Mapping motivational bias in recalling the SARS-CoV-2 pandemic

Philipp Sprengholz[1,2 + *], Luca Henkel[3 +], Robert Böhm[4,5,6 #] and Cornelia Betsch[2,7 #]

[1] Institute of Psychology, University of Bamberg, Germany
[2] Health Communication, Bernhard Nocht Institute for Tropical Medicine, Hamburg, Germany
[3] Department of Economics, University of Bonn, Germany
[4] Faculty of Psychology, University of Vienna, Austria
[5] Department of Psychology, University of Copenhagen, Denmark
[6] Copenhagen Center for Social Data Science, University of Copenhagen, Denmark
[7] Institute for Planetary Health Behaviour, University of Erfurt, Germany

*Corresponding author: Philipp Sprengholz
University of Bamberg
Markusstr. 8a
96045 Bamberg
Germany
E-Mail: philipp.sprengholz@uni-bamberg.de

+ all authors contributed equally
# shared senior authorship

How people recall the SARS-CoV2 pandemic is likely to prove crucial in future societal debates around pandemic preparedness and appropriate political action. Beyond simple forgetting, recall may be distorted by strong motivations and anchoring perceptions on the current situation. There is evidence of strong polarization in how vaccinated and unvaccinated people perceived the ongoing situation during the SARS-CoV2 pandemic. However, it remains unclear how these differences affect recall. Here we show based on three studies across 11 countries (total N = 10,242) that recall of perceived risk, trust in institutions and protective behaviours depend strongly on current evaluations. While both vaccinated and unvaccinated individuals were affected by this bias, people who identified strongly with their vaccination status—whether vaccinated or unvaccinated—tended to exhibit greater and opposite distortions of recall. As biased recall was not reduced by incentivizing accurate recall or by providing information about common recall errors, it seems that motivation and identity influence the direction in which evaluations of the past are distorted. Individual post-pandemic evaluations were found to be linked to future behavioural intent, including adherence to regulations during any future pandemics or punishing politicians and scientists. Taken together, these findings indicate that historical narratives about the COVID-19 pandemic are motivationally biased, sustain societal polarization between vaccinated and unvaccinated groups and are likely to hamper preparation for future pandemics. The fact that negative ex-post evaluations of the pandemic are accompanied by anti-system tendencies and a desire to punish suggests that any future measures must look beyond immediate public health implications to the longer-term consequences for societal cohesion and trust.

Main Text

Since most pandemic restrictions were lifted in early 2023, many societies have been transitioning to a post-pandemic phase.[1] This typically includes evaluation of the appropriateness of the measures employed and efforts to enhance future pandemic preparedness. Any such evaluation necessarily depends on accurate recall of factual data and subjective interpretations at the time (e.g. infection rates and associated risk perceptions). While this information is available from large-scale surveillance and survey data gathered during the pandemic,[2] such evaluations must also take account of public and media discourses, which are often influenced by personal perceptions and memories. However, as memory formation is a constructive process, retrospective narratives about historical events like the pandemic are at risk of significant distortion.[3] Beyond simple forgetting, recall and ex-post evaluation are prone to various forms of bias, reflecting differences in motivation and purpose, e.g. a wish to conform with prevailing opinion.[3–5]

We argue here that recall and retrospective evaluations of the COVID-19 pandemic are characterized by ubiquitous bias.[6] Regardless of whether one complied with government vaccination provisions or chose to remain unvaccinated, the pandemic incurred high costs for everyone. When recalling past events or feelings both vaccinated and unvaccinated individuals may be subject to biases, motivated by self-affirmation and consistency with today's beliefs, perhaps reinforcing the existing polarization based on vaccination status and discrimination against those who differed in this regard.[7–9]

Here we report three empirical studies to explore the nature and extent of bias in individual historical narratives of the COVID-19 pandemic. Study 1 mapped the extent and direction of recall bias within opinion-based groups and assessed the effects on evaluations of political action that took place during the pandemic. Study 2 investigated the robustness of bias in recall and evaluation vis-a-vis different mitigation measures. Finally, Study 3 assessed

the potential societal implications of this bias and the generalizability of findings across different countries.

Assessing bias in recall and evaluation

To assess the extent and direction of biased recall and evaluation, one must be able to reliably compare current and past perceptions.[10] For the purposes of Study 1, we recruited and surveyed a sample of German adults (N = 1,644) in late 2022. Of these, 74% had received at least one dose of a COVID-19 vaccine. All respondents had previously been surveyed (in summer 2020 or winter 2020/2021).[2] At both timepoints, they were asked about their current perceptions of risk (i.e. infection probability and severity, affective risk), trust in government and in science, mask wearing frequency and perceived exaggeration of the pandemic measures, as well as current life satisfaction. In the 2022 survey, respondents were further asked to recall their responses to the same items in the previous survey.

