (32.23)
	Issues regarding performance	16 (16.49)	
	Obvious and easy to figure out	12 (12.37)	
	Issues regarding magicians themselves	10 (10.31)	
	Tricks are too simple	10 (10.31)	
	Aesthetic issues	7 (7.22)	
	Offending and making people feel fool	7 (7.22)	
	Violence and dangerousness in magic tricks	6 (6.19)	
	Sexism in magic	5 (5.15)	
	TV magic	3 (3.09)	
	There is nothing I like in magic	3 (3.09)	
	Being fooled	Being fooled and the fact magic is just a trick	
Fear of being manipulated		23 (29.11)	

Discovering secrets behind the tricks	Not knowing the methods	61 (83.56)	73 (24.25)
	Difficult to learn and to develop skills to perform magic tricks	7 (9.59)	
	Being distracted from the magical effect due to their desires to figure out the methods	2 (2.74)	
	Exposure of methods and people trying to figure it out	3 (4.11)	
Ethics and exploitation	Worries about the possibility of exploiting people's faith	50 (96.15)	52 (17.28)
	Ethics issues on manipulating subjects	2 (3.85)	
TOTAL			301 (100)

Impact of learning the psychology of magic on feelings toward magic

In the third and final qualitative question, 'How has learning about the psychology of magic changed the way you feel about magic?', 91 participants reported having no changes to their feelings after having learned about the psychology of magic, 39 participants did not answer this question and 14 answered that the changes were minimal if any. These results show that 34.8% of respondents did not report any positive or negative changes in their appreciation towards magic due to the exhibition. Among those who reported specific changes, the most frequently reported changes involved their views on magic's *relationship with science* (23.9% of respondents in this last question), *gaining more appreciation and respect for magic and magicians* (22.7%), *thought provoking and questions about perceptions* (13.53%), *more curiosity in trying to figure out the secrets* (2.9%), and *interest in the historical point of view* (2.17%).

Relationships between magic and science: Among those whose answers were coded as relationship with science, almost 70% of them specifically reported that they liked to learn more about the psychology and manipulation in play during a conjuring trick, whilst the other 30% just mentioned the relationship with science, without specifying exactly which fields in science.

More appreciation and respect to magic and magicians: From those who reported an increase of their own appreciation and respect towards magic and magicians, almost 80% described how the exhibition made them realize how much more complex and clever magic tricks were. A further 17% of the respondents in this category reported

that they would like to learn more about magic and that the exhibition made them more curious about the subject. Finally, the last 3 participants on this category reported that the exhibition made them realize magicians were truly professional artists.

Thought provoking and questions about perceptions: 51.8% of the participants in this category answered the exhibition made them more informed about the mechanisms underlying perception manipulation and that this provoked them to question their own perceptions. 37.5% were interested in how that knowledge is used or can be used in everyday life, and 10.7% of those in this category reported fear about the ways this kind of mechanisms can be used.

More curiosity in trying to figure out the secrets: Among those who reported the exhibition changed their interest in knowing the methods behind a trick, 83.3% reported that the exhibition increased their curiosity towards the secret methods behind a magic trick, whilst 16.7% stated it would have been better to *not* focus on the psychological mechanisms behind magic in order to better appreciate this art form.

Interest in the historical point of view: Finally, 9 participants (2.2% of all respondents for this question) focused their answers on how the exhibition increased their interest in the historical aspects of magic and how it developed alongside the spiritualism movement as well as spiritual and paranormal beliefs.

Table 6. Participants' reports of how learning about the psychology of magic changed their feelings toward magic

Macro Categories	Categories	Number of segments coded (%of the macro category)	TOTAL (% of the question)
No change	No changes	91 (63.19)	144 (34.78)
	No answer	39 (27.08)	
	Minimal changes if any	14 (9.72)	
Relationship with science	Understanding about psychology and manipulation	69 (69.7)	99 (23.91)
	Magic related to science	30 (30.3)	
More appreciation and respect to magic and magicians	More appreciation and respect about how complex and clever magic is	75 (79.79)	94 (22.71)

