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RESEARCH

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Evolution acceptance, literacy, and knowledge acquisition among online manosphere communities: an exploratory survey study

Louis Bachaud^{1,2*} and Romain Gauchon³

Abstract

Background Evolutionary scientists have recently expressed concern at the political weaponization of their research findings by online communities of laypeople. This is the case for genetics research among white supremacists, but also of evolutionary psychology among the online antifeminist communities of the “manosphere.” Yet, so far, there has been no empirical assessment of the evolutionary scientific literacy and scientific knowledge acquisition practices of these lay Darwinian aficionados. The present exploratory survey study ($n = 148$) aimed to start filling this gap by comparing results of English-speaking manosphere respondents on a science literacy questionnaire with those of a Prolific US respondent sample ($n = 151$).

Results Manospherians exhibited high educational levels, including scientific higher education, and an almost unanimous acceptance of evolutionary theory. Moreover, they scored much better than a counterpart group of US respondents on the science literacy questionnaire (70.4% vs. 50.5% correct answers), confirming their status as enthusiastic Darwinians. Unsurprisingly, they seek out scientific content at higher rates than other lay publics, including through direct access to peer-reviewed literature. They also tend to share and transmit such scientific content in online discussions and social media posts at much higher rates.

Conclusion Concerned scientists have been calling for more rigorous empirical and methodological standards to prevent appropriations and distortion by political factions. However, our evidence suggests that laypeople who appropriate research in ways that scientists disapprove of might not necessarily be guided by misunderstanding of the research, but rather by values, ideologies, and agendas. The impact of scientific education and outreach, which is primarily effective at bettering understanding of science, might in that case be limited, and other types of normative, non-epistemic interventions from the scientific community could become necessary.

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Background

Research on contemporary US politics and evolution has understandably so far mostly been focusing on Christian fundamentalist resistance to evolutionary theory (e.g. Gross, [25], Miller, [38]). However, recent years have seen the resurgence of a seemingly opposite trend: enthusiasm for evolutionary sciences among online far-right groups. Appropriations of evolutionary theory in right-wing politics have a long history, from the success of Social Darwinism/Spencerism among conservative US business elites during the Gilded Age [32], to Nazi enthusiasm for Darwinism [53]. Today, this is the case for example with the appropriation of population genetics research by white supremacists [15]. It has been shown that these activists engage with scholarly literature, which they curate in online collaborative “journal clubs” or share and interpret on social media [14, 47].

The “manosphere” is the name for a collection of online antifeminist men’s groups, which scholars have classified into five different communities: Men’s Rights Activists, Pickup-Artists, The Red Pill, Men Going Their Own Way, and incels (e.g., Ribeiro et al., [48]; [50]; see Additional File 1 for definition of each group). Although no comprehensive membership data exist for these decentralized online communities, registration figures for their most prominent forums and platforms reach several hundred thousand users¹ (for a comparative study of online activity between groups over time, see [48]). One group in particular has become a security concern: the incel community, which has been linked with several mass shootings in the United States and Europe (see [31] for a review of incel-motivated attacks). More generally, the manosphere has been home to increasing level of misogynistic online hate speech ([20]; Ribeiro et al. 2021; [29]).

The online men’s groups and antifeminist communities of the manosphere are fond of evolutionary biological models of sexual selection to explain behavioral sex differences in humans, and thus gravitate towards evolutionary psychology research [4]. Those lay communities remarkably consume vast amounts of evolutionary scientific literature, which they then organize and cite on platforms such as the incel wikipedia (<https://www.incelwiki.com>), which contains hundreds of references towards peer-reviewed literature [49]. Scholars have criticized the crude simplicity of manosphere appropriations of evolutionary psychology [4, 9, 16]. Manosphere ideologies have been singled out for their “turbocharged genetic determinism” [22], which ignores the interplay between genetic and environmental factors, in particular within the incel ideology known as the “blackpill” [5, 9]. Another recurrent manosphere misconception is the exaggeration

of evolved sex differences, whereby average trait differences between the sexes are turned into categorical essentialist differences, a bias we call “sex differentialism” (Alexander [1]; [6]).

Additionally, manosphere discourse has been shown to conflate the ultimate and proximate levels of evolutionary explanations. Instead of simply acknowledging that individuals are equipped with behavioral mechanisms which helped their ancestors solve fitness challenges and out-reproduce others (the behavior’s *ultimate* function), manospherians sometimes contend that individuals are consciously motivated to maximize their Darwinian fitness (i.e., at the *proximate*, mechanistic, level, [4]), a misconception known as the “intentionalistic fallacy” [54]. Lastly, species selection, i.e., “[t]he assertion that evolution via natural and sexual selection operates to ensure species survival” [54], is another common misconception of natural selection [2, 3, 24, 46] which underlies manosphere beliefs about sex differences (see [6], 230–237).

In spite of these qualitative criticisms of the manosphere’s interpretations of evolutionary theory, the scientific literacy of these groups has so far never been empirically assessed. Scientific literacy has been defined as “what the general public ought to know about science” and “commonly implies an appreciation of the nature, aims, and general limitations of science, coupled with some understanding of the more important scientific ideas” [35]. Unsurprisingly, respondents’ level of education in the United States is highly correlated with science literacy, with the strongest predictor being “number of college science courses completed” [39].

However, research about US creationism has complicated that picture. Indeed, as shown by studies of high school biology teachers, even presumably highly scientifically literate people can hold misconceptions about evolution. A study measuring the biological literacy of Oklahoma high school teachers found a mean correct response rate of only 72.9% [56], while a nationwide survey of biology teachers revealed that 16% believed that humans were created by God in their present form [10]. Recent approaches to this puzzling phenomenon have stressed the importance of factors unrelated to scientific content itself [28]. People might be driven to embrace certain beliefs to protect their sense of self, or to fit within a group, regardless of the evidence supporting this belief. This is especially true for politicized scientific issues [33]. Conservative political identity in the United States has thus been found to be associated with lower genetics and evolution literacy, as well as higher general distrust of the scientific enterprise [27]. Manosphere communities may represent a notable deviation from this observed pattern, given their simultaneous embrace of conservatism and evolution.

¹ See for example, the r/mensrights subreddit, with 368.000 members as of writing, <https://www.reddit.com/r/MensRights/>, accessed May 27, 2025.

In order to better understand this phenomenon, we conducted the first manosphere-wide survey study of scientific literacy and knowledge acquisition.

For ease of writing, we refer to members of any manosphere community as “manospherians.” Although the term is not widely popular, as people prefer identifying in community-specific ways, it is sometimes used in manosphere writings (e.g. Elam, [19]).

We were guided by the following research questions:

Research Question 1 (RQ 1): How scientifically literate are manospherians?

Research Question 2 (RQ2): How do manospherians acquire and share scientific knowledge?

To properly answer those research questions, the survey was also administered to a group of Prolific US respondents, allowing for comparison with manosphere test scores. This study also consequently addresses a third research question:

Research Question 3 (RQ3): How do manosphere scientific literacy and knowledge acquisition patterns differ from those of a general US population sample?