Based on their past and current perceptions and recall of the past, we estimated the extent to which recall tended towards one end of the respective scale (directional bias) and the extent to which recall was influenced by past or current perceptions.[10] Vaccination status and vaccination status identification[8] were added as potential moderators. Figure 1 shows how recall was influenced by past (x-axis) and present (y-axis) ratings of the variable in question. A perfectly horizontal line would indicate that recall was influenced only by present rating; a perfectly vertical line would indicate that recall was influenced only by past rating. A line that is further from the midpoint indicates a stronger directional bias in recall.

Across a range of variables related to perceived risk, trust and behaviour, the findings indicate that recall is strongly linked to current perceptions and that the direction of bias differs according to vaccination status and identification with vaccination status. For example, unvaccinated individuals tended to recall the probability of infection as less likely than actually perceived in the past (Figure1A); in contrast, vaccinated individuals tended to recall the probability of infection as more likely than previously perceived. Greater identification

with vaccination status was associated with more biased recall—as indicated by an interaction effect of being vaccinated and identifying with this status on perceived infection probability (standardized β = 0.23, $p < 0.001$; see online supplement for full regression models across variables).

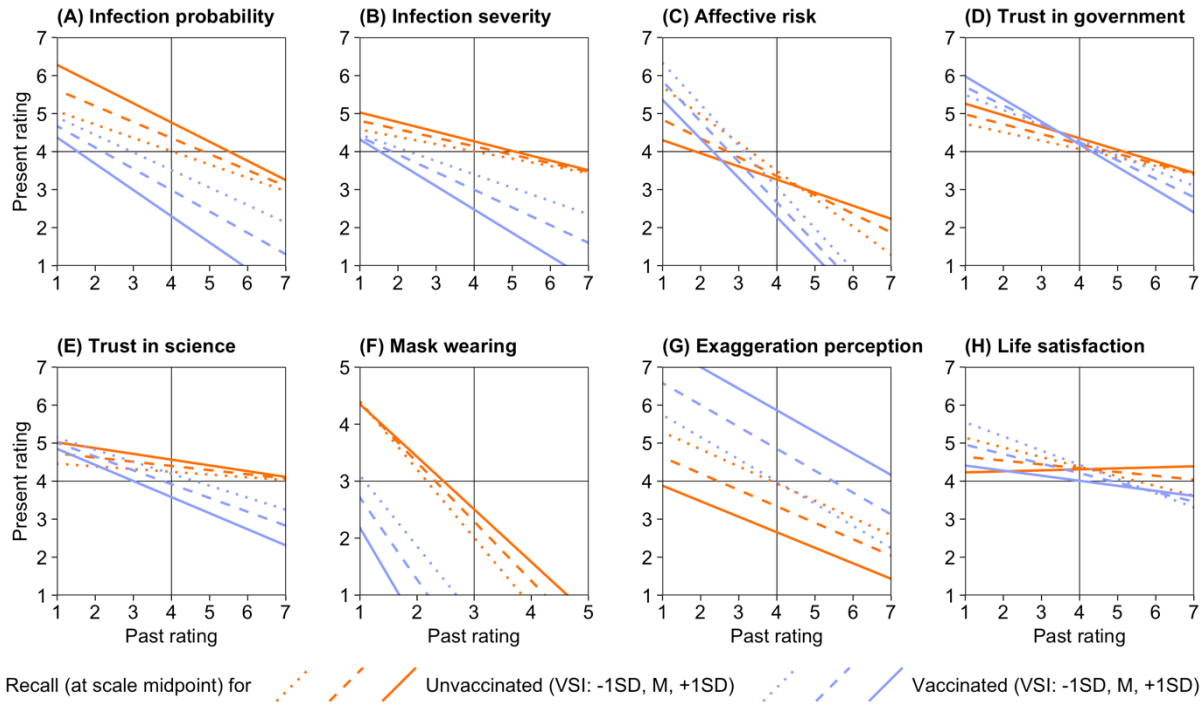

Figure 1. Biased recall of pandemic perceptions and behaviours.
Note: Each panel shows the results of a linear regression predicting individual recall of past perceptions based on actual past ratings (x-axis) in 2020/2021 and present ratings (y-axis) in late 2022, as well as interactions with vaccination status (colours) and vaccination status identification (VSI; dashed/dotted lines). Each line indicates predicted recall at the scale midpoint (e.g. 4 for infection probability). Direction and strength of bias are indicated by the line's position relative to the midpoint of the scale; the angle indicates the extent to which recall is influenced by past and present perceptions. Detailed descriptions and examples are provided in the text; see Methods section for more information on the regression models.