	Want to learn more about magic / more curious	16 (17.02)	
	Magicians as professional artists	3 (3.19)	
Thought provoking and questions about perceptions	Make me more informed and questioning my perceptions	29 (51.79)	
	Make me think and try to understand how it is used in everyday life	21 (37.5)	56 (13.53)
	Make me afraid	6 (10.71)	
More curiosity in trying to figure out the secrets	Trying to figure out how it is done	10 (83.33)	
	It would be better not knowing the psychology behind it	2 (16.67)	12 (2.9)
Interest in the historical point of view			9 (2.17)
TOTAL			414 (100)

DISCUSSION

The aim of this study was to survey how people's appreciation of magic was impacted by a magic exhibition designed to highlight and reveal the psychological mechanisms that underpin magic. The results from our qualitative and quantitative analyses indicated that the exhibition had a positive impact on participants' appreciation of magic. Our participants were visitors to the exhibition who were asked to rate the impact of the exhibition on a range of measures assessing people's interest and appreciation for magic. The results revealed significant positive changes in all measured dimensions. Despite some magicians' fear that the revelation of psychological mechanisms would rob people of the wonder in magic, our results reveal the contrary. The exhibition had a positive impact on visitors' appreciation and interest in magic, respect for magicians, and the wonder that visitor feel magic will elicit in future. Importantly, the exhibition also increased people's interest in seeking out opportunities to watch more magic, both live and on TV. Our correlational analysis revealed that all measures correlated positively with people's overall enjoyment of the exhibition. It is impossible to deduce the causal relationship between these factors, but it is likely that an engaging exhibition about the science of magic will enhance people's appreciation for magic.

The magic community is deeply concerned about preserving the secrets of magic tricks, and yet the exhibition visitors did not seem to be particularly concerned about this. Interestingly, the topic of exposure of magic methods was rarely mentioned spontaneously, and when it was, it was more frequently associated with positive feelings towards magic (46 responses included references to this subject) rather than something negative that could keep people away from magic (only mentioned 5 times). The qualitative responses dovetail with what we observed in the quantitative analysis in that the large majority of visitors either felt that the exhibition either led to a positive change in the way they felt about magic or did not change the way that they felt about it. Indeed, there were very few negative responses.

We have recently empirically investigated the impact that the exposure of a simple magic trick has on peoples' interest and appreciation for magic (Pailhes, Filho & Kuhn, 2022). In this study, participants watched short video clips in which a magicians vanished a silk handkerchief, after which half of the participants were informed about how the trick was done. These participants reported a higher interest and appreciation for magic, than participants who were given no further information about the secret methods. These results further illustrate that exposure of magic secrets may not necessarily be detrimental to our appreciation for magic, and, to the contrary, may have a positive effect. It is important to note that these measures were all taken immediately after our participants had learnt about the secrets/psychology that underpins magic. It is possible that once the excitement of the exhibition wears off, people will actually find themselves less interested in magic than they were before the exhibition. However, we have no a priori reason to suggest that the positive impact would boomerang in the other direction once participants have a chance to reflect on their experiences.

Magic relies on members of the audience not knowing how the effect has been created, which is why the topic of exposing magic secrets is a central topic for magicians. However, our data suggests that the public is less concerned about exposure; a point previously highlighted by Jay (2016). Neither the willingness to know how a magic trick is achieved nor the discomfort of exposing a trick's secret were recurrent topics from the audience. Our results show that exposing the psychological mechanisms that underpin magic is appealing to many, and that it encourages people to seek out opportunities to watch more magic. To be clear, these results do not indicate all types of exposure can have positive effects on people's perceptions of magic, but they do provide novel formal evidence that particular kinds of exposure - revelations related to scientific principles that contribute to magical experiences- can have a positive impact that does not necessarily spoil a lay audiences' appreciation of magic. *The Smoke and Mirrors* exhibition specifically did not involve exposures of methods related to particular commercial tricks or routines, and so our results cannot address the impact of these types of exposures. Researchers and presenters should of course continue to be mindful of respecting magic as an artform. But we hope that our results

will be heartening for current and future magic researchers, as well as magicians and magic enthusiasts, because they suggest that communicating science of magic ideas can lead to a greater appreciation of magic.