Methods

Survey instrument

Scientific literacy questionnaire

Our primary aim was to assess scientific literacy among manospherians (RQ1), in particular in the evolutionary life sciences which they are particularly fond of citing. In order to do so, a 20-item questionnaire was constituted, with items drawn from pre-existing validated instruments when possible (full survey materials are reproduced in Additional File 2). Those items were all multiple-choice questions with four options and only one correct answer, a very common form for such tests, which allowed us to compile items from different instruments. We selected undergraduate-level questionnaires, which we deemed the appropriate level of difficulty for those lay science enthusiasts. Indeed, high-school level questionnaires might have been too easy to produce interesting data, while postgraduate level was on contrary

deemed an unreasonable expectation. Five different areas relevant to the evolutionary behavioral sciences popular in the manosphere were included: endocrinology, genetics, evolutionary biology, evolutionary psychology, and general scientific literacy (i.e., statistics, scientific reasoning, etc.).

For endocrinology, no validated undergraduate-level questionnaire was found. One item was drawn from the test bank of an undergraduate textbook [41], while the other was designed ad hoc. For genetics, we drew three items from the Genetics Literacy Assessment Instrument (GLAI, [12]). It has been thoroughly designed and tested, and “is based on the central concepts in genetics that an undergraduate non-science major should understand, as determined by a subcommittee of the American Society of Human Genetics” [12]. For evolutionary biology, we selected three items from [3] Conceptual Inventory of Natural Selection (2002), a thoroughly tested multiple-choice questionnaire which evaluates basic understanding of Darwinian natural selection. For generic scientific literacy, we targeted a questionnaire without subject-specific content, the Test of Scientific Literacy Skills (TOSLS, [23]). Lastly, as no questionnaire existed for evolutionary psychology, we took this as an opportunity to design our own survey items (more on this below). The science questionnaire composition is detailed in Table 1 below:

For a detailed understanding of evolutionary scientific literacy, [3] seeded “distractors” in their questionnaire (2002). These are false answers which reflect a common misconception of natural selection (which they call an “alternative conception”). This device allows to measure the prevalence of such misconceptions in a given population, and to compare prevalence between groups (e.g., [46]). For similar purposes, and based on previous thorough qualitative exploration of manosphere uses of science [4], as well as common misunderstandings of evolutionary psychology [54], we designed distractors to assess the prevalence of five misconceptions in the questionnaire: extreme environmentalism (i.e., “the blank slate”), extreme biological determinism, the intentionalistic fallacy, sex differentialism, and species selection (for definition of each of these misconceptions, see Additional File 3). Although designing our own survey questions was an opportunity to seed distractors to assess the prevalence of those misconceptions, when possible, we selected pre-existing survey items which already contained relevant distractors. All in all, there are three distractors per misconception (for an exhaustive list of distractors and associated misconceptions, see Additional File 4). To calibrate difficulty and wording, items were pilot tested with an evolutionary anthropology

Table 1 Science questionnaire composition

Discipline	Number of questions	Source
Genetics	3	GLAI-3 [12]
Endocrinology	2	Textbook-1 [41]; Personal design-1
Evolutionary biology	5	CINS-3 [3]; Personal design-2
Evolutionary psychology	5	Personal design-5
Scientific literacy	5	TOSLS-5 [23]

professor, an EP postgraduate student, and a lay EP enthusiast.

Scientific knowledge acquisition and transmission

The other purpose of the survey was to learn more about manospherians' scientific knowledge acquisition and transmission practices (RQ2). In the rapidly shifting online and social media landscape, it becomes increasingly relevant to examine the pipelines through which people acquire science knowledge. As an example of this fast pace of change, our questionnaire was designed in the Autumn of 2022, a few months before the public release of Open AI's ChatGPT. As such, we unfortunately could not include it among potential mediums for online knowledge acquisition. We identified eight different types of content through which people could acquire science knowledge: Social media and Internet discussions, Wikipedia and other encyclopedic platforms, YouTube and other video platforms, books, peer-reviewed scientific literature, TV, the press, and manosphere-specific content. Respondents rated how much they learned about science from each of these media on a seven-point Likert scale ranging from 0 (*not at all*) to 6 (*a great deal*). Finally, in order to evaluate knowledge-transmission practices, they were asked how frequently they engaged in the following online activities: (1) "Publicly sharing scientific content on social media, forums, reddit," (2) "Citing scientific content and data to prove your point," (3) "Analysis and discussion of scientific theories and concepts," using a seven-point Likert scale ranging from 0 (*never*) to 6 (*very often*), (full survey materials available in Additional File 2).

Sociodemographic variables

Manospherians are extremely suspicious of outsiders, and as a rule, refrain from sharing personal information and remain anonymous on the platforms they visit (Sugiura 2021; for examples of suspicious reactions to our survey, see Additional File 5). Thus, we tried to keep the collection of personally identifiable or potentially sensitive information at a minimum, as it was likely to deter respondents from participating. We avoided directly measuring political orientation and asking respondents about their geographic location, as these questions would have triggered suspicion by appearing irrelevant to the study's stated object (science literacy and knowledge-acquisition).

To make sure that only manospherians' answers were counted, however, we asked respondents whether they self-identified with one of the five manosphere communities, or wished to provide an open-ended self-identification.

We included variables which have been repeatedly shown to have an impact on science literacy in order to

control for those, such as educational achievement, as well as the number of college science courses taken [39]. Indeed, this variable has unsurprisingly been identified as the strongest predictor for both scientific literacy and acceptance of evolution [39, 40]. We therefore included Miller's survey item: "How many college/university science courses did you complete?," with three potential options for respondents: 0, 1–3 (to represent non-science majors who took introductory science in their general education courses), and 4+ (for science majors).

Since religious fundamentalism has unsurprisingly been shown to be associated with lower acceptance and knowledge of evolution ([39]; [27]), we also included Miller al.'s question to identify creationist respondents: "What do you think about the following statement: '*Human beings, as we know them, developed from earlier species of animals*'" (*Definitely False; Probably False; Probably True; Definitely True; Don't Know/Not Sure*; [40]). Age and sex were also included, as they have also been shown to associate with science literacy (e.g., Miller, [39]).

Overall, this made for a relatively lengthy questionnaire, which we expected participants to take between 15 and 30 min to complete. The survey was conducted online via Qualtrics. To mitigate the bias coming from question ordering (order-effect bias), those were shuffled randomly for each respondent, within each of the science questionnaire's four subsections. Similarly, the four options inside each multiple-choice question were randomly shuffled as well.

Survey distribution

Classic random probability sampling is known to be impossible with such "hard-to-reach" or "hidden" populations, and studies of suspicious and marginalized groups such as drug users or sex workers thus have to resort to non-probability sampling [37]. This was the case here, as for all existing surveys of the incel community which advertised their study online to recruit participants (e.g., Costello et al., [17], Sparks, [51], or negotiated access directly with moderators of online platforms (Speckhard et al., [52])).

Our aim was to disseminate the questionnaire as widely as possible. Given the hostility of potential respondents, as well as the length of the questionnaire, a far-reaching communication campaign was necessary to gather a sufficient number of responses. Thanks to a long-term observation of the English-speaking manosphere, we established a comprehensive list of active online platforms and communities. Study-specific accounts were created on a wide array of platforms. For groups with moderation and administration teams, such as Discord servers, forums, or subreddits, we asked moderators or administrators for an authorization to post the survey

link. Many refused or did not answer, but some accepted, and even showed remarkable interest in the study. This was done to avoid being perceived as intruding on manosphere spaces (which was a frequent reaction, even after receiving moderator authorization), and thus avoid having the post immediately taken down.

