

Notable enough? The questioning of women's biographies on Wikipedia

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ABSTRACT

This study focuses on biographies nominated for deletion in the German-language Wikipedia and the encyclopedia's core principle of notability. Results are presented from quantitative content analyses of deletion nominations, discussions, and decisions from the year 2020. It shows that women's biographies are more often called into question but not deleted more often than men's biographies. Additionally, women's biographies are discussed more controversially. Neither a lack of notability criteria, a lack of external sources, nor individual misogynistic users seem to cause this increased questioning. Instead, the results suggest that the notability of women is collectively surveilled and contested with higher intensity due to biased perceptions. This can be explained by the fact that the concept of notability is not value-free or gender-neutral in the first place—even though it is based on rational discourse. The gender gap in biographies is contentiously discussed by users themselves, too, while overt sexism and gender-based devaluations are effectively countered by engaged users.

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Introduction

In 2018, Canadian physicist Donna Strickland made it into the news when she received a Nobel Prize, and it became known that she did not yet have a Wikipedia entry. An attempt to create a page in the English-language Wikipedia for Strickland was denied four years earlier by an administrator arguing that she was not important enough for Wikipedia, leading to discussions about gender biases within the user-generated online encyclopedia (Leyland Cecco 2018).¹ With more than 2.5 million articles, the German-language Wikipedia is currently the fourth largest Wikipedia in terms of number of articles and the second largest in terms of active users, which are estimated to number more than 20,700 (February 2022). Biographies account for almost 30% of all entries. However, there are about five times as many biographies of men as there are of women in the German-language Wikipedia, and only a very small number of biographies about people with non-binary gender identities exists.² Increasing the number of women's biographies, as feminist initiatives are trying to do, becomes especially important since Wikipedia

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knowledge also migrates to other platforms, when it is used to improve search engines or to train AI applications (Isabelle Langrock and Sandra González-Bailón 2022). In an interview with the German news magazine *Der Spiegel* in 2019, Wikipedia founder Jimmy Wales answered whether the lack of women's biographies just reflects the imbalance of society or if Wikipedia contributes to the imbalance, saying that both are the case. When asked for reasons, he said it is certainly not because the Wikipedia community believes that women are less important but rather because users would write according to their knowledge and interests.³ Although numbers are difficult to collect, it is estimated that a vast majority of users is male (Benjamin M Hill and Aaron Shaw 2013). Previous scientific studies have focused on reasons for gender differences in contribution (Eszter Hargittai and Aaron Shaw 2015), the exclusionary culture of Wikipedia (Heather Ford and Judy Wajcman 2017), content-related differences in biographies (Claudia Wagner, Eduardo Graells-Garrido, David Garcia and Filippo Menczer 2016), as well as female sociologists' lack of representation in the online encyclopedia (Julia Adams, Hannah Brückner and Cambria Naslund 2019). The body of research shows how multilayered Wikipedia's gender gap is, and reasons why women do not participate are well explored (Benjamin Collier and Julia Bear 2012; Stine Eckert and Linda Steiner 2013; Marit Hinnosaar 2019).

The question remains whether and, if so, to what extent and why the Wiki-worthiness of women's biographies is questioned more often. Francesca Tripodi (2023) found for the English-language Wikipedia that entries about women have a higher risk than those about men of being "miscategorized:" existing biographies are disproportionately often nominated for deletion, but also more often kept after deletion discussions, indicating that actually notable women are illegitimately called into question. Notability⁴ is one of Wikipedia's core principles, but it is still insufficiently reflected in research about the gender gap in biographies. This study therefore addresses this research gap by theorizing notability as a concept inscribed with values, such as public recognition, that favor men over women; and by empirically asking how notability is negotiated in discussions about biographies nominated for deletion and whether this differs by the gender of the subject of the biography. Three sources of epistemic authority and their role in deletion discussions are explored: 1) the community's criteria for notability, 2) external references, and 3) formal and informal hierarchies between users. Previous literature suggests that gender biases might enter at every stage, for example through biased expert sources, missing internal criteria for women, or the decision-making power of only a few users. Empirical results will be presented from quantitative content analyses of nominations of biographies for deletion, deletion decisions, and an analysis of the deletion discussions where notability is negotiated.

