Work package i

Putting the stress on conspiracy theories: Examining associations between psychological stress, anxiety, and belief in conspiracy theories

Swami et al., 2016

June 14, 2022

Task: Read the abstract and summarize the main findings of the paper. Use additional material when available. Reflect what the findings imply with respect to potential interventions to misinformation and conspiracy theories.

Abstract

Psychological stress and anxiety may be antecedents of belief in conspiracy theories, but tests of this hypothesis are piecemeal. Here, we examined the relationships between stress, anxiety, and belief in conspiracy theories in a sample of 420 U.S. adults. Participants completed measures of belief in conspiracy theories, perceived stress, stressful life events, trait and state anxiety, episodic tension, and demographic information. Regression analysis indicated that more stressful life events and greater perceived stress predicted belief in conspiracy theories once effects of social status and age were accounted for (Adj. R2 = .09). State and trait anxiety and episodic tension were not significant predictors. These findings point to stress as a possible antecedent of belief in conspiracy theories.

Zusammenfassung

Psychologischer Stress und Ängste können eine Vorstufe des Glaubens an Verschwörungstheorien sein, doch sind die Untersuchungen zu dieser Hypothese nur bruchstückhaft. Wir haben die Beziehungen zwischen Stress, Angst und dem Glauben an Verschwörungstheorien in einer Stichprobe von 420 Erwachsenen in den USA untersucht. Die Teilnehmer füllten Fragebögen zum Glauben an Verschwörungstheorien, zum wahrgenommenen Stress, zu belastenden Lebensereignissen, zur Eigenschafts- und Zustandsangst, zur episodischen Anspannung und zu demografischen Informationen aus. Die Regressionsanalyse ergab, dass belastendere Lebensereignisse und größerer wahrgenommener Stress den Glauben an Verschwörungstheorien vorhersagten, nachdem die Auswirkungen des sozialen Status und des Alters berücksichtigt worden waren (Adj. R2 = .09). Zustands-

und Eigenschaftsangst sowie episodische Anspannung waren keine signifikanten Prädiktoren. Diese Ergebnisse deuten darauf hin, dass Stress eine mögliche Vorbedingung für den Glauben an Verschwörungstheorien darstellt.

Übersetzt mit www.DeepL.com/Translator (kostenlose Version)

References

Swami, V., Furnham, A., Smyth, N., Weis, L., Lay, A., & Clow, A. (2016). Putting the stress on conspiracy theories: Examining associations between psychological stress, anxiety, and belief in conspiracy theories. *Personality and Individual Differences*, *99*. https://doi.org/10.1016/j.paid.2016.04.084

items were reverse-coded prior to analyses and an overall score was computed as the mean of all items. Higher scores on this scale reflect greater trait anxiety. This form of the STAI has been shown to have good psychometric properties (Spielberger et al., 1983). Here, Cronbach's α for this scale was .84.

2.2.6. Episodic tension

To measure episodic tension, we used the Tension–Anxiety subscale of the Short Form of the Profile of Mood States (POMS-SF; Shacham, 1983). This subscale consists of 6 adjectives (sample item: "Tense"), which participants are asked to rate for the degree to which each adjective described themselves during the past week. As such, it provides a measure of transient or episodic tension. All items were rated on a 5-point scale, ranging from 1 (*Not at all*) to 5 (*Extremely*). A subscale score was computed as the mean of all 6 items, with higher scores reflective of greater tension and anxiety. The POM-SF, including its subscales, has good psychometric properties (Baker, Denniston, Zabora, Polland, & Dudley, 2002). Here, Cronbach's α for the Tension–Anxiety subscale was .89.

2.2.7. Socioeconomic status

We used the MacArthur Ladder of Subjective Social Status (MLSSS; Adler, Epel, Castellazzo, & Ickovics, 2000) to measure respondents' subjective social status. Participants were presented with a "social ladder" and asked to indicate the rung they felt best represented their socioeconomic status. Adler et al. (2000) reported that responses on the MLSSS are strongly correlated with traditional measures of socioeconomic status.