On generic or Alt-Right social media platforms such as X, Gab, Parler, Pinterest, and Imgur, accounts were created to promote the questionnaire by using hashtags, or by tagging influential manosphere accounts. Finally, for some unmoderated groups and platforms, the link to the survey was posted directly. Each time, the link was accompanied by a short descriptive text about the nature and aims of the survey. A complete summary of these survey distribution procedures can be found in Additional File 6.

As an incentive for participating, estimates of the questionnaire scores were communicated to respondents upon completion, and the study was promoted accordingly: “Come Test Your Scientific Knowledge!” Data collection proved relatively slow, owing to the many refusals and hostile reactions of targeted platforms and communities. Moreover, we were unable to reach the wide audience of Facebook and Instagram, which do not authorize such promotional accounts to be created. Overall, 417 answers to the questionnaire were collected over a period of eight months, from November 2022 to July 2023.

Data cleaning

Since respondents were allowed to skip questions and to drop out at any point, some set of answers were incomplete, with 128 respondents dropping out before even answering any of the multiple-choice science questions. We therefore excluded respondents who had provided less than 15 answers on the 20 multiple-choice questions. Minors were excluded, as indicated on the survey’s consent form. Respondents who did not self-identify with one of the five manosphere communities were dismissed, unless they provided an answer to the open-ended self-identification question. On a case-by-case basis, the respondents who answered the open-ended question were either re-categorized as belonging to one of the five manosphere branches, or dismissed (See Additional File 7 for details). After those filters were applied, there remained 148 complete answers for data analysis, with an average number of 19,6 multiple-choice questions answered out of 20 (see Additional File 8 for complete breakdown of excluded respondents).

Missing values

Respondents were given the option to skip answers in the survey, so as to let them choose what personal information to disclose. As a result, there are missing values in the manosphere survey responses. For example, six

manospherians did not specify their age, and three did not specify their gender. When presenting descriptive statistics, respondents with missing values on the relevant variables are removed, which explains why sample sizes might differ between tables and figures. Finally, for the linear regression model, which cannot handle missing values, assumptions were made in order to conduct statistical analysis (for a breakdown of assumptions and details of the model, see Additional File 9).

Counterpart group (RQ3)

A manosphere-only survey study would not allow for generalization. For some questions, such as age or acceptance of evolution, the base rates of the population are known, allowing for comparison. However, for other questions, in particular the ones specifically designed for the study, there is no such possibility. Hence the necessity to administer the survey on a comparison group. In their comparison of manosphere communities with generic Reddit communities, Mamié et al., refer to these generic communities as “counterparts,” arguing that “counterparts provide a sanity check on the effect sizes observed across different communities” ([36], p. 6). We therefore follow their practice and terminology.

We recruited a counterpart group of 151 US respondents on the platform Prolific, which is specifically designed to help survey researchers find paid participants and gather quality data [43]. The sample was required to be evenly distributed between male and female participants, and composed of US nationals, with a minimum response approval rate of 95% on the platform, a common threshold for quality responses on Prolific [44]. Respondents were paid at a rate of 12 GBP/hour. The survey opened on March 27, 2023, and closed on March 29, 2023. The questionnaire was slightly altered to fit the group under study, and to adapt to the specific needs of the data collection context (modifications are detailed in Additional File 10). Yet, none of these modifications concerned the science questionnaire questions. They do not harm the validity of comparisons between manosphere respondents and the counterpart group. There was no need for data cleaning and no missing values with the Prolific dataset. Average response rates between the two groups (19,6/20 vs. 20/20) are not significantly different (since the response rate distribution was not normally distributed due to ceiling effects, a nonparametric Mann Whitney U test was run, $U = 9739.5$, $p = 0.06$).

Demographics

A full breakdown of sociodemographic data for both manosphere and counterpart respondents is provided in Tables 2 and 3.

Table 2 Manosphere respondents demographic information (n = 148)

Characteristics	Partici- pants (n)
Age	(Range = 18–64)
18–20	10
21–25	50
26–30	15
31–35	25
36–40	23
41–45	9
46–50	5
51–60	4
61+	1
Unreported	6
Mean = 30.6	
Median = 29	
Std. Deviation = 9.620	
Sex	
Male	142
Female	3
Unreported	3
Level of education	
Some high school	4
High school diploma or equivalent	18
Some undergraduate education	31
Trade/Technical/Vocational training	6
Undergraduate college/university degree	44
Some postgraduate education	11
Completed postgraduate education	33
Unreported	1
Number of college Science classes	
0	34
1–3	34
4+	80
Manosphere group	
Men's rights activists	96
Pickup-artists	8
The red pill	12
MGTOW	11
Incels	19
General manosphere	2

Results

Acceptance of evolution

Before assessing evolutionary scientific literacy (RQ1), acceptance of evolution is a preliminary starting point when studying right-wing politics in the United States. As done by Miller et al., [40], answers on the five options were collapsed into three (*Definitely False* and *Probably False* -> *Reject*; *Definitely True* and *Probably True* -> *Accept*; and *Don't Know*). As shown in Fig. 1, results unambiguously reflect the Darwinian enthusiasm of manospherians, with acceptance of evolution being almost unanimous, outpacing the counterpart group's (2×3 non-parametric chi-square test, $X^2 = 13.2$, $p = 0.0013$), and far over the baseline measured for the US population with the same question [40].

Table 3 Prolific respondents demographic information (n = 151)

Characteristics	Partici- pants (n)
Age	(Range = 18–72)
18–20	5
21–25	30
26–30	29
31–35	23
36–40	20
41–45	10
46–50	11
50–60	15
61+	7
Unreported	1
Mean = 35.67	
Median = 33	
Std. Deviation = 12.278	
Gender	
Man	73
Woman	73
Other	5
Level of education	
Some high school	1
High school diploma or equivalent	17
Some undergraduate education	39
Trade/Technical/Vocational training	5
Undergraduate college/university degree	61
Some postgraduate education	9
Completed postgraduate education	19
Number of college Science classes	
0	26
1–3	65
4+	60

Evolutionary scientific literacy (RQ1)

Each respondent had a score corresponding to their raw number of correct answers on the 20-item science questionnaire. Skipped answers were counted as false answers. Overall, manospherians outperformed the counterpart group by a wide margin, as shown in Fig. 2 below.

Given the high scores of manospherians, a potential bias must be mentioned here. The survey was advertised in a way that probably would have appealed more to people interested in science, as respondents were invited to come test their scientific knowledge. The difference in score between manospherians ($M = 14.07$, $SD = 3.30$) and the counterpart group ($M = 10.13$, $SD = 3.2$) was significant (independent samples t test, $t(297) = 10.49$, $p < 0.001$).