Wikipedia's principles of notability

Studying the representation of sociologists in the English-language Wikipedia, Adams, Brückner, and Naslund (2019) show that the absence of biographies of women and nonwhite sociologists can only be partially explained by differences in academic notability. The authors state (2019, 2): "Wikipedia's conceptualization of notability engages measurement strategies that do not adequately capture the actual achievements and contributions of women and minorities." Strickland's example suggests that the lack of women's biographies is not only a result of a lack of users' interest or expertise to create

those articles in the first place, but that the deletion of biographies compounds the gender gap. Tripodi (2023) shows that for a three-year period, the proportion of women's entries nominated for deletion was consistently greater than the number of existing female biographies relative to male biographies (about 25% vs. 17–18%). At the same time, about 25% of women's biographies nominated for deletion were considered notable and kept after discussions, while only 17% of men's biographies undergo this kind of "miscategorization" in the English-language Wikipedia (Tripodi 2023, 1696). Since questionable notability is the most common motive for deletion nominations, Tripodi concludes that the "data indicate that biographies about women who meet Wikipedia's criteria for inclusion are more likely to be considered non-notable than men's" (2023, 1688). Research also indicates that "the degree to which many things are considered notable in Wikipedia is not only inconsistent and arbitrary but also biased" (Maude Gauthier and Kim Sawchuk 2017, 394). By creating their own entries in domains such as feminism, Gauthier and Sawchuk (2017, 394) observed that the rules were applied more strictly for issues related to gender, revealing "latent conflicts seething within Wikipedia that are triggered whenever the words like women, feminism, ethnocultural communities, or lesbian and gay are used." For the deletion of articles about academics in the English-language Wikipedia, Mackenzie Emily Lemieux, Rebecca Zhang and Francesca Tripodi (2023) show that the notability criteria are unequally applied across race and gender.

Thus, previous research suggests, on the one hand, that the criteria for notability are not suited to adequately capture women's achievements; on the other hand, the criteria seem to be interpreted more strictly for women than for men. Therefore, the principles of notability—including specific criteria as well as editorial processes—need to be examined in more detail.

Specific criteria for notability

Notability criteria for persons in the German-language Wikipedia are a complex set of rules that comprises more general notes, e.g., that Wikipedia is not a general directory of people, to quite *specific* criteria. In the general notes on notability the criteria state,

If a topic meets one of the criteria described here, it is relevant to Wikipedia. [. . .]. If a topic does not meet the following criteria, this does not necessarily lead to the exclusion of this article's subject, but other valid arguments for its notability must then be provided. The notability criteria are therefore sufficient, but not necessary conditions for encyclopedic relevance. ("Wikipedia:Relevanzkriterien" 2022, translated by author)

Over the years, the community has formulated specific notability criteria for persons of certain occupations or activities, while for others, they have not.⁵ For example, they explicitly state that non-fiction authors need at least four monographs as main authors with a regular publisher to be considered notable. They are understood as criteria for inclusion, meaning that they are safeguards for notability, whereas persons not meeting the requirements can still be notable if justified. Most of the specific criteria cover occupations that are historically male gendered, such as architects, soldiers or boxers—a sport into which women in Germany have only been allowed since 1996. While these criteria set out specific requirements, they can also be understood as assigning notability to these persons in general, provided they meet certain conditions. On the other hand,

(political) activists for example are not explicitly mentioned in the criteria but their notability needs to be assessed individually each time. E.g., two-thirds of the 56 biographies tagged as covering climate activists are about women with one third of them having been nominated for deletion between 2018 and 2023. It remains unclear how many more articles were created but deleted.⁶ This leads to the assumption that the notability of women's biographies is called into question more often because they have fewer safeguarding criteria but need to be argumentatively justified. Uncertainty has been shown to lead to more bias and inequality because editors must make subjective decisions about whether to include articles (C. Wagner et al. 2016).

External references and sources

Wikipedia's principles additionally include that notability must be verifiable by external sources which adds another layer of possibly gender-biased epistemic principles. A lack of credible citations and sources for notable women has been discussed as one of the reasons for their exclusion from Wikipedia (Ford and Wajcman 2017): if women are not present in media reports and reference works or do not receive awards, they will probably not be considered notable enough for Wikipedia. It is well researched that women have been excluded from written history for most of time (Gerda Lerner 1986), they still are underrepresented in news media (Eran Shor, Arnout van de Rijt, Alex Miltsov, Vivek Kulkarni and Steven Skiena 2015), and they are less often visible as experts in public (Matthias Wagner, Gwendolin Gurr and Miriam Siemon 2019). Sean Hansen, Nicholas Berente and Kalle Lyytinen (2009, 50) find from their analysis of article discussions that the medium depends "on legitimized, institutional forms of authority." And René König (2013, 160) concludes from a case study that the community is "rigorously excluding knowledge which is not verified by external expert authorities. [...] in this case, lay participation did not lead to a 'democratization' of knowledge production, but rather re-enacted established hierarchies."