As further support for the motivational basis of recall, individual evaluations differed strongly in terms of whether political measures were appropriate—justified, effective and based on an honest desire to protect citizens. A regression analysis revealed that perceived overall appropriateness varied by vaccination status (β = 1.32, $p < 0.001$), vaccination status identification (β = -0.42, $p < 0.001$) and their interaction (β = 0.77, $p < 0.001$). For both vaccinated and unvaccinated individuals, appropriateness was rated as medium when

identification was low. However, evaluations were increasingly positive among the vaccinated and increasingly negative among the unvaccinated as vaccination status identification increased. These results mirror the results for biased recall. In fact, individual appropriateness ratings related to the extent of directional recall bias ($r = .24$, $p < 0.001$; individual estimation of directional recall bias was based on multiple outcome variables; see Methods section for details). This indicates that greater bias when recalling the past was associated with more extreme evaluation of political action—in either direction.

Overall, individual memories of the pandemic diverged considerably; for both vaccinated and unvaccinated individuals, memories were biased in the direction of their current thinking and feelings, and perceptions of the past diverged further in line with vaccination status identification.

Attempts to reduce recall bias

Assuming that recall and evaluation of the pandemic interact and that each affects the other, it seems important to explore possible techniques for reducing memory distortion. To that end, Study 2 investigated whether recall bias is reduced (i) when monetary incentives are introduced to encourage accuracy or counteract motivated recall or (ii) when metacognitive information about widespread recall bias is provided. Both incentives[11,12] and information[13,14] are known to instigate correction of own judgements in other domains.

As these techniques might have differing effects on vaccinated and unvaccinated individuals, our sample included a disproportionally high percentage of unvaccinated individuals[8] and reassessed 3,105 participants from Germany and Austria in January 2023 (71% of whom had received at least one dose of a COVID-19 vaccine). Before asking respondents to recall their perceptions and behaviours from December 2021, they were randomly assigned to one of two interventions or to a control group (no intervention).

To test the effect of incentives, participants in one condition were told that they would be asked to recall behaviours and perceptions from a specific phase of the pandemic. They

were also told that more accurate recall would increase their chances of winning a cash prize. To test the effect of metacognitive information about the existence of recall bias, participants in another condition were told about the extent of this bias in others, which was randomly varied across participants. Following these interventions, we tested participants' recall and assessed their perceptions of the appropriateness of political action (as in Study 1).

The analysis utilised largely the same statistical model as in Study 1; the only difference was that *experimental condition* replaced vaccination status identification as a moderating variable. In Figure 2, the lines again confirm that recall of perceived risk and trust was heavily biased towards present perception; in the case of behavioural variables, the influence of past values was visibly stronger.

Across all variables, the direction of recall bias again differed by vaccination status. Vaccinated respondents tended to overestimate their previous risk perceptions and protective behaviours, with main effects of being vaccinated on infection probability ($\beta = 0.30$, $p < 0.001$); severity ($\beta = 0.25$, $p < 0.001$); mask wearing ($\beta = 0.33$, $p < 0.001$); and avoiding contacts ($\beta = 0.33$, $p < 0.001$). Unvaccinated respondents underestimated their previous trust in government and science, with main effects of being vaccinated on trust in government ($\beta = 0.32$, $p < 0.001$) and trust in science ($\beta = 0.28$, $p < 0.001$). Importantly, recall accuracy was not significantly improved by incentivizing accurate recall or providing information about widespread bias (see online supplement for full regression models).

