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<https://doi.org/10.1057/s41599-025-04841-9>

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# Is issue voting solely based on issues? Latent factors of political ideology in response patterns of voting advice applications

Merlin Monzel<sup>1,3</sup> , Thomas Grünhage<sup>1,3</sup> & Martin Reuter<sup>1,2</sup>

In recent years, an increase in issue voting has been observed, which is further facilitated by voting advice applications (VAAs) that inform users about the structure of the political contest in terms of their own preferences. Nevertheless, some response patterns seem to occur more frequently in VAAs than others, which could indicate ideological influences. To investigate this, we aggregated  $N = 5963$  datasets of the German VAA *Wahl-O-Mat* (WoM) from three consecutive legislature periods and extracted latent factors using multiple correspondence analysis. Results show that the latent factors across all legislature periods were highly associated with dispositional traits related to political ideology, i.e., right-wing authoritarianism, social-dominance orientation, and moral foundations. In addition, the validity of the latent factors was demonstrated intertemporally, at the voter group level and at the content level, suggesting that political ideology even plays a role in issue voting. Importantly, the underlying ideological structure was more predictive for voting decisions than individual issue stances. We discuss the risks of this observation for democratic systems since predefined sets of political opinions might narrow the political debate, ultimately leading to greater polarization and disenchantment with politics.

<sup>1</sup>Department of Psychology, University of Bonn, Bonn, Germany. <sup>2</sup>Center for Economics and Neuroscience (CENS), Laboratory of Neurogenetics, University of Bonn, Bonn, Germany. <sup>3</sup>These authors contributed equally: Merlin Monzel, Thomas Grünhage. ✉email: [merlin.monzel@uni-bonn-diff.de](mailto:merlin.monzel@uni-bonn-diff.de)

## Introduction

Investigating the dispositions for and consequences of ideological beliefs is a core area of research in political psychology. By now, reality has undoubtedly overruled optimistic notions of an ‘end of ideology’ (Jost, 2006), which had allegedly led to non-ideological policies, often referred to as ‘the third way’ (Taylor, 1999). The increasing polarization in WEIRD (western, educated, industrialized, rich, and democratic) political systems indicates that ideological beliefs are still factors that differentiate and potentially divide people (Iyengar & Westwood, 2015; McCright & Dunlap, 2011; Nisbet et al., 2015). This is particularly puzzling given that a rise in issue voting, that is, voting based on issues as opposed to ideology or party affiliations (Denver & Hands, 1990), was promoted at the end of the 20th century (e.g., Franklin, 1985; Himmelweit et al., 1981; Särilvik & Crewe, 1983). Accordingly, political science identified trends towards political dealignment (i.e., abandonment of previous party affiliations) and an increase of floating voters throughout Europe (Dalton & Wattenberg, 2002). Prior to this, it was assumed that voters had not enough political knowledge to perform issue voting (Converse, 1964), rendering them ‘cognitive misers’ who base their voting decision on only a few salient topics (Krosnick, 1990; Schultze, 2014). However, the spread of mass media made it easier for voters to inform themselves about political issues and the positions of political parties, enabling them to perform issue voting. In more recent years, voting advice applications (VAAs) have been introduced, which facilitate this process by automatically matching voters’ individual issue stances with the positions of multiple parties (Garzia & Marschall, 2016). For example, the German Wahl-O-Mat (WoM) provides a percentual score of concordance, according to which the parties are ranked to inform the user about their most suitable voting choice. The aim of the present study is to investigate whether the response patterns of the VAAs are unsystematic or not and whether underlying factors are based on ideological convictions that could harbor risks for independent opinion-forming and thereby foster democratic decline. In other words: Am I ‘allowed’ to support pro-refugee policies and be against certain gender policies at the same time?

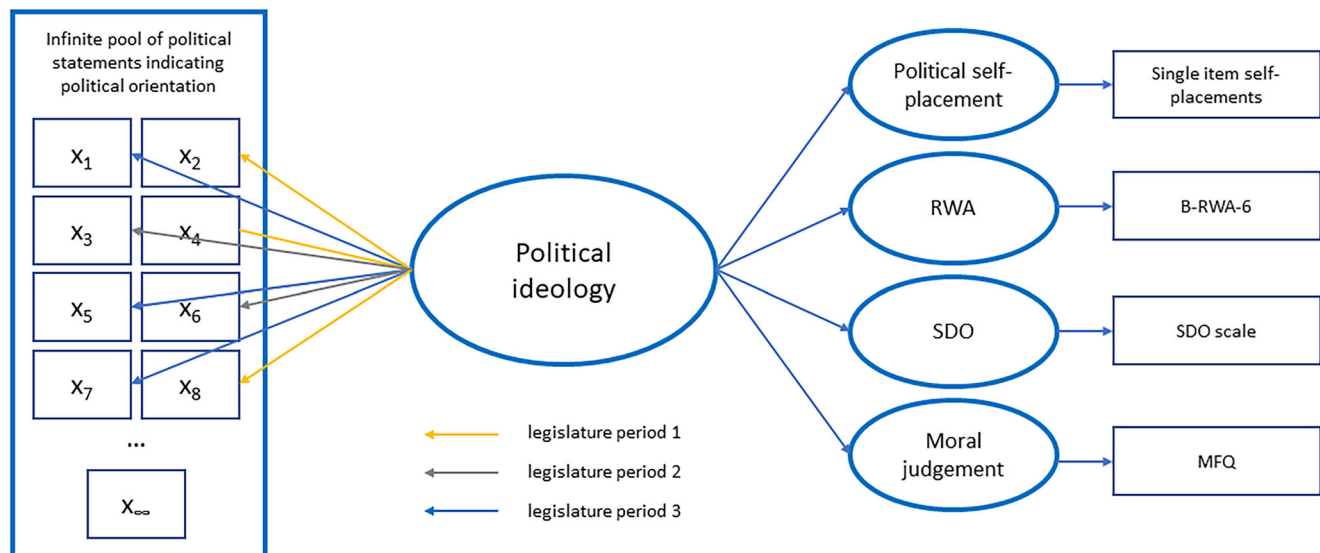
**Voting advice applications.** VAAs are often provided by national agencies or non-profit organizations and social enterprises to help voters find a political candidate or party that most closely matches their political views. They aim to measure a person’s level of agreement with a set of political statements, which are then compared with the views of candidates or parties in a particular election campaign (van der Linden & Vowles, 2017). The major difference to other sources of information on political actor’s policy stances lies in the customization of political information; that is, VAAs inform the users about the structure of the political competition in light of their own preferences (Garzia et al., 2017). In most cases, results are presented in the form of a ranked list of parties or by placing both the parties and the user in a dimensional space (Gemenis & Rosema, 2014). This is intended to advise the user on a potential voting decision.