(In)formal hierarchies between users

Basically, any Wikipedia user can suggest an article for deletion for different reasons. Wikipedia provides a publicly accessible guideline on how to proceed when nominating an article for deletion. Users do not have to create an account for this; they must, however, specify a reason for the nomination.⁷ The article is then publicly discussed by any user who would like to participate. The decision, however, is made after seven days of discussions by an *administrator*. José van Dijck (2013, 134, original emphasis) argues that "the real wisdom of Wikipedia can be found not in its crowds but in its crowd *management*." What started in 2001 as a project by few "elite" users soon became a place for a variety of users, a shift that required organization, user socialization, and "an organized hierarchy of user categories" (van Dijck 2013, 136). This division of labor is formalized in hierarchies between editors and administrators: the latter are more experienced users that are elected by other users into this position, which includes having larger rights. This hierarchy has been problematized to limit new users' opportunities to introduce topics of their interest and challenge established policies. However, informal hierarchies also seem to emerge from varying activity levels and a (gendered) division of

labor. Brian Keegan and Darren Gergle (2010) describe Wikipedia's knowledge as a "one-sided gatekeeping" process since they found that especially active "elite editors" can successfully oppose topics being featured on the main page. Activity in networked publics often follows a power law distribution, meaning that a few hyper-active users account for the majority of activity, while the majority of users is only sporadically active (Orestis Papakyriakopoulos, Juan C. Medina Serrano, and Simon Hegelich 2020). Nevertheless, the literature seems ambiguous regarding the role that user hierarchies play in contributing to Wikipedia's gender gap.

Theoretical background: Wikipedia's knowledge order

Ford and Wajcman (2017, 519) state that "Wikipedia is extending the epistemologies of previous male-dominated technoscientific projects." What does this entail? Wikipedia is committed to not create new original knowledge but collect and represent existing knowledge that is provably true. However, the community's goal is not only trueness, but providing "neutral" and "objective" knowledge.⁸ Hardly discussed by the community, the principles of notability still bear on questions of *validity* based on attributions of value (what knowledge is valuable and to whom?). As discussed above, most of the occupations and activities explicitly listed as creating notability are (historically) male gendered and still dominated by men. Closer inspection of Wikipedia's general notes and specific criteria, and discussions about them by the community further reveals that notability is primarily derived from two aspects: a person's achievements and public recognition thereof, e.g., in the form of awards; but also from prominence and public attention. Controversy in Wikipedia discussions seems to mainly occur when users disagree on how to evaluate evidence (e.g., how many media reports are enough to prove public interest?)—and not so much, whether specific achievements or (presumed) public interest should be criteria to assess notability, or whose interests this knowledge serves. Both, public recognition and modes of attention are subject to androcentric value patterns (Nancy Fraser 2007).

Analyzing scientific knowledge production, Sandra Harding (2004, 6) observes that "The more value-neutral a conceptual framework appears, the more likely it is to advance the hegemonous interests of dominant groups, the less likely it is to be able to detect important actualities of social relations." The basic idea of Harding's standpoint theory is that knowledge is bound to the knowing subject and thus is always situated and located in a social-historical context. Defending standpoint theories against accusations of amounting to epistemological relativism, Sandra Harding (1991, 2004) notes that (scientific) knowledge can be empirically accurate (true) while socially constructed at the same time. Without including diverse standpoints, knowledge projects that are carried out only by people in socially similar positions are prone to systematically overlook interests and values that the people involved benefit from (e.g., Harding 1991, 143).

Wikipedia's lack of female editors has been confirmed in previous research (David Laniado, Andreas Kaltenbrunner, Carlos Castillo and Mayo F Morell 2012; Hill and Shaw 2013). Central to Wikipedia's conceptual framework are the principles of notability as well as rational discourse. In deliberation research, rationality is agreed to be one of the characteristics that defines high-quality discourse and deliberative communication, where positions are supported by arguments and by

empirical or logical evidence (Dennis Friess and Christiane Eilders 2015). Rationality means engaging in standardized and intersubjectively reasonable practices that are justified by “good reasons” (Christoph Neuberger, Anne Bartsch, Carsten Reinemann, Romy Fröhlich, Thomas Hanitzsch and Johanna Schindler 2019). Part of Wikipedia’s commitment to rationality is that deletion discussions follow a standardized procedure,⁹ there are rules for assessing notability, and a number of types of evidence has become accepted as credible for proving notability. As shown above, these rational and standardized procedures cloud the values inscribed in the very concept of notability.

Promising though, is that Wikipedia’s “knowledge order,” that is, the processes of knowledge production according to its epistemic principles (Neuberger et al. 2019), is located in a digital, public realm. Therefore, these processes—including the genesis, testing, distribution and acquisition of knowledge—are circular and networked. Since knowledge is continuously produced, tested and distributed in a non-linear order by a network of users, it seems more open to change compared to traditional encyclopedias. Feminist initiatives¹⁰ have therefore been organizing projects and edit-a-thons for a number of years, with the aim of introducing more female editors to Wikipedia as well as creating content such as women’s biographies (also Langrock and González-Bailón 2022).

Research questions

As shown, Wikipedia’s knowledge order is based on epistemic principles that are not gender neutral. Assuming that deletion discussions are based on rational communication, including arguments and evidence, it seems possible that women’s biographies need to be justified more strongly than men’s biographies in order to counterbalance Wikipedia’s biased principles. In the German-language Wikipedia, biographies are tagged with one of the categories “men,” “women,” “person of gender unknown,” or “non-binary person.” According to the categories’ revision history page, the category for “non-binary persons” was only created in early 2020, and it includes only 120 people (November 2022). Since numbers are too small for quantitative analyses, this study focuses on women and men only, while acknowledging that gender is not binary. This study asks the following questions:

RQ1: Is the notability of women’s biographies called into question more often than the notability of men’s biographies?