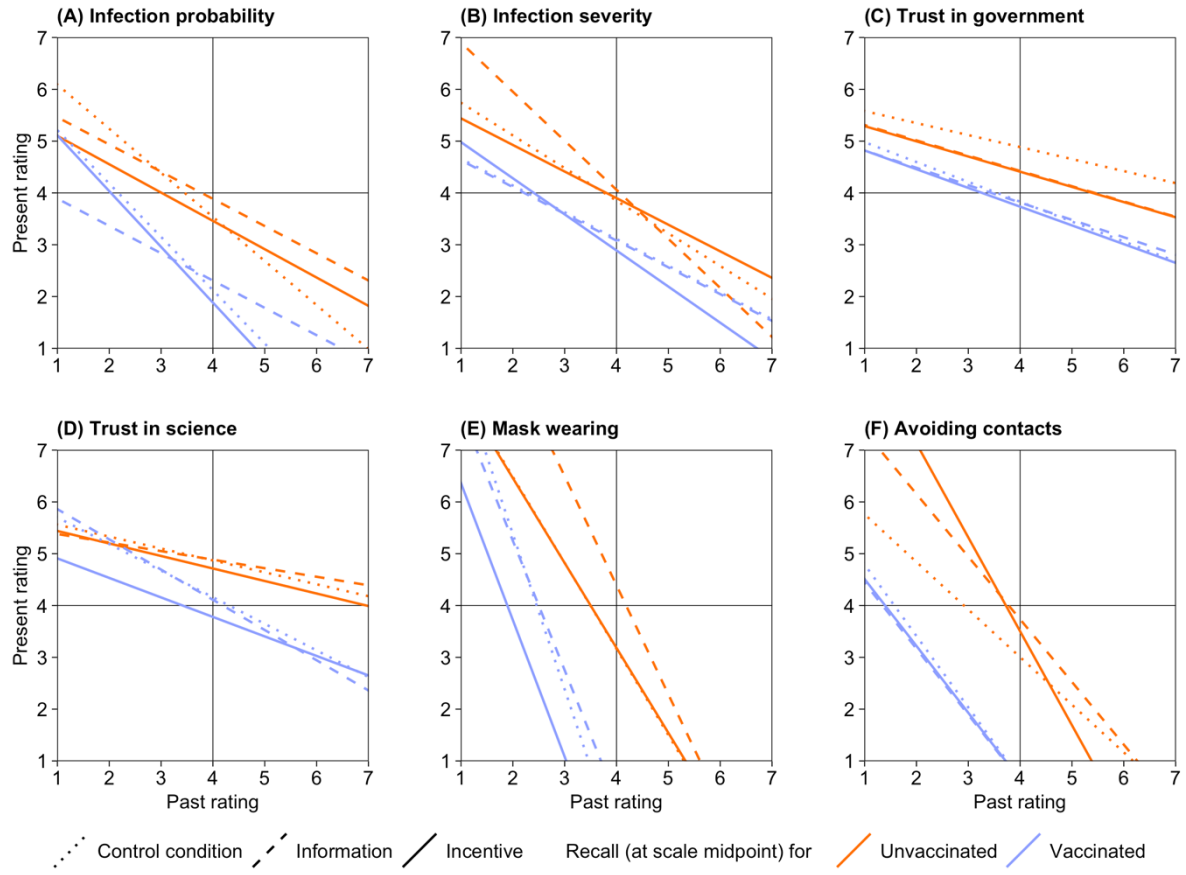

Figure 2. Effects of interventions to reduce recall bias.

Note: Each panel refers to a linear regression predicting individual recall based on past (December 2021) and present (January 2023) ratings and their interactions with vaccination status and experimental condition. Each line visualizes directional bias and how past and present perceptions affect recall (at recall = 4) for a given vaccination status and experimental condition. (See online supplement for regression details.)

While evaluation of the appropriateness of past political action was found to depend on vaccination status and again related to individual directional bias (r = .31, $p < 0.001$; for details, see online supplement), it did not differ significantly by experimental condition. Overall, the results of Study 2 indicate that biased recall and evaluation of the pandemic are relatively stable and difficult to correct.

Generalizability across countries

As polarization can be observed in many countries,[7,15] we investigated the relation between recall bias and post-pandemic evaluations on a more global scale in Study 3. We also wanted to explore any correlates that might indicate societal tensions. Dryhurst et al.'s study[16] conducted in March/April 2020 served as a benchmark, providing data on pandemic

perceptions in 10 countries (Australia, Germany, Italy, Japan, Mexico, South Korea, Spain, Sweden, the United Kingdom and the United States) that differ in terms of culture, pandemic impact and government response. We collected data from new samples in these countries (N = 5,493), of whom 88% had received at least one dose of a COVID-19 vaccine. Respondents were asked to estimate how many people anticipated high probability and severity of infection and perceived high government effectiveness at the beginning of the pandemic.

Comparing ratings with the benchmark values,[16] we found that participants in all countries overestimated perceived probability of infection, while participants in all countries except Japan underestimated perceived severity of the illness in 2020 (Figure 3A). Bias regarding government effectiveness varied by country. As in the previous studies, we identified associations between recall bias and post-pandemic evaluation, but this varied by country. For instance, in most countries, recalling COVID-19 as more severe than perceived in the past by a representative country sample was associated with evaluation of political action as more appropriate (ranging from r = .02 in Germany to .21 in Sweden; exceptions: r = -0.01 in Japan; r = -.15 in the US).