2.2.8. Demographics

Participants were asked to provide their demographic details, consisting of sex, age, ethnicity, and educational qualifications.

3. Results

3.1. Preliminary analyses

An independent-samples *t*-test showed that women ($M = 2.88$, $SD = 1.41$) and men ($M = 2.62$, $SD = 1.35$) did not significantly differ in the belief in conspiracy theories, $t(418) = 1.93$, $p = .054$, $d = 0.17$. Analyses of variance showed that there were significant differences in belief in conspiracy theories between ethnic groups, $F(3, 416) = 5.40$, $p = .001$, $\eta_p^2 = .02$, and between educational groups, $F(4, 416) = 2.87$, $p = .015$, $\eta_p^2 = .02$. Younger participants were more likely to believe in conspiracy theories, $r = -.15$, $p = .002$, but there was no significant correlation between belief in conspiracy theories and subjective social status, $r = -.06$, $p = .247$. Although these analyses suggest some demographic differences in belief in conspiracy theories, effect sizes were negligible-to-small. For this reason, we pooled the data for all subsequent analyses, but controlled for age and subjective social status.

3.2. Regression analysis

Partial correlations (controlling for social status and age) between belief in conspiracy theories and our measures of stress and anxiety are reported in Table 1. As seen, stronger belief in conspiracy theories was significantly associated with more stressful life events in the last 6 months, greater perceived stress in the last month, and higher trait anxiety. Effect sizes were small-to-moderate (*r*s = .10–.29). We next conducted a hierarchical linear regression with subjective social status and age entered in a first step[1] and the stress and anxiety measures entered in a second step. The first step of the regression with subjective social status and age was significant, $F(2, 417) = 5.30$, $p = .005$, Adj. $R^2 = .02$, with only age emerging as a significant predictor, B = −.02, SE = .01, ß = −.05, $t = -0.96$, $p = .002$. The second step of the regression was also significant, $F(7, 412) = 7.88$, $p < .001$, Adj. $\Delta R^2 = .09$. Of the variables entered into the model, the only significant predictors were stressful life events, B = .22, SE = .04, ß = .28, $t = 5.61$, $p < .001$, age, B = −.02, SE = .01, ß = −.13, $t = -2.77$, $p = .006$, and perceived stress, B = .26, SE = .12, ß = .12, $t = 2.21$, $p = .028$. Multicollinearity was not a limiting factor in this analysis (all variance inflation factors <2.52).

Table 1
Partial correlations between belief in conspiracy theories, stress, and anxiety, controlling for subjective social status and age.

	(1)	(2)	(3)	(4)	(5)	(6)
(1) Belief in conspiracy theories	–	.15*	.29**	.06	.10*	.07
(2) Perceived stress			.25**	.41**	.22**	.43**
(3) Stressful life events				.29**	.22**	.30**
(4) State anxiety					.44**	.74**
(5) Trait anxiety						.39**
(6) Episodic tension						–

Note. $N = 420$.
* $p < .05$.
** $p < .001$.

4. Discussion

Here, we examined associations between stress, anxiety, and belief in conspiracy theories. Our findings suggested that two separate indices of psychological stress were positively associated with belief in conspiracy theories once the effects of subjective social status and respondent age had been accounted for. Conversely, indices of anxiety were not significantly associated with belief in conspiracy theories once all other effects had been taken into account. Broadly speaking, our findings are consistent with theoretical discussions of the role that conspiracy theories play, particularly in terms of providing rational narratives of the world (Nefes, 2015). Below, we provide a fuller account of stress as a possible antecedent of belief in conspiracy theories.