RQ2: How is the (non-)notability of women’s and men’s biographies argumentatively justified and are there differences between the genders?

RQ3: What role do a) external sources and references, b) Wikipedia’s criteria for notability, and c) hierarchies between users play in this process?

Data and methods

Wikipedia provides open access to its archives of deletion discussions and decisions, listed by date. In the first step, the archives of German-language articles nominated for deletion for the whole year of 2020 was manually filtered for those deletion discussions concerned with biographies. The biographies' titles were collected, including their dates of nomination, nomination outcomes, and subject genders. Gender was assessed by pronouns and descriptions used in the discussion, the actual biography, or, if the biography was no longer available due to deletion, by further online research. For the content analysis of the discussions, a coding scheme was developed comprising five categories of variables.

1) The discussions' length and the reason for the nomination for deletion, were collected. Only if a discussion dealt with a person's notability, the following variables were coded. 2) The deletion nominator; the administrator that decided the discussion; users; their positions toward deleting or keeping a biography; and the level of justification (none, general, simple, or specific) for their position were coded (Roland Burkhard and Uta Rußmann 2010).¹¹ 3) As a specific argument for deleting an article, it was coded if at least one user argued for deletion due to a lack of and/or poor sources. 4) Regarding Wikipedia's specific criteria of notability for certain occupations and activities, I asked which of a person's occupations and activities were mentioned in the discussions, if specific criteria were available for the biography in question, and if those criteria were explicitly addressed in the discussion. 5) Finally, gender-related aspects, including explicitly discussed gender aspects and sexist language, were openly coded.

A sample of 499 discussions was drawn from the deletion nominations from 2020 (19.3% of all nominations), stratified by decision type¹² and outcome and weighted by gender in order to obtain groups of similar size. Four coders were trained and collected the data after sufficient intercoder reliability was reached (Supplementary Material, Table I and II). It was not possible to retrieve a biography's external sources, such as reference works or media coverage, from the discussions. Hence, reliable and valid coding could not be achieved. Instead, I additionally collected all biographies that were still available in their latest versions before they were nominated for deletion. I then collected the number of references, weblinks, literature, and other sources for each biography. A total of 211 biographies were restored and coded respectively.

Results

Nominations for deletion

A total of 2,592 deletion requests were made on biographies in the year 2020 in the German-language Wikipedia. Most of these (71%) were discussed regularly, i.e., for seven days; 17.6% of requests were withdrawn or removed early ("speedy keep"). Overall, more male biographies than female biographies were nominated for deletion in 2020: 681 female biographies vs. 1,909 male biographies, i.e., 26.3% of the biographies nominated for deletion were about women. A comparison to the numbers of existing biographies indicates that women are overrepresented in deletion discussions: by the end of 2020, only 16.3% articles were on women overall. Among the biographies created (and not deleted) in 2020, approximately 21.5% are about

Table 1. Number of Wikipedia biographies nominated for deletion by gender, decision type and outcome (absolute and column percentages); Pearson's chi-square test of independence between gender and decision outcome ($df = 1$) and effect size (ϕ).

Decision	N (%)		χ^2	ϕ
	Women	Men		
Regular decisions				
Keep	150 (31.25)	357 (26.27)	4.407 ($p < 0.05$)	0.049
Delete	330 (68.75)	1002 (73.73)		
Speedy decisions				
Keep	143 (71.14)	314 (57.09)	12.204 ($p < 0.001$)	0.127
Delete	58 (28.86)	236 (42.91)		
All decisions				
Keep	293 (43.02)	671 (35.15)	13.324 ($p < 0.001$)	0.072
Delete	388 (56.98)	1238 (64.85)		
<i>total</i>	<i>681 (100)</i>	<i>1909 (100)</i>		

women.¹³ In 2020, one deletion discussion was related to a person with non-binary gender identity; the article was deleted. Overall, more biographies were deleted after discussions than kept. However, decisions to *keep* an article after it was nominated for deletion were significantly more often made for women than for men: 43.02% vs. 35.15%. Speedy deletions were significantly more often made on men's biographies in 2020, while deletion nominations on women's biographies were significantly more often withdrawn or removed ("speedy keep," Table 1). Therefore, following Tripodi (2023), women are more likely to be questioned and "miscategorized" in the German-language Wikipedia, too (RQ1).

Differences in deletion discussions about women's and men's biographies

Content analysis shows that the majority of biographies (92.4% in the sample) are nominated for deletion due to questionable notability. Only these discussions were considered for further analysis ($N = 461$). The discussions' lengths ranged from 28 to 9,931 words, with 564.86 words on average and a median of 326.18 words. Results show significant differences between the genders: the median for women is 455 words, while the median for men is lower at 293 words (Table 2).