In order to make sure that this mean group difference was not the product of other variables, a linear regression model was run with score as the dependent variable, and age, gender, educational achievement, number of college science courses, acceptance of evolution, and a binary variable for manosphere/counterpart as explanatory variables (details on missing values and assumptions for this regression can be found in Additional File 9). Answers on

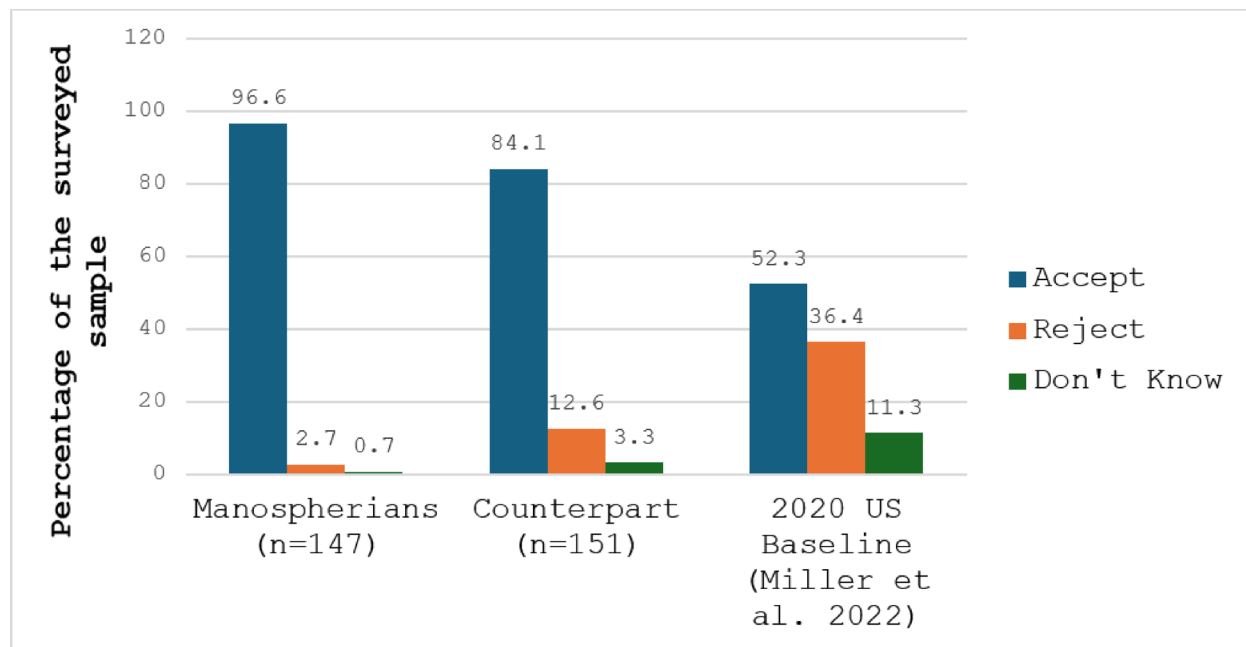


Fig. 1 Acceptance of evolution among manospherians, counterpart respondents, and the 2020 US baseline

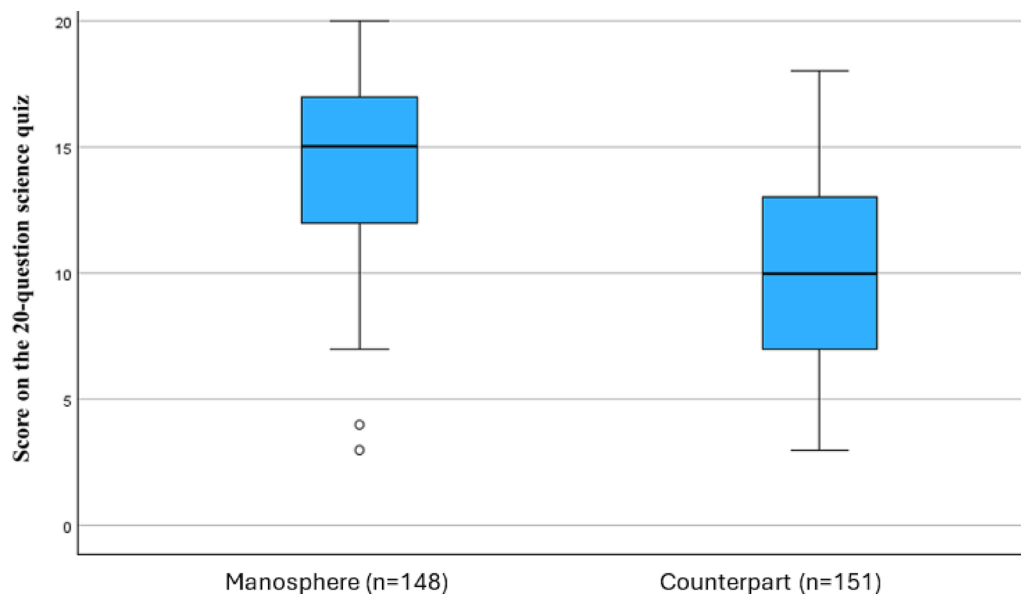


Fig. 2 Manosphere and counterpart scores on the 20-item science questionnaire

the educational achievement survey item were computed into a binary variable, with no college degree coded as 0 and college degree or higher coded as 1. Answers on the evolution acceptance survey item were computed into a binary variable, with those who answered “Definitely False”; “Probably False”; and “I don’t know” coded as 0, and those who answered “Probably True”; and “Definitely True” coded as 1. The variable about the number of college science courses taken was treated as a three-level categorical factor. One for those who have taken between 1 and 3 college science courses and one for those who

have taken more than four such courses. As for those who reported no science courses, they are included in the intercept. Lastly, a binary variable was added to differentiate between manosphere respondents (1) and Prolific respondents (0). The two respondents who did not answer on educational level or acceptance of evolution were dismissed, as were the five respondents who reported a non-binary gender identity. Lastly, Generalized Variance Inflation Factors (GVIF) were calculated to assess multicollinearity between predictor variables. All GVIF values were below 2, indicating no problematic

Table 4 Linear regression results for score on the science questionnaire (n = 285)

	Estimate	Std. Error	t value	p value
(Intercept)	7.37	0.92	8.05	< 0.001
Manosphere (1)	4.14	0.45	9.23	< 0.001
Gender–Woman (2)	0.04	0.50	0.08	0.94
Age	0.02	0.02	1.05	0.29
Education (1–college degree)	1.08	0.44	2.48	0.01
1–3 College science courses	0.04	0.57	– 0.06	0.95
4+ College science courses	1.10	0.59	1.87	0.06
Acceptance of evolution (1)	1.13	0.63	1.78	0.08

Goodness of fit $R^2 = 0.37$ bold = statistically significant at $p < 0.001$

collinearity between variables. Results are presented in Table 4 below.

Being a manospherian was by far the strongest predictor of success on the evolutionary scientific literacy questionnaire, with manospherians scoring over four points more than counterpart respondents, all other factors being equal (std. error 0.45, $p < 0.001$, $R^2 = 0.37$). This was followed by other known predictors, albeit with much weaker effects, such as having a college degree, as well as having followed 4+ college science courses, and acceptance of evolution (almost significant at respectively $p = 0.06$ and $p = 0.08$). We also ran a similar model without the manosphere variable, which failed to capture as much variance ($R^2 = 0.18$). That model found a large effect for Gender, which was confounded by the fact

that manospherians are almost exclusively male; once Manosphere is added to the model, the Gender effect disappears.

Misconceptions

Since they tended to select correct answers on the questionnaire, manospherians scored lower on misconceptions across the board, as detailed on Table 5 below. The most prevalent manosphere misconception of evolutionary behavioral sciences was the intentionalistic fallacy, i.e., the belief that humans consciously act to maximize their Darwinian fitness, a finding which is addressed in the Discussions section.