Major world events, particularly those that are traumatic and emotive, are known to increase levels of stress (e.g., Goenjian et al., 2000). In addition to being stressful, such events also increase feelings of uncertainty, confusion, and existential threat (van Prooijen & Jostmann, 2013). In such a climate, some individuals may engage in sense-making processes aimed at restoring individual agency and a belief that the world is orderly and predictable (van Prooijen & Acker, 2015). In this view, some individuals may seek out and assimilate the sorts of all-encompassing explanations for events that conspiracy theories provide. By simplifying and by linking a series of events in relation to its supposed causes and effects, conspiracy theories may offer seemingly coherent explanations for distressing phenomena.

Of course, this view suggests that stressful events give rise to sense-making processes that favour conspiracy theories, whereas our data suggest that intra-individual subjective experiences of stress and the experience of negative life events are related to belief in conspiracy theories. Nevertheless, there may be parallels between the two pathways. For example, an individual experiencing stressful life events may begin to engage in cognitive patterns (e.g., seeing patterns in unrelated stimuli, making dispositional inferences about others; Sullivan et al., 2010; Whitson & Galinsky, 2008) that promote conspiracist ideation. Thus, stressful intra-individual life events may sometimes lead to a tendency to adopt a conspiracist mind-set. Once this worldview has become entrenched, other conspiratorial ideas are more easily assimilated and reinforced (Wood, Douglas, & Sutton, 2012).

Alternatively, it is not stress that is driving our findings, but rather threats to a sense of control (van Prooijen & Acker, 2015). That is, in

[1] We also repeated this analysis, including ethnicity and education in the first step of the regression with age and subjective social status. Neither of the former variables reached significance, either in the first or second steps of the regression. Stressful life events, age, and perceived stress remained the only significant predictors in the second step.

Work package ii

Does it take one to know one? Endorsement of conspiracy theories is influenced by personal willingness to conspire

Douglas and Sutton, 2011

June 14, 2022

Task: Read the abstract and summarize the main findings of the paper. Use additional material when available. Reflect what the findings imply with respect to potential interventions to misinformation and conspiracy theories.

Abstract

We advance a new account of why people endorse conspiracy theories, arguing that individuals use the social-cognitive tool of projection when making social judgments about others. In two studies, we found that individuals were more likely to endorse conspiracy theories if they thought they would be willing, personally, to participate in the alleged conspiracies. Study 1 established an association between conspiracy beliefs and personal willingness to conspire, that fully mediated a relationship between Machiavellianism and conspiracy beliefs. In Study 2, participants primed with their own morality were less inclined than controls to endorse conspiracy theories – a finding fully mediated by personal willingness to conspire. These results suggest that some people think "they conspired" because they think "I would conspire".

Discussion (Selection)

The present two studies were designed to test a new explanation for why people endorse conspiracy theories. Specifically, drawing on the literature on projection (e.g., Ames, 2004), we argued that people would be more likely to endorse conspiracy theories to the extent that they project their own willingness to conspire onto the alleged conspirators.

Zusammenfassung

Wir stellen eine neue Erklärung dafür vor, warum Menschen Verschwörungstheorien befürworten, indem wir argumentieren, dass Individuen das sozial-kognitive Instrument der Projektion nutzen, wenn sie soziale Urteile über andere. In zwei Studien haben wir

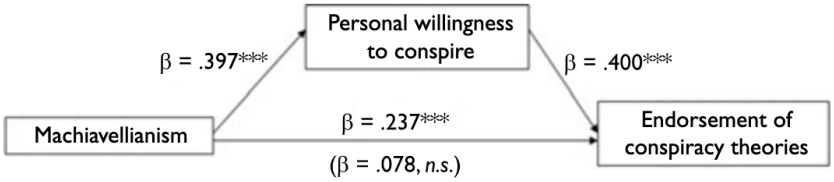

Figure 1. The association between Machiavellianism and endorsement of conspiracy theories is fully mediated by participants' personal willingness to conspire.