Furthermore, discussions about women include significantly more users than those about men on average. An average of 7.26 users are involved in discussions about a woman's notability, while 5.66 users on average discuss the deletion of a man's biography ($T(459) = -3.535$, $p < 0.001$).

Table 2. Length (in words) for deletion discussions about women's and men's biographies.

	Women ($N = 234$)			Men ($N = 227$)			Z-Value	r
	Mean rank	Mean	Median	Mean rank	Mean	Median		
Length (in words)	260.58	756.56	455.00	200.51	490.40	293.00	-4.840 ($p < 0.001$)	0.23

Length is not normally distributed (Kolmogorov-Smirnov test for normality, $p < 0.001$).

Users' positions and levels of justification

I asked how the (non-)notability of biographies is argumentatively justified in the deletion discussions and whether there are differences between biographies about women and men (RQ2). Before considering specific arguments for the deletion of an article, I was interested in users' positions and how well they justified their arguments in general. I therefore collected the number of users who positioned themselves in a discussion in favor of deleting or keeping a biography, as well as the level of justification for their positions. Justifications were measured in four manifestations: no justification, a general justification containing an unspecific statement, a simple justification containing a fact, and a specific justification containing facts and evidence.

Differentiating between biographies that were kept after (regular) deletion discussions and those that were deleted, the following pattern emerges: biographies deleted have on average 48.2% of the users involved in the discussions arguing in favor of deletion, 37.5% with no position, and 14.3% arguing for keeping the article. Vice versa, kept biographies have on average 51.2% of users in favor of keeping them, 32.6% with no position, and 16.3% in favor of deleting them. There are no significant differences between biographies about women and about men, with one important exception. While the percentage of users in favor of deleting an article is on average about 13.3% in discussions about men's biographies that were later kept, discussions about women's biographies that were kept have on average 23.2% users arguing in favor of deletion, that is, more users than in men's discussions arguing contrarily to the administrator's decision to keep the article ($T(100) = -2.423, p < 0.05, r = 0.24$).

When in regular discussions users argue for keeping an article ($N = 569$), they most often give a simple justification (47.9%). Less often, they give general (22.0%) or specific justifications (21.2%) for their positions. In a smaller number of cases, they give no justification at all (9.0%). The level of justification for positions favoring a deletion ($N = 803$) is overall lower, with users giving a simple justification in 34.9% of cases or, similarly often, just a general justification (34.6%) for their positions. Only in 7.7% of the cases did they give specific justifications. Deletion positions were not justified at all in 22.8% of cases. When comparing those numbers for women and men, there is no significant relation between users' average levels of justification for arguments for keeping the biography and the gender of the biography ($\chi^2(3) = 1.294, p = 0.731$). The same applies to deleting arguments and the biography's gender ($\chi^2(3) = 4.729, p = 0.193$) (Supplementary Material, Figure I).

I hypothesized that women's biographies need stronger justification than men's biographies in order to counterbalance biased criteria and to be kept. If the average level of justifications for keeping positions within a discussion (scale from 0 = none to 3 = specific justification) is higher for women's biographies not deleted than for men's biographies not deleted, this would be an indication that women's biographies require stronger justification. Group comparison shows that there are no significant differences between the genders; the average level of justification of keeping positions within a discussion is 1.73 for women and 1.71 for men for biographies not deleted ($T(174) = -0.177, p = 0.859$).

Users often express their support of other users' well-justified positions without giving justifications themselves, and very different dynamics can be hidden behind the

average justification score. For example, it is reasonable to assume that it is not necessary for a lot of users to question notability, but that a single user can drive discussions, too. Results show that women's biographies have at least one user specifically arguing for their deletion in 22.0% of (regular) discussions, while it is only 12.2% of (regular) discussions about men. This relationship between gender and the existence of specifically argued deletion positions is significant ($\chi^2(1) = 5.670$, $p < 0.05$, $\phi = 0.13$). Specifically argued keeping positions from at least one user, on the other hand, are prevalent in 28.0% of women's and 25.5% of men's discussions, with no statistically significant difference. These results indicate that women's biographies do not need higher justifications for keeping arguments in order to be kept, even though (reasoned) opposition is higher.

External sources as argument for deletion

I expected that women's biographies' notability would be more often contested due to a lack of approved sources than men's biographies (RQ3). Content analysis shows that missing or poor sources are a common argument for deletion, brought forward in 38.8% of the discussions about biographies. Further, this argument actually is made significantly more often in discussions about women's biographies (47.9% vs. 35.2%, $\chi^2(1) = 7.552$, $p < 0.01$, $\phi = 0.128$).