Evaluations of the appropriateness of political action during the pandemic were broadly similar across the included countries (Figure 3B). Importantly, in all countries other than Japan, evaluations of political measures were more positive among the vaccinated and more negative among the unvaccinated as vaccination status identification increased (Figure 3C), echoing the results of Study 1. Regarding post-pandemic societal tensions, we found that evaluation of past political action as less appropriate was associated with a stronger desire to punish politicians (ranging from r = -.32 in Mexico to -.70 in Germany) and scientists (r = -.47 in Mexico to -.77 in the US) for their handling of the pandemic. Those who evaluated political actions more negatively were also less inclined to vote (r = .06 in the US to .21 in Germany) and had a greater desire to dismantle the entire political order (need for chaos[17]: r = -.35 in Germany to -.59 in Sweden). Finally, post-pandemic evaluations were positively

related to intended compliance in a future pandemic in all countries except Japan (r = .18 in Mexico to .56 in Germany). Germany and Italy exhibited the strongest associations between negative ex-post evaluation of political actions and critical societal tendencies. This suggests low system trust within a small segment of society, accompanied by a strong desire to take revenge on those who spoke out or took responsibility during the pandemic. In summary, we observed both biased recall and polarized evaluation of the pandemic in many countries and across continents. In many countries, too, negative evaluations of political action were associated with indicators of societal tension.

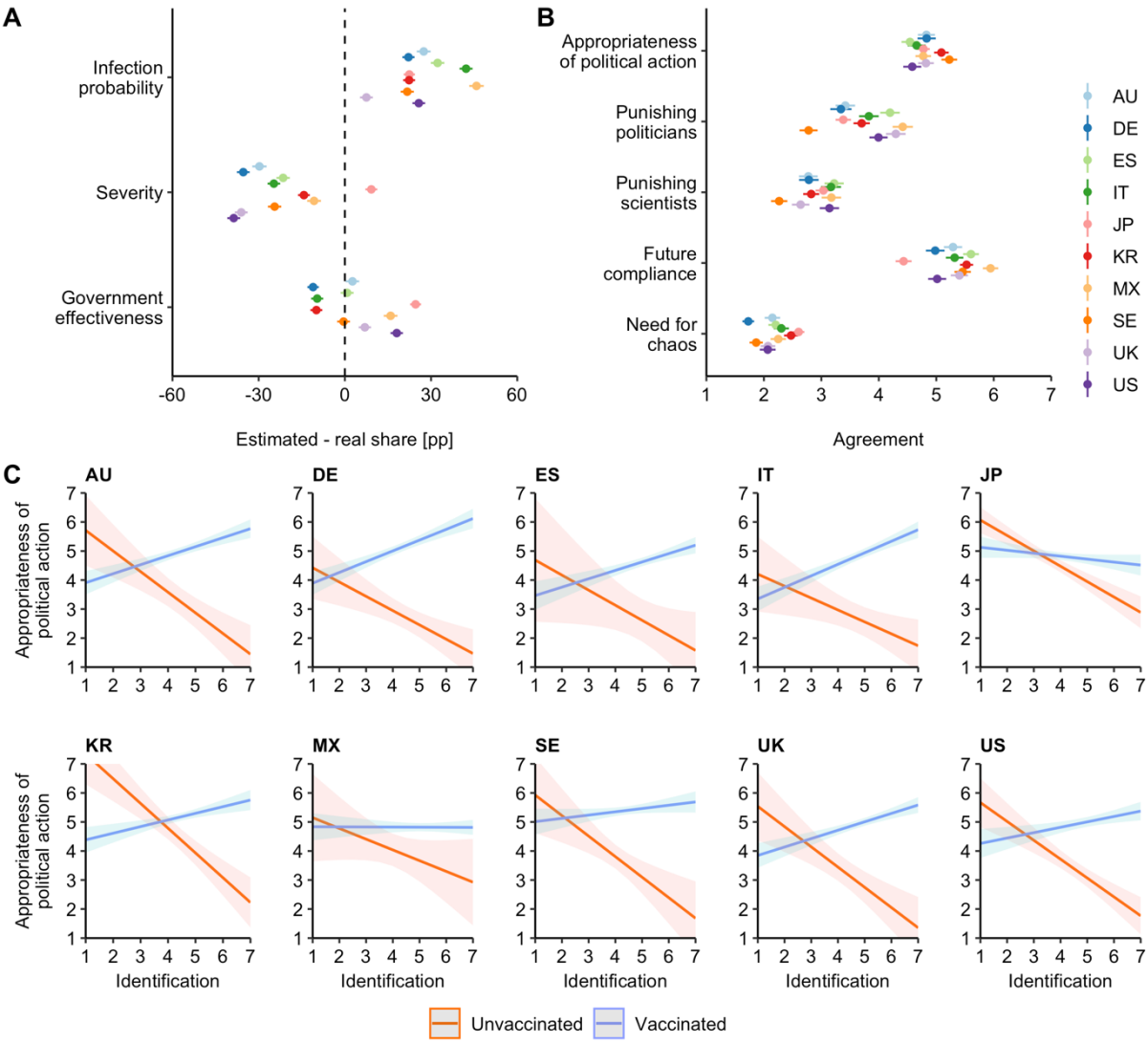

Figure 3. Pandemic perceptions and behavioural intentions across countries.