Scientific knowledge acquisition (RQ2)

Manospherians and the counterpart were asked what media they used the most for scientific knowledge acquisition, using a seven-point Likert scale from “not at all” to “a great deal” to rate each media. Average results for each group and media are presented in Fig. 3 below.

Significance levels for the difference in ordinal distributions between manosphere and counterpart ratings for each media were calculated using nonparametric Mann-Whitney U-tests. Wikipedia and science papers were listed by manospherians as their most preferred sources of scientific knowledge acquisition (pairwise comparison with Tukey’s HSD post-hoc test, Wikipedia ($M = 3.52$) vs. Science Papers ($M = 3.51$), $p = 1$). Videos and online discussions were listed next. Those results indicate that their knowledge acquisition mostly occurs online. However,

Table 5 Prevalence of misconceptions among manosphere and survey respondents

Misconception	Distractors	Responses per item		Total responses		Frequencies		Rank	
		Mano	Counter	Mano	Counter	Mano	Counter	Mano	Counter
Intentionalistic Fallacy: the belief that humans intentionally act to increase their Darwinian fitness. This is confusing the proximate and ultimate levels of behavioral explanation.	EvoBio4-A; EP1-C; EP3-A.	37; 33; 31	45; 18; 32	101	95	29.6%	19.4%	1	4
Species Selection: explaining the evolution of a trait/behavior by its sole capacity to have been beneficial for its group’s or entire species’ fitness in the past, without regard for gene-level selection.	EvoBio4-D; EvoBio5-C; EP4-C.	57; 11; 13	51; 32; 20	81	103	23.8%	21.1%	2	1
Sex Differentialism: the exaggeration of sex differences. It usually occurs by taking an average difference on traits/behavior between the sexes, and turning it into an exclusive generality which erases any overlap.	Horm2-B; EvoBio5-B; EP5-B.	1; 40; 24	8; 57; 36	65	101	19.1%	20.7%	3	2
Extreme Environmentalism: The belief that human behavior is almost exclusively determined by environmental factors (also called “the Blank Slate”).	Gen3-D; EP1-B; EP3-D.	5; 35; 11	9; 70; 21	51	100	15.0%	20.4%	4	3
Extreme Biological Determinism: the belief that human behavior is almost exclusively determined by genetically heritable factors.	Gen3-B; Horm2-C; EP2-A.	16; 8; 19	28; 9; 55	43	92	12.6%	18.8%	5	5
Total				341	489				

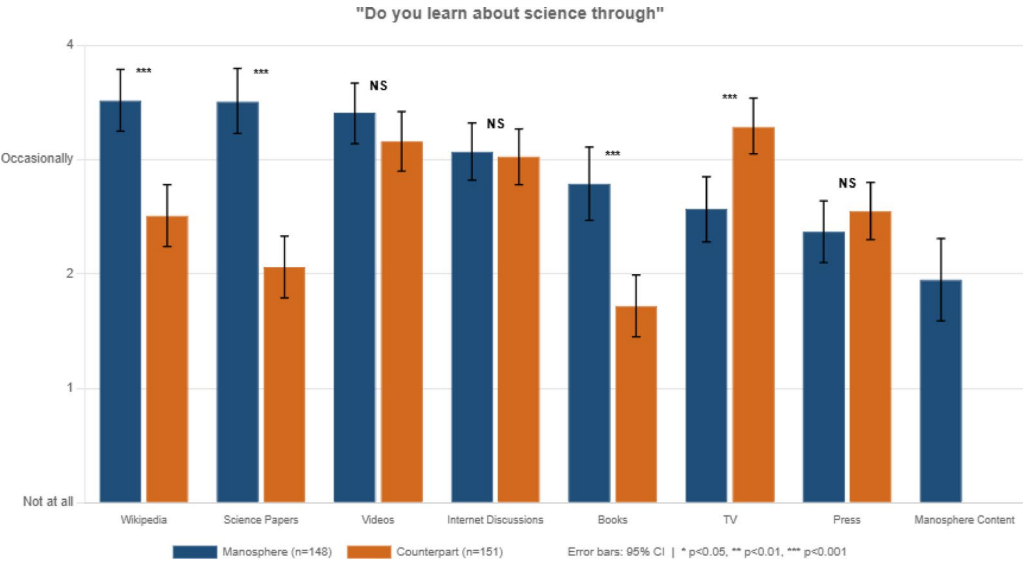


Fig. 3 Sources of scientific knowledge acquisition among manosphere and US prolific respondents

Table 6 Media and misconceptions among manosphere respondents (n = 148)

	Extreme environmentalism	Extreme biological determinism	Intentional-istic fallacy	Sex differentialism	Species selection	Misconceptions Total
Social media	− 0.12	0.11	0.10	− 0.02	0.06	0.06
Papers	− 0.13	− 0.11	0.11	− 0.03	0.00	− 0.03
Books	− 0.14	− 0.14	− 0.08	0.02	− 0.14	− 0.18**
TV	0.04	− 0.04	− 0.04	0.11	0.16*	0.07
Videos	− 0.07	0.05	0.04	0.09	− 0.01	0.05
Press	− 0.14	− 0.02	0.00	0.06	− 0.03	− 0.03
Wikis	− 0.07	− 0.07	− 0.01	0.00	0.02	− 0.05
Manosphere Content	− 0.11	0.08	0.22**	0.06	− 0.02	0.08

p < 0.05 = *; *p* < 0.01 = **; *p* < 0.001 = *** bold = statistically significant at *p* < 0.001; italics = false discovery rate < 5%

they interestingly listed manosphere content as their least favorite source of content (this option was not available to the counterpart group), as confirmed by Tukey’s HSD post-hoc test ($p < 0.001$ for pairwise comparisons with Wikipedia, science papers, videos, and online discussions). There is always of course the possibility of a desirability bias, as respondents might have been ashamed of telling researchers that they learned about science through manosphere content. Yet, Wikipedia had the best ratings, which is also presumably not the most desirable answers to give researchers. From these results, it can thus safely be assumed that manospherians mainly obtain their knowledge from “mainstream” i.e., non-manosphere sources. Remarkably, peer-reviewed scientific papers were tied for first place in manosphere ratings ($M = 3.51$) in stark contrast with ratings of the counterpart (6th out of seven positions, $M = 2.1$, Mann Whitney $U = 14590$, $p < 0.001$), which can be assumed to more accurately reflect the scientific-knowledge acquisition

practices of laypeople. The implications of this finding are discussed at the end of this paper.