While the results confirm the importance of external validation for Wikipedia's biographies, it is still unclear whether there actually is a lack of sources for women or whether the argument is (partially) based on users' biased perceptions. In discussions about biographies that were decided to be *kept*, the argument for deletion due to poor or missing sources was still made in 41.0% (women) or 33.7% (men) of the cases, but differences between the genders are not significant.¹⁴ Therefore, the biographies not deleted after discussions can be expected to be similarly (poorly) sourced at the time of their nomination for deletion—if not, men's biographies should be slightly better sourced. Analysis of the content of biographies that were kept shows that there are significant differences between men and women regarding sources included in the articles. While 76.5% of women's articles had at least one reference at the time they were nominated for deletion, this was true for significantly less of men's articles (62.5%). Overall, 80.0% of women's biographies included at least one reference, literature, or other source, compared to 67.7% of men's biographies at the time they were nominated for

Table 3. Wikipedia biographies nominated for deletion containing sources by gender and source type (absolute and column percentages); Pearson's chi-square test of independence between gender and sources (df = 1) and effect size (phi ϕ).

Sources*	Women (N = 115)	Men (N = 96)	χ^2	ϕ
	N (%)	N (%)		
References	88 (76.5)	60 (62.5)	4.912 ($p < 0.05$)	0.153
Literature	4 (3.5)	10 (10.4)	4.066 ($p < 0.05$)	-0.139
Reference/literature/other sources	92 (80.0)	65 (67.7)	4.151 ($p < 0.05$)	0.140
Weblinks	77 (67.0)	45 (46.9)	8.652 ($p < 0.01$)	0.202

*Biography contains at least one of the following sources.

deletion. Effect sizes are overall small, however (Table 3). A similar tendency but no significant differences are found for the total number of references. Of course, the existence of sources is no indicator of their quality. Investigating what constitutes good quality on Wikipedia and subsequently assessing the quality of the sources is beyond the scope of this paper. However, the results suggest that women's biographies are not necessarily affected by a lack of sources per se; Instead, it seems to be the case that either there is a lack of sources that are considered good quality, or that higher requirements are imposed on the sources of women's biographies, or both.

The role of specific criteria for notability

I assumed that availability of specific criteria for notability (for certain occupations and activities) is important because "hard" criteria leave less room for subjective biases (RQ3). In most of the deletion discussions (84.0%), specific criteria for notability exist for at least one of the person's occupations and activities that are mentioned by the users.¹⁵ There are no significant differences between woman and men. In 43.3% of all discussions, at least one of the specific criteria is available and is also explicitly addressed by the deletion nominator, a user, or the administrator, also with no significant differences between the genders. In the sample, there are slightly less often specific criteria available for deleted biographies than for kept biographies, but this relationship is not significant (81.3% vs. 88.0%, $\chi^2(1) = 3.539$, $p = 0.060$, $\phi = -0.09$). Analysis shows no significant differences between men and women regarding a relation between deletion decision and specific criteria for notability. In those cases where specific criteria for notability are not only available but also explicitly addressed in the discussion, women and men are similarly often considered not notable and deleted (57.4%).

Hierarchies between users

Analysis of the (elected) administrators who decide the deletion discussions, the deletion nominators (potentially anyone), and the users participating in the discussions shed light on formal and informal hierarchies between them (RQ3). There is a total of (only) 35 administrators in the sample who are responsible for 362 decisions. The activity level follows the typical heavy-tailed distribution, with the top four administrators making more than half the decisions ($N = 191$), and the one most active administrator making 57 (15.75%) decisions alone. Among the eight most active administrators (each with more than 10 decisions in the sample), none was found to have an obvious bias toward women or men, but rather toward deleting or keeping in general. Numbers show that the administrators' decisions to delete or to keep biographies are in 86.7% of cases in accordance with the majority position, that is, the position most users favor, or when positions are in balance; only in 13.3% of discussions, administrators decide against the majority of users (for both keeping and deleting). There is no difference between discussions about women and men in this regard.

Regarding users who nominated an article for deletion, there were 158 logged-in users and 61 anonymous IP addresses responsible for 457 deletion nominations in the sample. Their activity also follows the heavy-tailed distribution: 67.7% of logged-in users nominated only one article for deletion, while the one most active nominator suggested 77

biographies in the sample. Together, the eight most active nominators suggested women's and men's biographies in equal shares in the sample. Again, none was found to have an obvious bias toward women or men. The same is true for the anonymous deletion requests, though it is not possible to discern the number of actual users behind the IP addresses.

A total of 608 unique logged-in users participated in 461 discussions, again showing the typical heavy-tailed distribution of activity: 66.0% of the users contributed only to one discussion each, while the one most active user participated in 115 discussions (Supplementary Material, Figure III, IV, V). The 11 most active users (each participating in 50 or more discussions in the sample) significantly differ in their positions from the rest of the users: they position themselves more often for the deletion of a biography than the other users, and less often for keeping an article ($\chi^2(2) = 29.837, p < 0.001, \phi = 0.11$). Neither for the most active users nor for the other users was any relation between positions and a biography's gender found, though. Only one highly active user, whose user page and name indicate is a woman, was almost only involved in discussions about women, where she advocated more often for a deletion than for keeping.