Note: Results from Australia (AU), Germany (DE), Spain (ES), Italy (IT), Japan (JP), South Korea (KR), Mexico (MX), Sweden (SE), United Kingdom (UK) and the United States (US). (A) Participants' estimates of

the share of perceived high levels of infection probability, severity and government effectiveness as reported in a 2020 survey.[16] Dots depict differences between these estimates and observed values; error bars indicate 95% CIs. (B) Evaluation of appropriateness of political action, desire to punish politicians and scientists for their handling of the pandemic and intended compliance with regulations and recommendations in any future pandemic, ranging from 1 (very much disagree) to 7 (very much agree); dots depict means, and error bars indicate 95% CIs. (C) Linear regression analyses of VSI, vaccination status and their interaction, predicting evaluation of the appropriateness of political action. Lines represent linear fit, with ribbons visualizing 95% CI.

Discussion

The COVID-19 pandemic has had a profound impact on global society. Around the world, governments and individuals have experienced significant upheaval, and tough decisions were made to mitigate the spread of the virus. In this context, the three studies presented here illuminate how individuals' memories, attitudes and perceptions have been shaped by the pandemic and how these factors continue to affect everyday life and influence future public health responses.

Our findings confirm that recall is biased towards current perceptions and behaviours and that this bias is motivational, differing according to how people behaved during the pandemic and how they identified with those behaviours. This is also supported by the finding that neither incentives nor bias-awareness information were able to reduce the extent of the bias, possibly because the motivational force was too strong as shown in other contexts[18,19]. The bias and its association with polarized and negative post-pandemic evaluations in many countries related to various indicators of societal tension. The fact that negative ex-post evaluations of the pandemic are accompanied by anti-system tendencies and a desire to punish suggests that any future measures must look beyond immediate public health implications to the longer-term consequences for societal cohesion and trust.

The observed recall bias is problematic because it may lead to underestimating the efficacy of pandemic interventions, undermining individual willingness to comply during future crises. In addition, the desire to punish those responsible for past pandemic measures may make it difficult to build on 'lessons learnt'. The observed biased recall of events is neither new nor surprising.[20] However, the strongly directional character of this bias and the

influence of identity in this regard have major implications that warrant further exploration. Catastrophic events typically require a rapid response, and this works best when people can agree a way forward. It follows that diverging representations of the past may impede effective action, and it would be useful to investigate this problem in other crisis contexts such as climate change. Our results suggest that almost no one remembers incidents as they 'really' were; depending on identity-related factors, memories will diverge, and existing polarization will increase accordingly. This is likely to impact how people remember heat waves, floods or droughts, their severity and how best to cope with such events, with adverse implications for general acceptance of necessary future measures. Future research must seek new ways of mitigating societal polarization and recall bias.

The studies reported here have some limitations. While the tested interventions addressed metacognitive processes, our findings suggest that it may prove more useful to target motivational issues like identity. In Study 3, the observed single effects may reflect country-specific factors beyond the scope of the present study, and these invite further investigation.

In conclusion, the three studies reported here highlight the complex nexus of attitudes, memories and behaviours surrounding the COVID-19 pandemic. Motivational factors related to identity and behaviour in extreme situations seem pivotal in this context, linking the past to biased memories and future behaviours. Researchers and policymakers must pursue a better understanding of these connections in order to develop more fruitful ways of learning from the past for improved crisis preparedness and response.

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Methods

Study 1

Participants

Participants were surveyed for the first time in summer 2020 or winter 2020/21 (within the COVID-19 Snapshot Monitoring project, COSMO[1]) and for the second time in late 2022. In total, 1,644 individuals participated. They were 18 to 74 years during the first survey (M = 52.68, SD = 12.75), 49% were male and 51% were female. Unvaccinated participants were oversampled as compared to the general population to be able to assess the interaction of vaccine status and vaccination status identification.

Measures

Vaccination status and vaccination status identification

Participants were asked how many vaccines against COVID-19 they had received (recoded to (un-)vaccinated if they received at least one (no) vaccine). Identification with vaccination status was assessed using the 5-item scale by Henkel et al.[1] (sample item: 'I am proud (not) to be vaccinated against COVID-19', measured on a 7-point scale from 'do not agree at all' to 'very much agree').

Pandemic perceptions and behaviours

At both time points, participants were asked how likely it was that they would get infected (*infection probability*, measured on a 7-point scale from 'very unlikely' to 'very likely') and how severe the infection would be (*severity*, measured on a 7-point scale from 'completely harmless' to 'very severe'). *Affective risk* was assessed by mean-averaging answers to three 7-point items: how often participants thought about the coronavirus, how much they worried about it and how scary they found it (Cronbach's $\alpha = 0.84$ at the first and 0.91 at the second time point).