Entertainment magic is thought to be one of the oldest forms of entertainment, and yet very little formal research has sought to directly address questions about what aspects we enjoy (see Leddington, 2016; 2017; Kuhn, 2019). Our survey offers a valuable glimpse into what people like and dislike about magic. Our results revealed a wide range of views about what people liked and disliked about magic, which marks a contribution to a small but growing body of literature surveying people's appreciation of magic performances (Jay, 2016; Silva et al., 2020). While there was no universal consensus, several themes did emerge, and the most frequently identified themes focused on being entertained and the emotions that magic elicits. It is interesting to note that visitors mentioned a wide range of positive emotions that magic elicits, and future work should try to examine these emotions in more detail and with different samples. Since the sample analysed here was people who came to the magic exhibition, there is likely a sample bias given that their deliberate attendance of the exhibition might indicate that they already liked magic more than general population. Most of our participants were antecedently interested in the relationship between magic and psychology and they may have been primed to feel positively about magic, following exposure to a successful exhibition. Further, due to the method of collection of data chosen, it is fair to raise the question of a self-selecting, sample bias since those who had not appreciated the exhibition may have declined the invitation to participate.

Notwithstanding, the emotions described in this study coincide with those from Ozono et al. (2021). People also commented on how magic gave them the sense of believing the impossible and referred to the 'child-like' feelings that magic can elicit. Several people commented on how they enjoy the relationship between the magic and the human mind, and the psychological tricks that magicians use. This aspect of magic was likely due to the exhibition, since these were the themes that it explored (and also how it was advertised). Nevertheless, it highlights people's intrinsic interest in the link between magic and science. Our qualitative analyses also revealed that many participants explicitly expressed appreciation for the relationship between magic, science, and the human mind. These findings support the idea that magic can offer an appealing and enjoyable framework for presenting scientific ideas, and that it provides a valuable tool to present complex concepts about psychology in a playful way, corroborating studies of magic and teaching (e.g. Moss, Irons & Boland, 2017; Wiseman & Watt, 2020; Wiseman, Houstoun & Watt, 2020). Our results suggest that the benefits of combining magic and science communication are not one directional, and that using magic to present scientific concepts not only helps make the science more appealing, but also leads people to have a greater appreciation for the art of magic.

We also asked our participants to comment on the things that they disliked about magic, and their responses reveal several patterns (see Silva, et al., 2020 for further discussion of people disliking magic). For example, people seem to dislike the repetitive and formulaic nature of some magic. This finding coincides with informal data reported by Jay (2016), who noted that the criticism towards magic performance is frequently involves the perception that no new techniques have been invented since the classic magicians of the past. Others commented on disliking the feeling of being fooled, a concept that has been raised by other magicians who have written about magic theory. For example, Ortiz (2006) explicitly distinguishes the experience of magic from being fooled, and argues that magicians should try to focus on creating strong magical moments rather than eliciting a feeling of being deceived or fooled.

The worlds of magic and science have opposing views on openness and transparency. The science of magic endeavour sometimes involves revealing elements of magic methods to the general public, which seems to contradict a strict interpretation of the 'Magician's Code'; the idea that magicians should never reveal their secrets under any circumstances, for fear of damaging people's perceptions of magic. Our study demonstrates that the exhibition visitors enjoyed the use of magic to illuminate complex psychological principles, and that this approach increased, rather than diminished people's appreciation for magic. One limitation of our study is that our data is based on a biased sample of individuals who had opted to attend an exhibition on the science of magic; baseline measures confirm that most of our participants already had a positive attitude towards magic, which means we should be cautious about generalizing our findings to the wider public. However, nearly all magic consumers are self-selected; this study can shed light on the portion of the general population that is more likely to attend magic shows anyway. Our survey evaluated the impact of learning about broader psychological mechanisms that underpin some magic tricks and not a total disclosure of a specific magic trick, which would imply not only discussing psychological mechanisms but, more importantly, would focus on conjuring techniques and sleight of hand used to perform a given magic routine. Nonetheless, the *Smoke and Mirrors* exhibition's examination of the psychological mechanisms that underpin magic methods arguably exposed some magic 'secrets' without apparent ill effects. Our results demonstrate that the science of magic endeavour does not necessarily hinder people's appreciation of magic and highlights many benefits of this symbiotic relationship.

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