Starting with a paper-pencil-version of the Dutch ‘StemWijzer’ in 1989, usage of VAAs steadily increased, reaching proportions of 10–40% in countries with a relatively long VAA history, such as the Netherlands, Belgium, and Germany (Marschall, 2014). Garzia et al. (2017) report a universal upward trend in the proportion of VAA users across several countries, and VAAs have long spread beyond Europe, now being deployed in North and South America, Africa, and the Middle East, Oceania, and Asia (Garzia & Marschall, 2019). VAAs are thus a powerful tool for enabling voters to make informed decisions in democratic

systems, and they are likely to become even more important in the future due to the increasing number of digital services (e.g., smartphone apps).

**The German Wahl-O-Mat.** The German Wahl-O-Mat is an example of a web-based VAA offered by the Federal Agency for Civic Education (Bpb) in Germany and belongs to the most prominent examples of VAAs in the literature. Initially constructed in 2002, it is consistently updated before elections on the state, federal, or European level. The instrument nowadays consists of short and clear statements, chosen and formulated by an invited council comprised of first- and second-time voters, political scientists, statisticians, additional experts, as well as representatives of the bpb. The initial statement selection is based on party manifestos and election programs. After the initially formulated statements (usually 80–100) are answered by the German parties, 38 are selected based on how salient the respective issue is in the given campaign, how controversially it is answered by the parties, how distinctive it is, and to what extent all important domains are covered. Exemplary statements of the most recent national version are: ‘Asylum should continue to be granted only to politically persecuted persons.’ or ‘The statutory minimum wage is to be increased to at least 12 euros by 2022 at the latest.’ (bpb, 2021; see Supplemental Material for the full list). Concordance between individual issue stances and party views is coded following the city-block method (Garzia & Marschall, 2012): Parties and participants can indicate *agree*, *disagree*, or *neutral* for each of the 38 statements. If the participant agrees with a statement and the party disagrees, proximity is minimum (zero points). If the participant and party share the same opinion, proximity is maximum (two points). If one of them is neutral and the other either agrees or disagrees, one point is given. Participants (but not parties) have the opportunity to skip certain statements and to indicate which statements are especially important to them. For the latter, points are doubled. For every participant, the number of concordance points with each party is calculated, divided by the maximum possible number, given individual skips and weightings, and multiplied by 100, resulting in a percentual score of concordance, according to which the parties are ranked in the final results to inform the user about their most suitable voting choice.

**Extracting latent factors from the WoM.** It is surprising that VAAs are seldom used in political psychology, as virtually all psychological theories of ideological differences from Adorno’s ‘Authoritarian Personality’ to recent evolutionary informed approaches (Claessens et al., 2020) focus on substantive policy preferences. Hence VAAs’ preclusion of additional factors relevant to vote choice other than political views (e.g., candidate attractiveness, party size, or evaluations of performance in past incumbencies; Israel et al., 2017; van der Linden & Vowles, 2017; Wagner & Ruusuvirta, 2012) is rather advantageous. Accordingly, symbolic motivations (e.g., being reluctant to call oneself ‘liberal’ or ‘a right-winger’) do not bias VAA-derived measures as much as self-placements. Thus, a latent factor underlying the response patterns in a VAA most likely reflects the influence of ideology on issue stances and not on the overall self-perceived political identity, which also includes factors that are excluded by VAAs, such as party identification. Moreover, unlike other policy-based instruments that often include hot-button issues, VAAs are constructed by a diverse team of stakeholders independent of potential research questions, making them less susceptible to bias in the selection of statements, yet they are updated regularly. In addition, the consistent internal structure of different VAA versions makes it easier to compare the results from different electoral periods.



**Fig. 1** Conceptual model showing that different political statements (e.g., from different legislature periods or even different VAAs) originate from the same infinite pool of political statements (left), which are indicative of the same latent factor of political ideology that is, in turn, predictive for political self-placement, RWA, SDO, and moral judgment (right). Residual variables were omitted from the model for simplicity.

Notwithstanding the potential of VAAs, we know of only a few studies incorporating VAA measures, but those few yielded promising results (Grünhage and Reuter, 2020a; 2020b; 2021). However, in contrast to these former studies, here we follow a different approach: instead of replicating the original WoM algorithm and using the agreement scores, we utilize ex-post dimensionality reduction by applying multiple correspondence analysis (MCA). MCA resembles factor analysis but accepts categorical data (e.g., allowing us to differentiate between neutral positions and skips) and, therefore, enables us to extract latent factors from the categorical answer patterns of the WoM. Moreover, while our study focuses on the WoM, the procedure is easily replicable for other policy-based VAAs. As a proof of concept, we included three versions of the German WoM from different legislature periods in our analyses which all include different political statements. However, since all these statements originate from the same infinite item pool, all latent factors extracted from these three versions measure the same underlying construct (see Fig. 1: left). Demonstrating temporal stability between the latent factors will enable us to potentially generalize our findings to future versions of the WoM.