Media and misconceptions

Our survey investigated adults’ scientific literacy and misconceptions, and also collected data on their favorite media sources for autonomous science learning. As such, we can investigate whether some sources of content are associated with higher or lower prevalence of specific misconceptions. In Tables 6 and 7, and 8 below, we present correlation matrixes between media ratings and scientific misconceptions. Since the media rating variables are ordinal, these correlations are Kendall rank correlation coefficients, which can be interpreted similarly to Spearman’s correlation coefficients for continuous variables. However, there is a risk of false positive, as these matrixes contain multiple tests. In order to account for that, we ran the Benjamini-Hochberg procedure, with a false discovery rate of 5%. Significant correlation

Table 7 Media and misconceptions in the counterpart group (n = 151)

	Extreme environmentalism	Extreme biological determinism	Intentionalistic fallacy	Sex differentialism	Species selection	Misconceptions total
Social media	− 0.13	− 0.07	0.00	− 0.04	− 0.01	− 0.08
Papers	− 0.17*	0.09	− 0.12	− 0.07	0.07	− 0.10
Books	− 0.24***	− 0.02	0.02	− 0.01	− 0.02	− 0.12
TV	− 0.08	0.07	− 0.01	− 0.04	0.09	− 0.01
Videos	− 0.21**	− 0.13	0.03	− 0.02	0.08	− 0.10
Press	− 0.12	− 0.07	0.08	− 0.03	0.04	− 0.06
Wikis	− 0.13	0.04	− 0.12	− 0.08	0.10	− 0.04

$p < 0.05 = *$; $p < 0.01 = **$; $p < 0.001 = ***$ (bold italic = false discovery rate < 5%)

Table 8 Media and misconceptions in both samples (n = 299)

	Extreme environmentalism	Extreme biological determinism	Intentionalistic fallacy	Sex differentialism	Group selection	Misconceptions total
Social media	− 0.13*	0.02	0.05	− 0.03	0.02	0.00
Papers	− 0.23***	− 0.04	0.01	− 0.09	0.00	− 0.14**
Books	− 0.25***	− 0.11*	0.00	− 0.03	− 0.09	− 0.19***
TV	0.03	0.04	− 0.04	0.07	0.14**	0.06
Videos	− 0.16**	− 0.05	0.04	0.02	0.04	− 0.04
Press	− 0.11*	− 0.04	0.04	0.02	0.02	− 0.03
Wikis	− 0.15**	− 0.05	− 0.05	− 0.09	0.03	− 0.10*

$p < 0.05 = *$; $p < 0.01 = **$; $p < 0.001 = ***$ (bold italic = false discovery rate < 5%)

coefficients which are below this threshold are highlighted in bold and italicized in Tables 6 and 7, and 8.

For each respondent and misconception, a score was computed based on the number of associated distractors selected, as well as a total misconception score. A somewhat rejoicing finding is that consumption of mainstream science media overall tended to be associated with lower prevalence of misconceptions (Table 8). Extreme environmentalism, or the “blank slate” view of human nature according to which the human mind has no evolved predisposition, was by far the misconception for which this association was strongest. Conversely, prevalence of the intentionalistic fallacy—the most popular misconception among manosphere respondents (see Table 5)—was positively associated with consumption of manosphere content. These findings are addressed in the Discussion section.

Online scientific knowledge transmission practices

Answers to questions on scientific knowledge transmission practices reveal the specificity of manospherians compared to the general public. Not only do they individually seek out more scientific content (see Fig. 3), but they also tend to disproportionately cite and share scientific information online, as shown by Figs. 4 and 5, and 6 (nonparametric Mann-Whitney U-Tests run to compare distributions of manosphere and counterpart responses on each item; respectively Fig. 4, $U = 4895.5$, $p < 0.001$; Fig. 5, $U = 4343.5$, $p < 0.001$; Fig. 6, $U = 5466.5$, $p < 0.001$).

These results all point towards the same direction, and reveal the collective nature of online knowledge transmission in the English-speaking manosphere. Scientific research appears to be a “prized epistemic currency” in those spaces ([6], p. 367), as it is often invoked to win arguments, and cited in forum threads of Reddit posts to be more convincing. A consequence of these practices is to make scientific content more present and accessible in manosphere spaces than elsewhere.

Discussion

Limitations and future research

Manosphere respondents were recruited on a voluntary basis. This means the most inimical and mistrustful probably did not participate. Similarly, the survey was only posted on the presumably more moderate manosphere platforms whose administrators accepted, a case of gatekeeper bias. Finally, this was a long survey, and the people who took the time to complete it were presumably more interested in and knowledgeable about science than average. However, random probability sampling is known to be impossible with hard-to-reach populations (Mathy et al. 2022). As such, using some form of non-probability sampling is the norm when studying “hard-to-reach,” “hidden,” or “underrepresented” populations. In their review of these suboptimal sampling methods, Bonevski et al. write, “Selection bias and gatekeeper bias which limit validity of the sample are the primary limitations of these strategies” [11]. Our survey study unsurprisingly

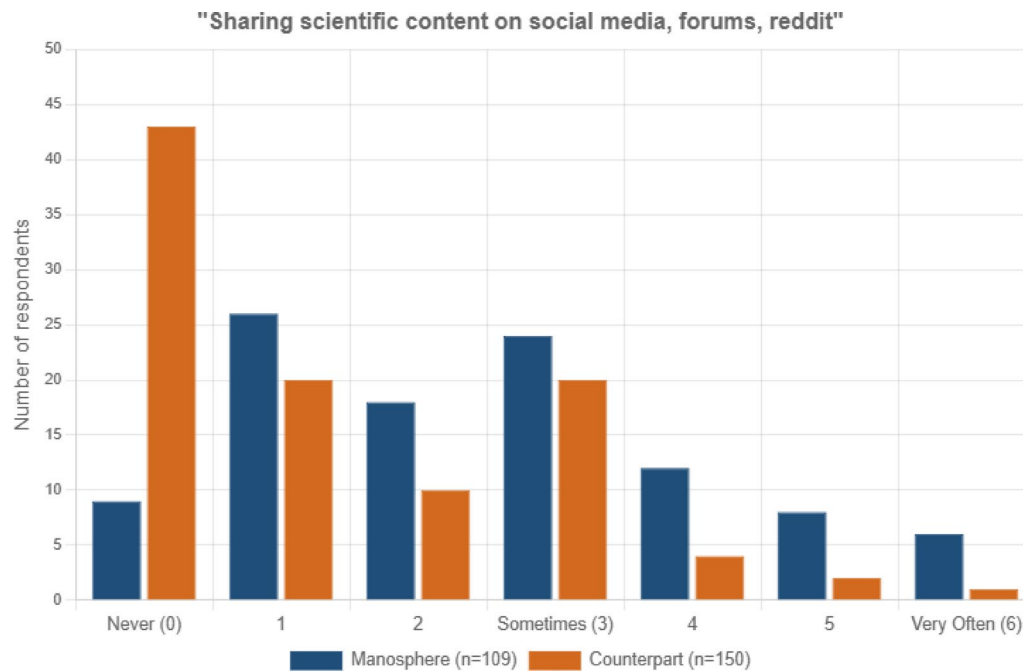


Fig. 4 Prevalence of online scientific content posting among manospherians and counterpart respondents