Participants also indicated how often they had worn a face mask in the previous week (measured on a 5-point scale ranging from 'never' to 'always'); how much they trusted the federal government and science to manage the pandemic (measured on 7-point scales ranging from 'no trust at all' to 'very much trust'); and to what extent they agreed with the statement 'I think the measures that are currently being taken are greatly exaggerated' (measured on a 7-point scale ranging from 'do not agree at all' to 'agree very much'). Finally, participants were asked to assess their overall life satisfaction (on a 7-point scale ranging from 'not at all satisfied' to 'very satisfied').

Pandemic recall

At the second time point, participants were asked to recall the time of the first survey. To help them recall the period in question, they were provided with some details of the pandemic

situation and a visual showing COVID-19 cases over time. They were asked to recall their perceptions of risk, their trust in government and science, their mask-wearing behaviour, as how exaggerated they had perceived the policies and their life satisfaction during that period (using the same 5- or 7-point scales as before).

Appropriateness of political action

Participants were asked to respond to nine items evaluating how the pandemic was handled, measured on 7-point scales ranging from 'do not agree at all' to 'agree very much' (example items: 'It has been proved that most corona measures have not worked', 'The Corona measures were a pretext to restrict civil liberties', Cronbach's $\alpha = 0.92$). The items were inspired by a newspaper report.[2]

Analyses

Population models

To assess the effects of past and present ratings on recall for each variable, eight Truth and Bias (T&B) models[3] were estimated. In each model, recall of one variable (e.g. infection probability) was regressed on past and present ratings, along with all their possible interactions with vaccination status and vaccination status identification. For visualization purposes (Figure 1), we plotted all intersections of present and past values that resulted in a predicted recall at the respective variable's scale midpoint (separately for vaccinated and unvaccinated individuals with different levels of identification). Modelling showed effects of vaccination status and vaccination status identification on directional bias (the extent to which responses tended towards scale endpoints, model intercept) and the force of past ('truth force') and present ('bias force') ratings. To be able to interpret directional bias as an over- or underestimation of recall compared to the past, all models were estimated for a second time with recall, past and present ratings being centred by the grand mean of past ratings (see online supplement for regression tables).

Individual models

Assuming that recall at the individual level is similarly biased for all variables, we estimated directional bias and the biasing force of past and present ratings for each participant. In calculating each participant's T&B model, only seven variables were included; life satisfaction was excluded, as this simply differed between participants, and recall was based almost entirely on current life satisfaction at population level. Perceptions of exaggeration were inverted (as they correlated negatively with the other variables). All variables were rescaled to range from 0 to 1 and recall, past and present ratings were centred by the grand mean of past ratings before model estimation to be able to interpret directional bias as an over- or underestimation of recall compared to the past.

Study 2

Participants

Participants were surveyed at two time points: December 2021 and early 2023. In total, 5,3105 individuals aged 18 to 97 years (M = 49.90, SD = 16.02) participated, of whom 50% were male and 50% were female. Participants were recruited from a panel containing Austrian and German participants who had already taken part several times in surveys around vaccination[1]. The panel included more unvaccinated participants than the general population to reliably observe potential changes of vaccination-related perceptions, intentions and behaviours over time.

Experimental manipulation

At the second time point, participants were randomly assigned to one of three groups. Those in the *incentive* group were told that accurate recall increased their chances of winning a 100 Euro prize. For a given variable, correct recall was awarded 5 points; if recall varied by 1 scale unit, 4 points were awarded, and so on. Each respondent's points total determined how often they would participate in the prize lottery. This intervention aimed at incentivising correct recall, i.e., giving people the chance to overrule motivated thinking by valuing a financial win as higher than confirming with one's current opinions. Participants assigned to

the *information* group were provided with some written details of another study, in which a selected group of 100 people were asked to recall their perceptions of infection severity, their trust in government and their mask wearing behaviour during December 2021. The information group participants were then asked to guess what proportion of that other group underestimated those three variables. Each of our participants was then given an answer ranging from 10% to 90% (in 10% increments) based on randomly selected individuals from the other study. Thus, some participants were told that 10% of people underestimated perceived infection severity, trust in government and mask-wearing behaviours; others were told that 20% had underestimated these variables, and so on. This procedure generated random variation in the information received. The control group received no such information or incentive. This intervention aimed at raising people's awareness of the bias, triggering accuracy concerns.

Measures

As in Study 1, vaccination status and vaccination status identification (Cronbach's $\alpha = 0.75$) were assessed at the second time point. Present and past risk perceptions, trust and protective behaviours as well as their recall were assessed. Items queried infection probability, severity, trust in government and science and mask wearing again, plus frequency of avoiding close contacts (7-point scale ranging from 'never' to 'always'). Appropriateness of political action was assessed as in Study 1 (Cronbach's $\alpha = 0.92$).