*H1: The answer patterns of all three versions of the WoM can be used to extract reliable latent factors that are significantly associated with each other (validation at the temporal level).*

Importantly, frequent response patterns in the WoM cannot be driven by individual values as these would only lead to consistency in the responses within the same individual (e.g., supporting pro-refugee policies and pro-LGBTQ policies due to humanistic values) but not to consistent response patterns between individuals (e.g., many people showing the aforementioned pattern). Ideology, on the other hand, is broader and also effective on the societal level and would thus lead to similar response patterns between individuals. Nevertheless, it is necessary to examine the factors obtained with regard to external criteria of political ideology. To validate them, we will report their associations to political self-placements, voting intention, and, crucially, measures of constructs central to prominent psychological theories of political ideology (see Fig. 1: right). In particular, we refer to the Dual-Process-Model of Ideology (DPM; Duckitt & Sibley, 2010) and the Moral Foundations Theory (MFT; Haidt & Joseph, 2004). Elaborating on these frameworks would be beyond the scope of this article (see, for example, Duckitt & Sibley, 2010a; Graham et al., 2009; Grünhage & Reuter, 2020a, 2021b), but, in a

nutshell, the DPM posits that political ideology can be traced back to two persistent motivational goals, namely *Right-Wing-Authoritarianism* (RWA) and *Social-Dominance-Orientation* (SDO), which are driven by views of the world as a dangerous place or a competitive jungle, respectively. People scoring high on RWA can be characterized as sticking to tradition, being obedient and submissive to authorities, and being aggressive towards elements threatening the established order. SDO refers to whether one prefers intergroup relationships to be more hierarchical or more equal. Moral Foundations Theory (MFT) posits five psychological systems, entailing specific emotional reactions that evolved as adaptations to specific evolutionary problems. Haidt and Joseph (2004) describe those as an innate preparedness to construe and respond to the social world in a particular way (i.e., connecting social evaluations with emotional and motivational reactions). In particular, the five foundations are called Harm, Fairness, Loyalty, Authority, and Purity. Whereas harm and fairness are referred to as *individualizing* foundations because of their emphasis on individual rights, the last three foundations are referred to as *binding* foundations serving group cohesion (Graham et al., 2009). Political conservatives or right-wingers were shown to endorse RWA, SDO, and binding relative to individualizing foundations more strongly in numerous studies (e.g., Grünhage & Reuter, 2020; Koleva, Graham, Iyer, Ditto, & Haidt, 2012).

*H2: The extracted latent factors of the WoM are significantly associated with SDO, RWA, moral judgment, and political self-placement (validation at the individual level).*

*H3: The extracted latent factors of the WoM can significantly differentiate between voter groups of the most common German political parties (validation at the group level).*

Overall, extracting and validating latent factors from the response patterns of the WoM not only contributes to the development of new measures for the investigation of new research questions, such as the significance of issue voting, but also contributes to the assessment of the validity of VAAs.

**Consequences of latent factors of political ideology underlying issue voting.** According to issue voting, citizens vote in favor of the party that most closely matches their individual goals and

**Table 1 Relative frequency (in %) of votes per party in the samples of the WoM-2013, WoM-2017, and WoM-2021 compared with the actual voter turnout in the corresponding federal elections.**

Party	WoM-2013	2013 federal election	WoM-2017	2017 federal election	WoM-2021	2021 federal election
Die Linke <sup>- -</sup>	15.1	8.6	15.9	9.2	8.3	4.9
Bündnis 90/Die Grünen <sup>-</sup>	19.9	6.4	36.7	8.9	45.0	14.8
SPD <sup>-</sup>	14.3	25.7	9.0	20.5	9.6	25.7
CDU/CSU <sup>+</sup>	15.9	41.5	10.9	32.9	11.4	24.1
FDP <sup>++</sup>	12.7	4.8	8.7	10.7	4.4	11.5
AfD <sup>+++</sup>	5.1	4.7	3.9	12.6	3.5	10.3
Others	6.2	2.8	6.2	5.0	10.9	3.4
No voter turnout	10.8		8.7		7.0	

Excluding missing data. '+' and '-' indicators indicate a more right- vs. left-wing position in Germany's political spectrum.

opinions. Consequently, their opinions should not be influenced by ideological factors, and thus, no latent factor of political ideology should be found in the response patterns of the WoM. In 1990, Denver and Hands argued for a rise in issue voting based on their findings that an 'issue index' explained more variance in voting decisions than a 'principle index', which was meant to represent ideological principles. However, looking at the items constituting the issue index, it becomes clear that even the issue index is based on an underlying ideological system. For example, the item 'Too much attention is paid to the demands of ethnic minorities in Britain' is most likely driven by SDO as it taps into the hierarchical structures of society. In the same vein, the item 'Britain should change its electoral system to ensure fairer representation in Parliament for all parties' is most likely driven by low scores in RWA as it taps into societal change. Thus, it can be argued that the conclusion of Denver and Hands was faulty since even the issue index contained ideological variance (this is also reflected in the fact that they extracted a principles factor from those same items without using external criteria for political ideology to validate it). Coming back to the WoM, if we can find a latent factor of political ideology in its response patterns, this suggests that there are underlying needs and ideologies that ensure that certain questions are systematically answered in agreement with each other (e.g., supporting pro-refugee policies and gender policies at the same time), which would reject the assumption of Denver and Hands that responses to political issues can be interpreted as a sole index of issue voting. Instead, ideological influences have first to be partialized out of such an issue index, before issue voting and ideological voting can be compared. This leads to our last hypothesis:

*H4: After partializing ideological influences out of the extracted latent factors of the WoM, the remaining variance does not explain more variance in the voting decision than the ideological factors themselves.*

Importantly, such an underlying factor of political ideology harbors a number of risks for independent opinion-forming: first, the observed systematically combined agreement with two (or more) political issues could exert pressure to conform, intentionally or unintentionally, on people who do only agree with one of these positions, originating from the need to maintain a consistent social identity (Devine, 2015). Making things worse, according to Jost et al. (2006), such a 'superstructure' that groups substantially independent issues is expected to trace back to elite influence. For example, working-class voters may be deprived of their ability to follow their well-understood interests for the sake of being consistent. Historically, the motivation to identify as conservative was partly to separate oneself from the social movements in the 1960s (Ellis & Stimson, 2012), fitting Johnston's (2018) idea of gravitating to parties sharing one's

cultural attitudes. In the German context, similar distortions are conceivable as there seems to be a mutual tendency to classify the political opponent and the proponents of 'their' issues as populist, extremist, or even terrorist (Butterwegge, 2009). However, adapting to certain positions just to maintain a consistent social identity leads to a narrowing of the political debate, as people can supposedly only hold opinions that correspond to their own political environment. This condemns the political camps to further polarization, which ultimately erodes social cohesion. Importantly, however, the same risk would not be expected when individual values align with some political positions, as individual values are less broad than ideologies and thus less likely to align the same issues for a majority of voters, leading to individual and not societal response patterns. Second, an ideologically shaped political landscape can lead to disenchantment with politics among people who do not bow to the above-mentioned pressure to conform, as people who agree with only one of these positions but reject the other cannot identify with any political camp. Ultimately, this could lead to voters not using their right to vote, as evident in the decline in voter turnout in German federal elections since 1972, which coincides with the supposed increase in issue voting.