Gender-related aspects in deletion discussions

Gender related aspects were discussed in the deletion discussions, too ($N = 37$). It was almost only discussions about *women's* biographies where gender-related aspects were brought forward. Encouragingly, sexist language and gender-based devaluations are rather scarce, and most of the time are countered by other users who are calling this language out. In particular, reality TV personalities seem to be affected by sexism, which necessitates an intersectional understanding of discrimination with other categories of difference besides gender, such as class.

Besides occasional specific topics, a recurring controversial issue found in the sample was Wikipedia's gender gap itself. The encyclopedia's gender gap was mentioned and debated several times, ranging from single comments such as "I find that something should be done about the **gender gap**, and that is what I am doing here by pleading for **keeping** [...]" (original emphasis, translated by author), to longer discussions that often move away from the person in question but become debates of principles. The following example is taken from a discussion about a Swiss female politician. It shows the variety of opinions on the topic and how easily a debate can get heated:

[User 1:] It is a pity that among the local politicians of Aargau [a Swiss Canton], only 8 out of 88 entries are women. Wikipedia also has a responsibility not to reproduce inequality. [...]

[User 2:] Does being a woman make relevant now? Something must have passed me by. Delete! [...]

[User 3:] "Wikipedia also has a responsibility not to reproduce inequality" is the funniest argument for an article I've ever read. And I've been doing this stuff for a while, after all. **Delete.** [...]

[User 4:] Yes, in fact in practice the opposite is true—we reproduce what's out there. No matter how unfair it may be. [...]

[User 2:] Unfair? Equal rights also apply in Switzerland. Maybe there are just too few representatives of femininity politically engaged? It's not up to Wikipedia. [...] (original emphasis, translated by author)

One line of conflict arises between the first and the fourth user, who fundamentally disagree about the question whether the Wikipedia has a responsibility to challenge societal gender inequalities, or whether bias is unavoidable. The second user on the other hand expresses their opinion that gender inequality is not a matter of injustice and therefore no problem after all, since women have equal rights; it is up to them to balance any bias by getting involved in politics. However, in this and other discussions, there seems to be a consensus that "gender does not constitute notability," which can only be challenged by the argument that a woman is the first woman to do something. Being a pioneer is often seen as a unique achievement and therefore fits into Wikipedia's logic of valuing accomplishments. The repeated reassurance that gender does not constitute notability by a few self-assigned guards can be interpreted as them signaling neutrality to preserve Wikipedia's reputation, while missing that the very notion of "notability" is not gender-neutral and value-free in the first place.

Discussion

This study's aim was to give an empirical basis for the ongoing scholarly and public debates about Wikipedia's gender gap and its deletion practices by quantitatively investigating gender differences in deletion discussions. When compared to the number of new biographies created every day in the German-language Wikipedia, article deletions occur proportionately rarely (1,626 deleted vs. 50,664 created and not deleted biographies in 2020) and do not seem to directly further the gender gap regarding numbers of biographies because the rates of women's biographies among deleted articles and women's biographies among newly created articles are similar (23.9% and 21.5%).

Deletion nominations and discussions display another layer of Wikipedia's gender gap in itself, though, since there are significant differences between the genders. The most important findings of this study are that women's biographies are questioned more often but not deleted more often compared to men's biographies; additionally, women's biographies are discussed longer and more controversially (Gauthier and Sawchuk 2017). That there is greater opposition to women's biographies also means that those users trying to defend them need to put in more work and effort. In relation to the numbers of newly created biographies, women's biographies might only be slightly overrepresented in deletion nominations (21.5% vs. 26.3%); however, proportionately, debates about women are much longer and take up more space.

Based on this insight, it stands to reason to ask about possible effects: users participating in the discussions might get the impression that women's biographies come off better without realizing they were more often and/or unjustly nominated in the first place. There are first signs that this situation might have triggered a backlash: biographies about women that were kept after discussions have relatively more users opposing the decision compared to the male counterpart.

Prior research points to the importance of external verification, with a lack thereof especially affecting women's biographies. This study shows that poor external validation is often brought forward as an argument for deleting an entry, which actually does more

often affect women than men. However, content analysis also shows that women's biographies nominated for deletion and kept after discussions are even slightly better sourced than men's entries in terms of numbers of sources. Only in-depth, qualitative analyses can reveal to what extent these findings result from qualitative differences in sources or rather from biased perceptions and higher thresholds that users might apply to women's entries. It is a limitation to this study that only kept biographies could be gathered for the analysis of sources and references.

Specific criteria of notability could be shown to play an important role in the discussions, too, but quantitatively, no differences between men and women were found. Previous studies focusing only on academics for example, could not answer this question. I assumed that women's notability is more often called into question and discussed due to a lack of hard criteria, facilitating more subjective decisions. But it has not been confirmed that women's biographies more often fall victim to a lack of specific criteria. Future studies should therefore qualitatively investigate whether specific criteria are interpreted differently in terms of strictness by a biography's gender in the German-language Wikipedia. The higher opposition to women's biographies point in this direction.