Analyses

Again, as in Study 1, population T&B models[3] were estimated for each of the six variables. On this occasion, however, recall was regressed on past and present values for each variable, along with potential interactions with vaccination status and experimental manipulation. Except for visualization (Figure 2), recall, past and present ratings were centred by the grand mean of past ratings. As in Study 1, individual T&B models were again calculated to estimate individual directional bias.

Study 3

Participants

Participants from 10 countries were assessed once between March and April 2023 (N = 5,493). The included countries were Australia (n = 534), Germany (n = 514), Italy (n = 519), Japan (n = 623), Mexico (n = 559), South Korea (n = 515), Spain (n = 528), Sweden (n = 562), the United Kingdom (n = 551) and the United States (n = 588). Participants were aged 18 to 89 years (M = 46.25, SD = 16.00); of these, 49% were male and 51% were female. The selection of countries and the criteria for representativeness matched those in the 2020 study by Dryhurst et al.[4]

Measures

Vaccination status and vaccination status identification (Cronbach's $\alpha = 0.72$) were assessed as in Study 1.

Pandemic recall

Participants were asked to guess responses (from 0 to 100%) to the following items in a survey conducted by Dryhurst et al.[4] between mid-March and mid-April 2020: the seriousness of COVID-19 ('What percentage of respondents (do you think) said in March/April 2020 that getting sick with COVID-19 can be serious?') the probability of getting sick with COVID-19 ('What percentage of respondents (do you think) said in March/April 2020 that they would probably get sick with COVID-19?') and the effectiveness of the government's response to the pandemic ('What percentage of respondents (do you think) said in March/April 2020 that the official response in their country was an effective way of dealing with the pandemic up to that point in time?'). Participants were told that we defined 'agreement' in the original study as a rating of 4 or 5 for infection severity and probability (originally measured on a 5-point scale) and a rating of 6 or 7 for government effectiveness (originally measured on a 7-point scale). For each of the items, we compared our participants' guesses with the actual percentage of people as found by Dryhurst et al.[4]

Appropriateness of political action

This issue was explored using two items from Study 1: 'The corona measures were a pretext to restrict civil liberties' and 'Evidence shows that most corona measures have not worked' (measured on 7-point scales ranging from 'do not agree at all' to 'agree very much').

Punishment intention

To measure punishment intention, we asked participants to respond to two statements: 'Politicians should be punished for how they handled the corona pandemic' and 'Scientists who gave advice to the government should be punished for how they handled the corona pandemic' (measured on 7-point scales ranging from 'strongly disagree' to 'strongly agree').

Voting intentions

Future voting intentions were assessed by the following yes/no question: 'If there was an election next week, would you vote?'

Compliance in a future pandemic

Compliance in a future pandemic was assessed in terms of the following statement: 'If there was a similar but new pandemic coming up, I would comply with measures and regulations.' (measured on a 7-point scale ranging from 'strongly disagree' to 'strongly agree').

Need for chaos

Participants were asked about their agreement with three items developed by Petersen et al.: [5] 'Sometimes I just feel like destroying beautiful things', 'I think society should be burned to the ground' and 'I fantasize about a natural disaster wiping out most of humanity such that a small group of people can start all over' (measured on a 7-point scale from 'strongly disagree' to 'strongly agree', Cronbach's $\alpha = 0.82$).

Data availability statement

Data are available at https://osf.io/bxg7v/?view_only=8a680c461c9c469bba340d5f9d86a8f3 (link for peer review; to be replaced by DOI on publication).

Study 2 was preregistered at https://aspredicted.org/KGF_SNN (link for peer review).

Code availability statement

Data analysis scripts are available at https://osf.io/bxg7v/?view_only=8a680c461c9c469bba340d5f9d86a8f3 (link for peer review; to be replaced by DOI on publication).

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Author contributions

All authors designed and performed the research. PS and LH performed data analysis. All authors wrote and revised the initial draft.

Competing interest declaration

The authors declare no competing interests.

Additional information (containing supplementary information line (if any) and corresponding author line)

Supplementary information is available at https://osf.io/bxg7v/?view_only=8a680c461c9c469bba340d5f9d86a8f3 (link for peer review; to be replaced by DOI on publication).

Corresponding author:

Philipp Sprengholz, Institute of Psychology, University of Bamberg, 96047 Bamberg, Germany

Ethical approval

The study was conducted in accordance with German Psychological Association guidelines. Ethical clearance was obtained from the University of Erfurt's institutional review board (#20200302/20200501/20211215) and all participants provided informed consent to use and share their data for scientific purposes without disclosure of their identities. Participants were compensated for their participation by the panel providers.