## Methods

**Participants.** Participants were recruited via online and offline advertisements, predominantly via mailing lists and diverse theme-oriented or local web forums. To reach a field of political opinion as broad as possible, political interest groups were directly contacted. Data for the WoM-2013 was collected between 2013 and 2017, data for the WoM-2017 between 2017 and 2021, and data for the WoM-2021 between 2021 and 2023. The WoM-2013 sample consisted of 371 participants, the WoM-2017 sample of 5363 participants, and the WoM-2021 sample of 229 participants. Overall, the samples included 57.8% females (41.5% males, 0.6% others) and were, on average, 32.80 years old ( $SD = 15.60$ ). Most of the respondents had achieved a university degree (37.5%), followed by A level (33.0%) and secondary school certificates (11.7%). 5.9% had an advanced technical college entrance qualification and 10.0% a degree from an advanced technical college. A breakdown of the individual samples can be found in the Supplemental Material. Table 1 shows the distribution of voter groups compared with the actual turnout in the corresponding federal elections.

## Measures

*Wahl-O-Mat 2013, Wahl-O-Mat 2017, and Wahl-O-Mat 2021.* Participants rated their support for 38 political statements by clicking 'agree', 'disagree', or 'neutral'. Also, they were allowed to



**Table 2 Convergent correlations of the WoM latent factor scores with political self-placement, RWA, SDO, and moral judgment.**

Scale	WoM-2013			WoM-2017			WoM-2021		
	<i>r</i>	<i>p</i>	<i>n</i>	<i>r</i>	<i>p</i>	<i>n</i>	<i>r</i>	<i>p</i>	<i>n</i>
SP_LR	0.69	<0.001	371	0.66	<0.001	4262	0.33	<0.001	229
SP_LC	0.47	<0.001	371	0.49	<0.001	4262	0.30	<0.001	229
RWA	0.54	<0.001	371	0.57	<0.001	3610	0.37	<0.001	229
SDO	0.63	<0.001	371	0.62	<0.001	3610	0.48	<0.001	229
Care				−0.25	<0.001	2437			
Fairness				−0.43	<0.001	2437			
Loyalty				0.38	<0.001	2437			
Authority				0.45	<0.001	2437			
Purity				0.26	<0.001	2437			
Progress				−0.59	<0.001	2437			

Moral foundations were only assessed for the WoM-2017 samples. SP\_LR = self-placement left-right. SP\_LC = self-placement liberal-conservative.

skip certain statements. As in the original WoM, participants were able to indicate which issues were especially important to them. A full list of items can be found in the Supplemental Material. To be as faithful to the WoM as possible, the statement order was the same as in the online application. Thus, the effects of statement order cannot be excluded, although the heterogeneous statements and the categorical response format leave little room for response biases. Other than in the original WoM, participants were not presented with a results screen, and they were not informed about answering a VAA. Instead, the instrument was described as a measure of societal attitudes.

**Self-placements and voting intention.** Participants were asked to indicate their political ideology on two seven-point Likert-scales ranging from 'left' to 'right' and from 'liberal' to 'conservative'. Additionally, participants were asked which party they would vote for if the next federal election was held next Sunday.

**Moral Foundations Questionnaire.** Participants answered the *Moral Foundations Questionnaire* (MFQ) by Graham et al. (2011) in its German translation (Jockel et al., 2010). The MFQ consists of two subscales, which are called *relevance scale* and *judgment scale*. The relevance scale assesses explicit assumptions about what is morally relevant ('When you decide whether something is right or wrong, to what extent are the following considerations relevant to your thinking?'). Examples of the 15 items (three per foundation) are 'Whether or not someone showed a lack of respect for authority' (authority) or 'Whether or not someone was denied his or her rights' (fairness). Items were to be answered on a six-point Likert-scale ('not at all relevant' to 'extremely relevant'). The judgment scale also encompasses 15 items (three per foundation) to assess, which foundations are relied on intuitively. Here, items take the form of short statements, which participants are asked to judge on a six-point Likert-scale ('strongly disagree' to 'strongly agree'). Exemplary items are 'It is more important to be a team player than to express oneself' (loyalty) or 'It can never be right to kill a human being' (harm). Within the subscales, items were presented in a randomized order.

**RWA and SDO.** RWA was assessed using the *Balanced Short Scale of Authoritarian Attitudes* (B-RWA-6; Aichholzer & Zeglövit, 2015), which consists of 6 items. Participants had to indicate their support for the 6 statements on a five-point Likert-scale ('not true at all' to 'very true'). An example item is 'We should be grateful for leaders, that tell us exactly what we shall do and how.' SDO was assessed by the original SDO scale (Pratto et al., 1994). As in the B-RWA-6, half of the 14 items were reversed. Participants had to indicate their support for the 14 statements on a seven-point