The few, most active users and administrators seem to drive deletions for both women and men. Surprisingly, administrators decide only rarely against the majority's position. This cautiously suggests that (new) users do have an influence on administrators' decisions—at least if they can form a majority. It is a limitation to this study that it was not possible to retrieve the users' gender. However, it shows that deletion discussions are less targeted by single misogynistic users or trolls campaigning against women than on other platforms (Debbie Ging and Eugenia Siapera 2018). It is presumably also due to those users who actively counter sexist language and gender-based devaluation—which again, requires work and effort—that discussions overall are civil and that overt sexism is relatively rare in deletion discussions (Laniado et al. 2012).

The digital, networked and circular character of Wikipedia's knowledge order appears double-edged: on the one hand, it opens possibilities for feminist initiatives to introduce new users and interests, and to challenge established practices. On the other hand, the open editing processes result in an increased surveillance and questioning of women's biographies that later prove notable according to Wikipedia's rules. This study indicates that this questioning of women's notability is the result of collective behaviour rather than single misogynists and is deeply entwined with certain beliefs about what knowledge is valuable and worthy. Jimmy Wales might have been wrong when he said the Wikipedia community does not believe that women are less important after all. While the *creation* of women's biographies might be constrained by a lack of editors interested in writing about women, as well Wikipedia's epistemic principle, such as sources for external validation and criteria for notability, gender inequalities in *deletion nominations* seem to stem from other sources, probably biased perceptions and higher thresholds unconsciously applied by users when assessing women's notability (C. Wagner et al. 2016). For feminist initiatives attempting to balance the gender gap in biographies, these findings underline the importance to (a) continue to defend women's biographies in the short term; and (b), in the long term, to dismantle the community's beliefs that rational discourse, standardized procedures and factual (true) knowledge results in value-free, "objective" and gender-neutral knowledge. In other words, the principles of notability are inscribed with values that narrow the corridor of what knowledge is produced in the first place. But even when meeting the principles, women's biographies are more often

challenged, probably because users perceive them stereotypically more difficult to associate with the inscribed values of achievement, public recognition and attention. Neither hierarchies between users and administrator nor individual hyperactive users are causing the gender differences in deletion nominations and discussions. Instead, it appears that most users are slightly more likely to occasionally doubt the notability of women than men.

Notes

1. In the German-language Wikipedia, Strickland's article was created for the first time after the Nobel Prize was announced (https://de.wikipedia.org/wiki/Diskussion:Donna_Strickland, last accessed October 17, 2022).
2. <https://de.wikipedia.org/wiki/Portal:Biografien>, Status as of April 1, 2022.
3. <https://www.spiegel.de/netzwelt/web/wikipedia-gruender-jimmy-wales-sind-wir-einladend-genug-a-1294830.html>, last accessed September 20, 2022.
4. <https://en.wikipedia.org/wiki/Wikipedia:Notability>, last accessed September 20, 2022.
5. Specific criteria exist for aristocrats; architects; authors; artists, including visual arts, performing arts, and pornography; journalists; chefs; musicians; politicians; spacemen; personalities in the area of religion; soldiers; sportsmen including e-sports, martial arts, climbers, boxers, cyclists, chess players, coaches, and winter sportsmen; and scientists. ("Wikipedia: Relevanzkriterien" 2022).
6. Based on <https://de.wikipedia.org/wiki/Kategorie:Klimaschutzaktivist> and [https://de.wikipedia.org/wiki/Kategorie:Person_\(Fridays_for_Future\)](https://de.wikipedia.org/wiki/Kategorie:Person_(Fridays_for_Future)), last accessed June 13, 2023.
7. <https://de.wikipedia.org/wiki/Wikipedia:L%C3%B6schregeln>, last accessed June 13, 2023.
8. https://de.wikipedia.org/wiki/Wikipedia:Neutraler_Standpunkt, last accessed June 13, 2023.
9. e.g., new articles must not be nominated for deletion within the first hour; articles nominated for deletion must be flagged to draw the attention of other editors to the discussion page; discussions must be open for seven days; only administrators can make a decision.
10. e.g., https://en.wikipedia.org/wiki/Women_in_Red, last accessed June 13, 2023.
11. For practical research reasons, only positions and levels of justification for the first 10 users in a discussion were coded. Results show that in a majority of discussions (88.1%) only 10 or fewer users are involved.
12. I discriminated between regular decisions, speedy keep decisions, and speedy delete decisions. Speedy delete decisions were not included in the sample since discussions often do not provide enough content to make meaningful analyses.
13. Status as of April 15, 2022; Supplementary Material, Figure II.
14. $N = 194$, Mann-Whitney-U-Test ($U = 4334.00$, $Z = -1.035$, $p = 0.301$).
15. Only discussions in which at least one occupation or activity is named ($N = 450$); Supplementary Material, Table III.

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