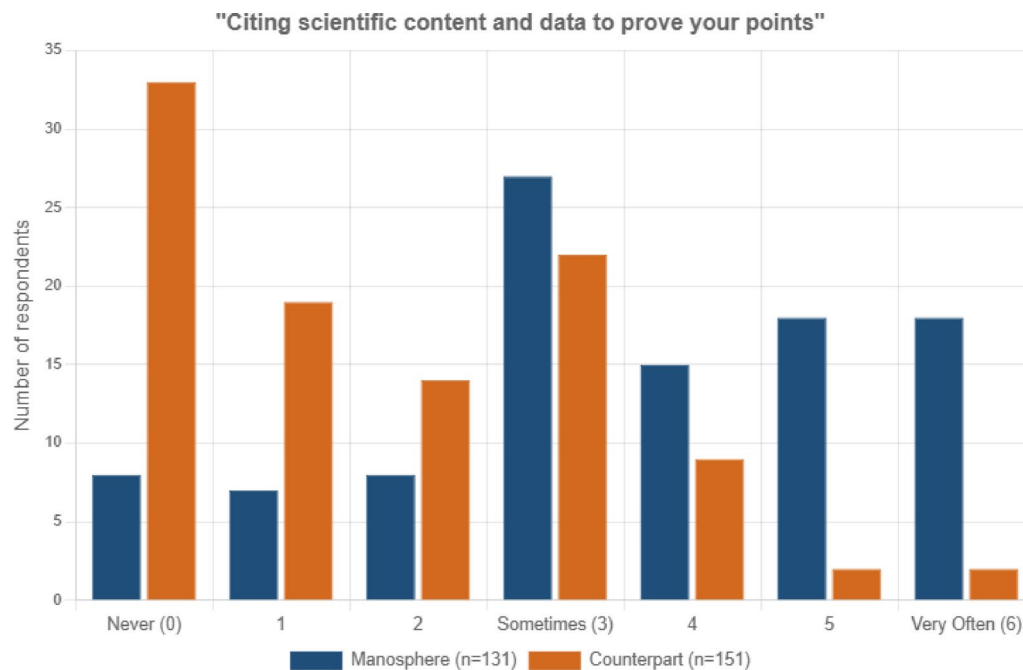


Fig. 5 Prevalence of scientific citation in manosphere and counterpart discussions

features those biases, as do all manosphere survey studies. This calls for a high level of caution when trying to generalize findings.

Handing out cash rewards to the best scorers on the science questionnaire was avoided to prevent cheating. In fact, respondents were explicitly asked to **“please refrain from consulting outside resources** to answer the quiz.” Nonetheless, this was a remotely-administered survey,

and there is no way to guarantee absence of cheating, or purposefully disingenuous answers. Overall, the study gathered fewer responses than originally desired (i.e., 100 answers per manosphere group for between-group comparison), due to the lack of means to promote the study on social media platforms, lack of control on the algorithms governing these private platforms, refusals of community gatekeepers, and mistrust of manosphere

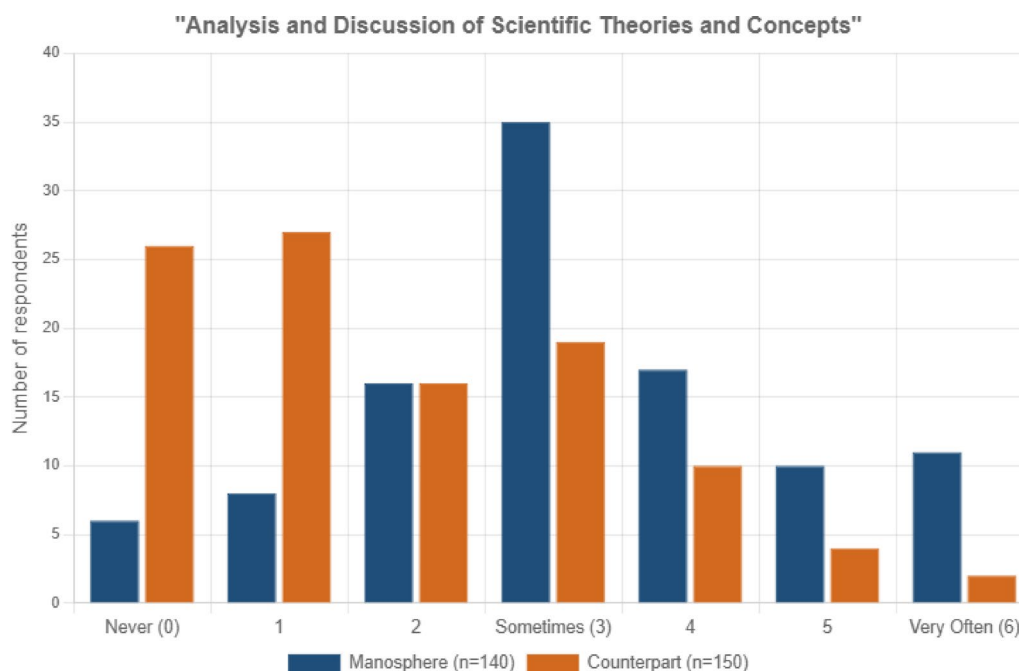


Fig. 6 Prevalence of scientific discussions in manosphere and counterpart conversations

communities. While disseminating the survey, we received some hostile reactions, and even a death threat, and had to suspend data collection for a while due to security concerns in our home university.

There was to the authors' knowledge no pre-existing psychometrically validated undergraduate-level evolutionary psychology (EP) literacy questionnaire. We therefore took the opportunity to design ad hoc multiple-choice items with distractors measuring the prevalence of several common manosphere misconceptions. However, this means that these survey items cannot be used as generic instruments to assess EP literacy. There are widespread fundamental theoretical disagreements between evolutionary psychologists (for epistemological analysis, see [18]; for a survey highlighting shared beliefs and disagreements, see [34]), to the point that scholars have argued that it has not yet reached the Kuhnian stage of mature "normal science" ([18, 55]; but see [7]). This makes the design of a peer-validated undergraduate-level EP literacy instrument more difficult, yet perhaps even more necessary to establish a core of shared axioms for students and lay enthusiasts. Ultimately, even if our ad hoc survey items lack the psychometric validation of the others included in our questionnaire (e.g., the Genetics Literacy Assessment Instrument, GLAI), this does not compromise the study's main findings. Whether these items are included or not in the data analysis, the group difference between average scores remains substantially similar, as do the results from the linear regression model.

In spite of these difficulties and limitations, this remains the only manosphere-wide survey study to date to span all subgroups, and the first to evaluate manospherians' scientific literacy. In order to encourage similar survey research, we strove to make our methodology as transparent as possible, and provide all details about survey distribution and promotion as supplementary materials. Our study was exploratory: it did not aim at confirming or invalidating specific hypotheses, since there was virtually no existing literature on the phenomenon. Replication of our findings would be necessary, with a drive towards reaching out more hostile segments of the manosphere and larger sample sizes. Larger sample sizes would also enable the use of automated clustering methods to establish different profile of "science learners" based on their science knowledge acquisition practices, which was not fruitful with the present data.

Lastly, in order to keep questionnaire length short and to minimize respondents' reluctance to engage, the present study only included the minimal number of socio-psychological variables. However, past research on US creationism has revealed the influence of many factors on evolution acceptance and knowledge: identity factors such as conservative or religious self-identity [27, 28]; cognitive factors such as the intuitive feeling of certainty (FOC) in one's beliefs [26]; or perception of group dynamics such as community support and norms around evolution [28]. If sufficient rapport and trust could be built with manosphere respondents to collect such data, we expect that some of the associations measured among conservative anti-evolution populations would be

reversed: for example, in conservative groups of manosphere Darwinian aficionados, it is likely that community norms would be perceived as favoring acceptance of evolution rather than dissuading it.

Now, we explore how the present findings can inform evolutionary scientists' concerns about the manosphere.