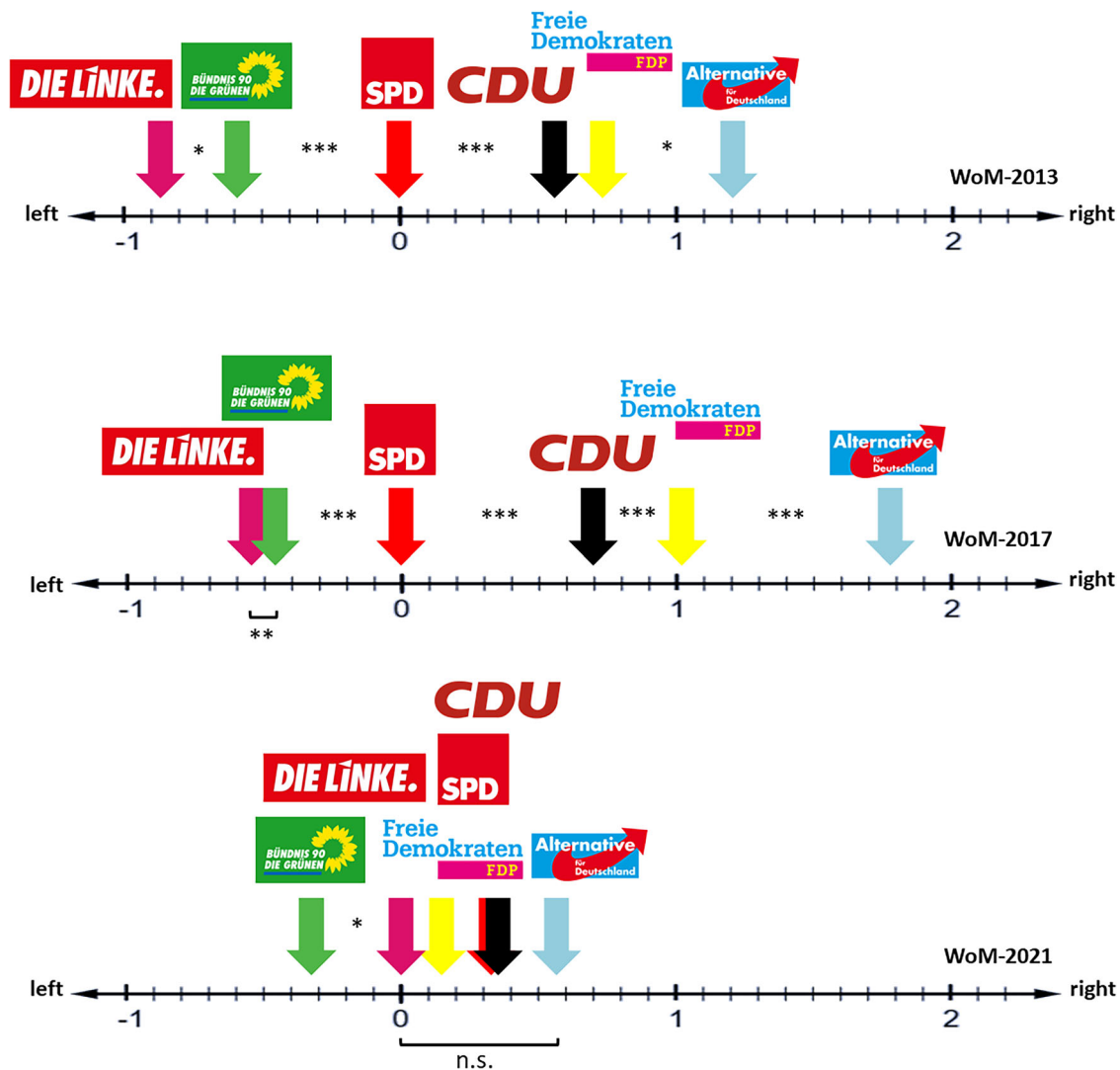
Likert-scale ('very negative' to 'very positive'). An example item is 'Some groups of people are simply inferior to other groups'.

**Procedure.** All measures were computerized and assessed online via the Questback unipark infrastructure ([www.unipark.com](http://www.unipark.com)). Since the data from several WoM surveys were combined, all participants have completed at least one WoM, but only subsamples have completed the other measures of political ideology or more than one WoM. The sample size for each individual validation analysis is reported in connection with the results (see Table 2). In addition to the measures above, demographic data was obtained consisting of age, gender and education. The order of the measures varied depending on the original study.

**Data analyses.** Since the number of extracted factors has to be determined a priori in multiple correspondence analyses, we opted for a single-factor model to examine a general factor of political ideology. In order to consider the double weightings of political statements, since participants were able to indicate which topics were especially important to them, the WoM items were coded as 1 = agreement, 2 = neutral, 3 = refusal, 4 = not specified, 5 = double weighted agreement, 6 = double weighted neutral, 7 = double weighted refusal and 8 = double weighted not specified. This was done since the real WoM also allows for double weightings, leading to more diverse answer patterns that provide additional information for the MCA.<sup>1</sup> To examine the latent factors' validity, convergent correlations with political self-placement ('left' vs. 'right' and 'liberal' vs. 'conservative'), RWA, SDO, and MFQ subscales were calculated. In addition, temporal stability was assessed via correlations between the factor scores from different legislature periods, and voter groups were examined for their factor scores by means of *t*-tests. Next, inter-correlations of the transformed WoM statements were explored in order to uncover the nature of systematic associations, and the robustness of the latent factors of the WoM was examined in subsamples with differing levels of education and in quota samples reflecting the actual voting turnout in the corresponding federal elections more closely. Last, we used multinomial logistic regression models to investigate whether RWA and SDO explained more variance in the individual voting decision (principle voting) than the latent factors of the WoM after partializing out RWA and SDO (issue voting).

## Results

**Extracting latent factors of political ideology.** The single latent factors of political ideology extracted via MCA explained 16.7% of the variance in the WoM-2013 with a Cronbach's Alpha of 0.87,



**Fig. 2** Factor scores of the latent factors of political ideology for each voter group in the WoM-2013, WoM-2017, and WoM-2021 sample. \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ , n.s. = not significant.

21.2% of the variance in the WoM-2017 with a Cronbach's Alpha of 0.90, and 24.9% of the variance in the WoM-2021 with a Cronbach's Alpha of 0.92. Convergent correlations with other measures of political ideology, such as political self-placement, SDO, RWA, and moral judgment are depicted in Table 2. All correlations were significant in the expected directions. Regarding temporal stability, 85 participants could be identified who had participated in WoM-2013 and WoM-2017 studies, showing a correlation between the latent factors of the political ideology of  $r(83) = 0.64$ ,  $p < 0.001$ . In addition, 10 participants could be identified who had participated in WoM-2017 and WoM-2021 studies, showing a correlation of  $r(8) = 0.56$ ,  $p = 0.098$ . In further analyses, we found that social and economic statements were equally discriminative for the latent factors of political ideology. For further information, see Supplemental Material.

The results of the voter group analyses are depicted in Fig. 2. While the positioning of the voter groups in the WoM-2013 and the WoM-2017 was relatively widely dispersed, the voter groups moved closer together in WoM-2021, resulting in a large cluster not differing significantly. However, as expected, voters of the most left-wing parties 'Die Linke' and 'Bündnis 90/Die Grünen' reached the lowest scores and voters of the most right-wing party 'AfD' reached the highest scores. In the WoM-2021, 'Die Linke'

and 'Bündnis 90/Die Grünen' swapped places, and 'FPD' moved further to the left.

The discrimination measures for the ten most and least discriminatory statements of each WoM are depicted in Table 3. High values indicate that these statements discriminated most strongly between two ideological camps (e.g., left and right). Importantly, these were also the statements that clustered most strongly with other items. For instance, the maximum inter-correlation for the WoM-2013 was between the statements 'I support intake of numerous refugees into the concerned state' and 'In my opinion, the state should increasingly hire people with migratory background for public service' ( $r = 0.57$ ); the maximum inter-correlation for the WoM-2017 was between the statements 'An annual upper limit should apply to the admission of new asylum seekers' and 'Child benefit should only be paid to German families' ( $r = 0.51$ ); and the maximum inter-correlation for the WoM-2021 was between the statements 'Federal authorities are to take linguistic account of different gender identities in their publications' and 'The Baltic Sea pipeline "Nord Stream 2", which transports gas from Russia to Germany, is to be allowed to go into operation as planned [reversed]' ( $r = 0.78$ ). The mean inter-correlation between the transformed statements was  $M = 0.13$  ( $SD = 0.11$ ) in the WoM-2013,  $M = 0.18$

**Table 3 Discrimination measures of the ten most and least discriminatory items of the latent factors of political ideology in the WoM-2013, WoM-2017, and WoM-2021.**

Rank	WoM-2013		WoM-2017		WoM-2021	
	Item (#)	DM	Item (#)	DM	Item (#)	DM
1	More migration background in the public service (23)	0.40	Upper limit for asylum seekers (3)	0.37	Tax on high wealth (28)	0.50
2	Hartz-IV sanctions (29)	0.34	Continuation of lignite mining (20)	0.34	Increase of the minimum wage (36)	0.41
3	Increase of the top tax rate (10)	0.32	Cut benefits for refugees (34)	0.34	Taxation of air travel (37)	0.40
4	Minimum wage (1)	0.32	Child benefits for Germans only (13)	0.31	Withdrawal from the EU (25)	0.39
5	Admitting large numbers of refugees (15)	0.32	Dual citizenship (22)	0.30	Linguistic consideration of gender identities (15)	0.39
6	Ban on arms exports (24)	0.31	Military spending (10)	0.30	Wind energy (4)	0.38
7	Introduction of an unconditional basic income (7)	0.28	Taxation of Diesel fuels (2)	0.30	Voting from 16 (3)	0.38
8	Sole debt liability of the state concerned (32)	0.27	Abolishment of solidarity surcharge (33)	0.29	Nord Stream 2 (16)	0.36
9	Limitation of rent increases (35)	0.26	Debt relief for Greece (8)	0.28	Organic farming (31)	0.36
10	Stronger state regulation of electricity prices (5)	0.23	Abolishment of woman's quota (25)	0.27	Internal combustion engine (19)	0.33
29	...	...	...	...	...	...
30	Disclosure of MPs' additional income (27)	0.07	Public debt reduction (18)	0.18	Asylum only for political persecutes (35)	0.16
31	Turkey's accession to the EU (26)	0.07	Fixed term employments (14)	0.16	Facial recognition in video surveillance (29)	0.16
32	Lowering the retirement age (22)	0.05	Statutory health insurances (28)	0.15	Married couples without children (30)	0.16
33	Collection of church tax by the state (30)	0.03	Earlier retirement (23)	0.15	Increase in defence spending (2)	0.13
34	Referendums at federal level (38)	0.03	Reference to God in the Constitution (36)	0.12	Increase in CO2 price (33)	0.13
35	Childcare allowance for non-daycare attending children (2)	0.03	Legal claim of all-day care (35)	0.09	Sale of cannabis (24)	0.12
36	BAföG payments independent of parental income (18)	0.02	Legalization of cannabis (32)	0.07	Patent protection for vaccines (6)	0.12
37	Use of the autobahns at a charge (37)	0.02	Fake news prevention (11)	0.06	Tax on digital services (10)	0.11
38	Ban on unconstitutional parties (17)	0.02	Mandatory vaccination (15)	0.04	Home office (38)	0.08
			Study loans independent of parent's income (6)	0.04	Contracts with Chinese companies (22)	0.06

DM discrimination measure. Large discrimination measures correspond to a large spread among the agreement with this statement and, consequently, indicate a high degree of discrimination between the agreement of a statement along the latent factor of political ideology.

(SD = 0.09) in the WoM-2017, and  $M = 0.22$  (SD = 0.12) in the WoM-2021. All inter-correlations are presented in the Supplemental Material.

Last, the latent factors of the WoM were extracted from samples separated by educational level to examine whether political knowledge might have an influence on the dimensions underlying the observed response patterns. In addition, the WoM-2017 sample was large enough to draw a stratified random sample using the actual voter turnout from 2017, enabling us to extract latent factors in a more ecologically valid sample. These analyses are presented in detail in the Supplemental Material. The latent factors of the WoM could be extracted across all levels of education as well as in the stratified sample, reaching comparable results.

**Issue voting vs. principle voting.** Based on the analyses by Denver and Hands (1990), we examined whether political ideology, represented by SDO and RWA, or an index of issue voting, represented by the latent factors of the WoM after partializing out SDO and RWA, is more predictive for the individual voting decision. For the WoM-2013, political ideology explained 35.6% of the variance in the individual voting decision, whereas issue voting explained only 17.1% of the variance. The same was true for the WoM-2017, where political ideology explained 34.6% of the variance and issue voting explained only 20.2% of the variance, and the WoM-2021, where political ideology explained 33.7% of the variance and issue voting explained only 4.2% of the variance. Thus, the predictive power of ideological factors was 1.7 to 8 times higher than the predictive power of issue voting.