Shedding light on darwinism in the manosphere

Evolutionary scientists have expressed concern about manosphere appropriations of their research. UC Santa Barbara evolutionary psychologist Daniel Conroy-Beam recently wrote in the press: "Peering into the manosphere has been like walking through a funhouse mirror version of my science. The manosphere view of evolutionary psychology is distorted, filtered, selective, and embellished" [16]. The present exploratory survey study helped explore literacy and science learning among these English-speaking communities, which could guide potential interventions or guidelines for concerned scholars.

Firstly, the most popular manosphere misconception of evolutionary behavioral science was the intentionalistic fallacy, i.e., the belief that organisms consciously think of maximizing their Darwinian fitness when acting (Table 5). While organisms are equipped with psychological mechanisms, such as emotions, preferences, or perception biases, which have presumably been naturally selected because they helped their ancestors reproduce more than others, it does not necessarily imply that they are consciously running Darwinian calculations. A peahen does not have to know why centuries of sexual selection make her attracted to a peacock's colorful tail to be attracted to it. In manosphere ideology, this important distinction is sometimes lost. For example, in incel ideology, heterosexual women are often vilipended for their mate preferences [13]. Using evolutionary research showing the adaptive basis of female preferences for traits such as height or muscularity, incels accuse women of being modern-day eugenicists who purposefully aim at eradicating short or non-masculine incels from the gene pool.² They are thus committing the intentionalistic fallacy, as people can be motivated by evolved drives and preferences without necessarily being aware of their Darwinian function. In fact, this fallacy was the only one to be positively associated with science knowledge acquisition from manosphere sources (Table 6). Evolutionary behavioral scientists have for decades been fighting the notion that the human mind is a "blank slate" without any evolved predisposition [45], and this seems to have been quite successful, as consumption of most science media was associated with lower prevalence of this

misconception (Tables 6 and 7, and 8). Maybe it is time for those scientists to also address other popular misconceptions more vigorously.

This is particularly relevant because our survey results suggest that a substantial portion of manospherians access the scientific literature directly (Fig. 3). While access to peer-reviewed scientific journals used to be limited to members of scholarly societies or to university libraries, this has radically changed in the Internet era, with the democratization of Open Access publishing and illegal services such as Sci-Hub. "For the first time, nearly all scholarly literature is available gratis to anyone with an Internet connection," write the data scientists who found that 85% of paywall-protected papers were available on Sci-Hub ([30], p. 1). Manospherians are well aware of this, and operate many platforms to curate and share scientific papers. For example, there are no less than seven dedicated subreddits (r/mensrightslink; r/MensRightsScience; r/Male_Studies; r/MaleStudies; r/puascience; r/redpillscience; r/BlackPillScience), with the community rules for one of them specifying that "Full-text articles may be acquired via unpaywall.org or sci-hub" (r/BlackPillScience).³ The use of Google Scholar, whereby papers are accessed through keyword queries, might also induce biases, as the results shown necessarily reflect the biases and assumptions of the queries. While this unprecedented access of laypeople to scientific literature should certainly be saluted as a positive development for science learning, scholars writing articles for peer-reviewed journals might still be operating under the assumption that they are only writing for their colleagues. This is not the case anymore, as even preprints are nowadays being widely accessed and shared by non-scientists on social media [14]. For those writing on controversial topics liable to be politically weaponized, such as genetic differences between populations or between the sexes, this should be kept in mind.

Yet, ultimately, English-speaking manospherians report relatively high educational levels, in particular regarding college science courses (Table 2). Moreover, their acceptance of evolution was almost unanimous (Fig. 1), and they widely outperformed the counterpart group in the science literacy questionnaire (Fig. 2). To put it shortly, their evolutionary scientific literacy was far above average. As such, there is only so much that better science education and communication can accomplish. If groups of people have different values and normative judgments than the people conducting the research, they will

²For an example of women being framed as modern-day eugenicists by incels, see the "feminism" entry on the incel wiki: Incels.wiki, "Feminism," <https://incels.wiki/w/Feminism>, accessed September 30, 2024.

³Respective URLs for these subreddits: <https://www.reddit.com/r/mensrightslinks/>; <https://www.reddit.com/r/MensRightsScience/>; https://www.reddit.com/r/Male_Studies/; <https://www.reddit.com/r/MaleStudies/>; <https://www.reddit.com/r/puascience/>; <https://www.reddit.com/r/redpillscience/> (needs moderator approval to join); <https://www.reddit.com/r/BlackPillScience/>, all accessed on November 26, 2024.

selectively interpret and appropriate findings to fit their own ideology and agenda [4]. Maybe this is inevitable, as argued by some evolutionary psychologists [21]. This does not mean that scientists should not be concerned about real-life implications impacts of their findings, especially given the weight and “seductive allure” of evolutionary explanations, but it means that this leaves the epistemic purview of science education, to enter that of ethics [8].

Conclusion

There has been growing recognition that the antifeminist communities of the manosphere ground their ideology in simplistic or distorted evolutionary narratives and concepts (O'Neill [42]; [4, 9, 16]). Our exploratory survey study was the first one to quantitatively assess part of the phenomenon, by examining scientific literacy and knowledge acquisition in the English-speaking manosphere. Manospherians exhibited high educational levels, including scientific higher education, and an almost unanimous acceptance of evolutionary theory. Moreover, they scored much better than a counterpart group of US respondents on a science literacy questionnaire, confirming their status as enthusiastic Darwinians. Unsurprisingly, they seek out scientific content at higher rates than other lay publics, including through direct access to peer-reviewed literature. They also tend to share and transmit such scientific content in online discussions and social media posts at much higher rates.

Although there might be evidence that science communicators and educators could address potential misconceptions, such as the intentionalistic fallacy, these results also highlight a complex landscape for intervention. If scientists are distressed over seeing their research findings exaggerated or truncated for ideological purposes, it is ultimately unsure whether they have control over this. Indeed, this might be seen as a side effect of the unprecedented access of the public to scientific research results. Yet, we contend that this is not a reason for scientists to ignore issues of public reception and understanding of their research. In fact, these results should be seen as a springboard for renewed discussion inside fields working on controversial and highly politicized issues such as evolved genetic differences between the sexes or between populations, as well as a call for conducting more evidence-based assessments of the social, political, and ideological impacts of their research findings.

Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s13227-026-00262-0>.

Supplementary Material 1.
Supplementary Material 2.

Supplementary Material 3.
Supplementary Material 4.
Supplementary Material 5.
Supplementary Material 6.
Supplementary Material 7.
Supplementary Material 8.
Supplementary Material 9.
Supplementary Material 10.

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Author contributions

LB conducted the literature review, designed and tested the survey instrument. RG reviewed the survey instrument. LB distributed the survey. RG and LB conducted statistical analyses. LB wrote the manuscript and RG reviewed it.

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Data availability

Since manosphere respondents are very protective of their private identities, they were told on the consent form: “Aggregated results may be disseminated in standard academic outlets. You will not be identifiable in any report or publication.” Complete answers for these respondents are therefore not provided to avoid re-identification. Answers from Prolific respondents, however, are provided. The dataset and R scripts for data analysis supporting the conclusions of this article are available in the Manosphere Science Literacy Survey repository, <https://osf.io/trfxb/>.

Declarations

Ethics approval and consent to participate

These survey studies were approved by the University of Kent School of Anthropology and Conservation's Ethics Review Board (Ethics ID 20221671538022231 for manosphere and Ethics ID: 20231677250257264 for Prolific).

Competing interests

The authors declare no competing interests.

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