## Discussion

Our results show that latent factors of political ideology are even observable in contexts that promote issue voting, that is when unknowingly answering a VAA and thus responding to questions from diverse policy domains, even in a political landscape as diverse as the multi-party democratic system of Germany. This conclusion is corroborated by excellent internal consistencies (standing for similar response patterns between individuals), strong convergent associations with political self-placements, and traits capturing the psychological foundations of political ideology such as RWA, SDO, and moral judgment (acceptance of hypothesis 2), as well as the ability of the corresponding factor scores to differentiate between various voter groups (acceptance of hypothesis 3). In this context, the convergence of the voter groups in the WoM-2021 can be seen as a symptom of the shift to the right of the German political system (Weber, 2019), even for left-wing parties, in order to prevent the right-wing parties from gaining votes (compare with the increase in AfD votes between 2013 and 2017 in Table 1). Importantly, the factor scores from three different legislature periods showed high inter-correlations, attesting to intertemporal stability and thus allowing us to potentially generalize our results to future versions of the WoM (acceptance of hypothesis 1).

In addition to our hypothesis-driven analyses, the content validity of the latent factors can be estimated by looking at the most discriminatory issues for each legislature period, as depicted in Table 3. Fittingly, in the WoM-2013, at the time of the Greek debt cut in 2012, the item 'In my opinion, every state belonging to the eurozone should be liable for their own national debt' was highly discriminatory, while in the WoM-2017, at the time of the 2015 European migrant crises, items as 'An annual upper limit should apply to the admission of new asylum seekers' and 'It should be possible to cut benefits for recognized refugees who refuse to take integration measures' have gained importance. In the WoM-2021, shortly after the

rise of Fridays for Future in Germany, climate-relevant issues such as 'Air travel is to be taxed more heavily' and 'The promotion of wind energy has to be ended' became more discriminatory. Thus, the latent factors of political ideology can be evaluated as valid not only at an individual and group level but also at the content level since the zeitgeist of the respective legislative period has been tapped.

Most importantly, the latent factors of political ideology originated from an underlying correlational structure that shows a systematic overlap of opinions to specific political issues that are not inherently linked. One could argue that some of these statements have overlapping topics (e.g., 'An annual upper limit should apply to the admission of new asylum seekers' and 'Child benefit should only be paid to German families'), whereas other combinations seem less intuitive (e.g., 'Federal authorities are to take linguistic account of different gender identities in their publications' and 'The Baltic Sea pipeline "Nord Stream 2" which transports gas from Russia to Germany, is to be allowed to go into operation as planned' [reversed]). However, in both cases, citizens deviating from this overlap might experience pressure to conform, leading to a narrowing of the political debate if they abandon their dissenting opinion or do not dare to express it in their respective environment. Alternatively, they might experience political disenchantment and withdraw completely from political life, as their opinions are often not represented by representatives of the same political camp. For example, a left-wing voter might support pro-refugee policies while disagreeing with a third gender, leading to a sense of delineation from their own left-wing environment. Future studies should, therefore, investigate whether a social environment with less correlated opinions on political issues leads to less pressure to conform and, thus, more political diversity, which is important for the existence of democratic systems.

Turning to the psychological dimensions behind the latent factors of political ideology, high correlations with RWA and SDO can be recognized, explaining why some political issues cluster together. For example, RWA high scorers can be characterized as sticking to tradition, being obedient and submissive to authorities, and being aggressive towards elements threatening the established order, thus being less progressive (Aichholzer & Zeglovits, 2015). However, it is possible that some voters are progressive regarding one political topic and less progressive regarding another, leading to less concordance with both political camps, conservatives and liberals. The same is true for SDO, which refers to whether one prefers intergroup relationships to be more hierarchical or more equal (Pratto et al., 1994). It is possible for voters to prefer hierarchical structures in parts of society while rejecting them in others. However, the correlations with the latent factor of political ideology indicate that most voters apply these tendencies to all issues at once, probably due to missing political knowledge (Converse, 1964), leading them to adjust their opinions to a few salient topics (Krosnick, 1990; Schultze, 2014) and/or to moral intuitions, as observed in the systematic associations with the moral foundations of the moral foundations theory (Haidt & Joseph, 2004).

Overall, we used these prominent measures derived from influential theories of Right-Wing-Authoritarianism (Altemeyer, 1981), Social Dominance Orientation (Pratto et al., 1994), and Moral Foundations (Haidt & Joseph, 2004) to show that ideological factors underly the response patterns of VAAs, although they should be less affected by symbolic motivations than political self-placements. The associations found with our latent factors can most likely not be explained by symbolic or expressive motifs (Ellis & Stimson, 2012), as most people are not politically sophisticated enough to know all positions of their preferred parties and adapt their responses to the WoM statements



accordingly (Krosnick, 1990; Schultze, 2014). Notably, latent factors of political ideology could be extracted from subsamples of *all* educational levels, even when political sophistication could be assumed to be low. Moreover, participants did not even know that they were answering a VAA and did not expect to gain accordance scores, further reducing any conceivable motif to present themselves as loyal party supporters.

Last but not least, the identified ideological structure behind the response patterns in the WoM influenced the voting decisions of our participants. The predictive power regarding the individual voting decision was higher for the ideological dimensions behind the latent factors of the WoM, that is, RWA and SDO, than the predictive power of the individual issue stances after controlling for these ideological dimensions (acceptance of hypothesis 4). This contradicts the conclusion of Denver and Hands (1990) that issue stances are more important for the individual voting decision than ideological principles. Thus, the notion of a ‘rise in issue voting’ should be questioned. Instead, as shown above, the underlying ideological structure is incorporated in several issue stances, whether consciously or unconsciously, and can, therefore, continue to drive the polarization of the political landscape. Importantly, however, this does not imply that there are no ideology-independent reasons for voting since only one-third of the variance in voting intention could be explained by RWA and SDO. There are other factors that influence the voting decision, such as candidate attractiveness, party size, or evaluations of performance in past incumbencies (Israel et al., 2017; van der Linden & Vowles, 2017; Wagner & Ruusuvirta, 2012), which were excluded by our current methodology. Similarly, these factors influence our issue stances, which is reflected in the result that only one-sixth to one-quarter of the variance in the response patterns could be explained by our latent factors of political ideology. Moreover, certain political issues may guide the voting decision more strongly than others, without being integrated into an ideological network (e.g., voting in favor of the party with the highest tax cut, despite being against their overall political course), which would, essentially, reflect issue voting based on a limited number of issues. Thus, while ideology still plays a big role in our voting decisions and our political stances, there are other factors that should not be neglected in future research.

**Limitations.** Of note, our study entails some important limitations and only represents a first step in assessing the ideological dimensions underlying the issue of voting. First and foremost, it is imperative to repeat our analyses in international and generally more diverse samples. We expect that differences grow as people’s personal political reference frames become more diverse, and people within our German and highly educated samples probably possessed comparable reference frames. However, we expect that other policy-based VAAs will lead to similar latent factors of political ideology since they beneficially omit differences in political structures or systems, which would be highly dependent on the respective country rather than on universal factors of ideology. Similarly, MCAs are also sample-dependent, which might explain why the convergent correlations in the WoM-2021 were smaller than in the WoM-2013 and WoM-2017, as the WoM-2021 sample was much smaller and voter groups were less diverse (see Table 1, sample distribution). However, despite the use of different political statements in each version of the WoM, the inter-correlations between the latent factors provide evidence that all statements originate from the same infinite item pool of political ideology and, therefore, repeatedly converge to the same (or at least similar) latent factors, comparable to parallel tests or even completely different psychometric tests that measure the same construct with different items (e.g., different IQ tests).

Similar inter-correlations have to be obtained from VAAs of different political and cultural contexts to show that latent factors of political ideology can actually be generalized. Second, it has to be mentioned that the voting distribution of our sample was not representative of the German political landscape and was less diverse (at least in the WoM-2021) (see Table 1, comparison between federal elections and sample distribution). However, as argued above, this fact has probably disadvantaged the latent factor, rendering our test more conservative. A reanalysis of our data separated by education (as a proxy for political sophistication) and utilizing quota samples confirmed this assumption. Last, VAAs themselves should be criticized: They are more complex, cognitively demanding, and time-consuming than single-item self-placements. Moreover, their statement selection is often based on how salient, distinctive, and controversial the respective issue is in the given campaign, making it possible that ideological influences are amplified. Thus, the stability of latent factors retrieved from VAAs should be examined more closely in future studies, for example, by examining whether factors from previous legislative periods can predict voting behavior in the current legislative period and vice versa. With this, the significance of the ideological factors can be determined even when certain topics are not relevant anymore or are not relevant at the time of voting. The same is true for the statement weighting procedure of the WoM, as participants may decide to double-weight topics that are especially ideology-driven. However, this seems to reflect the participants’ actual ideological principles.

Importantly, our study does not examine the influences that contribute to the development of the participants’ positions on VAA statements. There are unsystematic influences (e.g., having read a newspaper article by chance) that would not affect the systematic variance of the latent factors. On the other hand, there are systematic influences (e.g., only using one source of information) that would be reflected in the latent factors. However, we would argue that such systematic influences are part of ideology (e.g., in the form of a self-confirmation bias) and thus justified to be included in the latent factors. Further research is necessary to identify the relative significance of these factors for latent factors of political ideology.

**Conclusion.** The current study provides the first evidence for an ideological structure underlying the response patterns of VAAs, which—at first glance—just seem to ask for individual stances on diverse and mostly substantially unrelated policy issues. In an ideal, unideological world, these response patterns should be as diverse as the individual lives of the respondents. In contrast to this, the underlying ideological structure was even more predictive for voting decisions than the issue stances themselves. This harbors the risk that certain combinations of opinions on various issues are suppressed in political discourse (e.g., through pressure to conform or disenchantment with politics), which could ultimately jeopardize democratic principles such as independent political opinion-forming, political participation, and consensus-building, and promote groupthink, polarization, and tribalism. Future studies are needed to investigate the underlying mechanisms that lead to certain sets of political opinions.

#### Data availability

The datasets generated during and/or analyzed during the current study are available in the OSF repository, [https://osf.io/2h9jg/?view\\_only=5fca0dc45d2548288766f9e97064024d](https://osf.io/2h9jg/?view_only=5fca0dc45d2548288766f9e97064024d).

Received: 14 August 2024; Accepted: 31 March 2025;  
Published online: 12 April 2025

## Note

- 1 As expected, an MCA without double-weighted statements led to less variance explanation, i.e., 14.2% in the WoM-2013, 19.8% in the WoM-2017, and 20.2% in the WoM-2021.

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## Author contributions

MM contributed to the conception and design, data analysis and interpretation, manuscript drafting and revising, and the approval of the final version for submission. TG contributed to the data collection, the manuscript drafting and revising, and the approval of the final version for submission. MR contributed to the manuscript revising and the approval of the final version for submission.

## Funding

Open Access funding enabled and organized by Projekt DEAL.

## Competing interests

The authors declare no competing interests.

## Ethical approval

As we followed standard procedures in applied psychological research (e.g., informed consent and adherence to the Data Protection Guidelines of the European Union) and did not touch on sensitive topics nor used body invasive procedures or drugs, the procedure and the materials of the study needed no special approval by the ethics committee of the Institute for Psychology of the University of Bonn. These guidelines, as well as the statement, have been approved by the ethics committee of the Institute for Psychology of the University of Bonn.

## Informed consent

Digital informed consent was obtained from all participants on the day of participation. This included the voluntary nature of participation, the option of canceling participation at any time without repercussions, and the use of the anonymized data for scientific purposes.

## Additional information

**Supplementary information** The online version contains supplementary material available at <https://doi.org/10.1057/s41599-025-04841-9>.

**Correspondence** and requests for materials should be addressed to Merlin Monzel.

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