Figure 1: Figure from Douglas and Sutton, 2011.

herausgefunden, dass Personen Verschwörungstheorien eher zustimmen Verschwörungstheorien zustimmen, wenn sie glaubten, dass sie persönlich bereit wären, sich an den angeblichen Verschwörungen zu beteiligen. In Studie 1 wurde ein Zusammenhang zwischen Verschwörungsüberzeugungen und persönlicher Bereitschaft zur Verschwörung, die einen Zusammenhang zwischen Machiavellismus und Verschwörungsüberzeugungen. In Studie 2 waren die Teilnehmer, die mit ihrer eigenen Moral geprimt wurden, weniger geneigt Verschwörungstheorien zu befürworten - ein Ergebnis, das vollständig durch die persönliche Bereitschaft zur Verschwörung. Diese Ergebnisse deuten darauf hin, dass manche Menschen glauben, "sie hätten sich verschworen" weil sie denken, "ich würde mich verschwören".

Übersetzt mit www.DeepL.com/Translator (kostenlose Version)

References

Douglas, K. M., & Sutton, R. M. (2011). Does it take one to know one? Endorsement of conspiracy theories is influenced by personal willingness to conspire. *British Journal of Social Psychology*, *50*(3). https://doi.org/10.1111/j.2044-8309.2010.02018.x

Work package iii

Conspiracy mentality and political orientation across 26 countries

Imhoff et al., 2022

June 14, 2022

Task: Read the abstract and summarize the main findings of the paper. Use additional material when available. Reflect what the findings imply with respect to potential interventions to misinformation and conspiracy theories.

Abstract

People differ in their general tendency to endorse conspiracy theories (that is, conspiracy mentality). Previous research yielded inconsistent findings on the relationship between conspiracy mentality and political orientation, showing a greater conspiracy mentality either among the political right (a linear relation) or amongst both the left and right extremes (a curvilinear relation). We revisited this relationship across two studies spanning 26 countries (combined N=104,253) and found overall evidence for both linear and quadratic relations, albeit small and heterogeneous across countries. We also observed stronger support for conspiracy mentality among voters of opposition parties (that is, those deprived of political control). Nonetheless, the quadratic effect of political orientation remained significant when adjusting for political control deprivation. We conclude that conspiracy mentality is associated with extreme left- and especially extreme right-wing beliefs, and that this non-linear relation may be strengthened by, but is not reducible to, deprivation of political control.

Zusammenfassung

Menschen unterscheiden sich in ihrer allgemeinen Neigung, Verschwörungstheorien zu unterstützen (d. h. Verschwörungsmentalität). Frühere Untersuchungen ergaben widersprüchliche Ergebnisse über den Zusammenhang zwischen Verschwörungsmentalität und politischer Orientierung, die eine größere Verschwörungsmentalität entweder bei der politischen Rechten (eine lineare Beziehung) oder sowohl beim linken als auch beim rechten Rand (eine kurvenförmige Beziehung) zeigten. Wir haben diese Beziehung in zwei Studien aus 26 Ländern (insgesamt N=104.253) erneut untersucht und fanden insgesamt Belege sowohl für lineare als auch für quadratische Beziehungen, wenn auch in geringem

Umfang und in den verschiedenen Ländern unterschiedlich. Wir beobachteten auch eine stärkere Unterstützung der Verschwörungsmentalität unter den Wählern der Oppositionsparteien (d. h. derjenigen, die der politischen Kontrolle beraubt sind). Nichtsdestotrotz blieb der quadratische Effekt der politischen Orientierung signifikant, wenn man den Mangel an politischer Kontrolle berücksichtigt. Wir kommen zu dem Schluss, dass Verschwörungsmentalität mit linksextremen und insbesondere mit rechtsextremen Überzeugungen verbunden ist und dass diese nichtlineare Beziehung durch den Mangel an politischer Kontrolle verstärkt werden kann, aber nicht darauf zurückzuführen ist.

References

Imhoff, R., Zimmer, F., Klein, O., António, J. H. C., Babinska, M., Bangerter, A., Bilewicz, M., Blanuša, N., Bovan, K., Bužarovska, R., et al. (2022). Conspiracy mentality and political orientation across 26 countries. *Nature human behaviour*, 1–12.

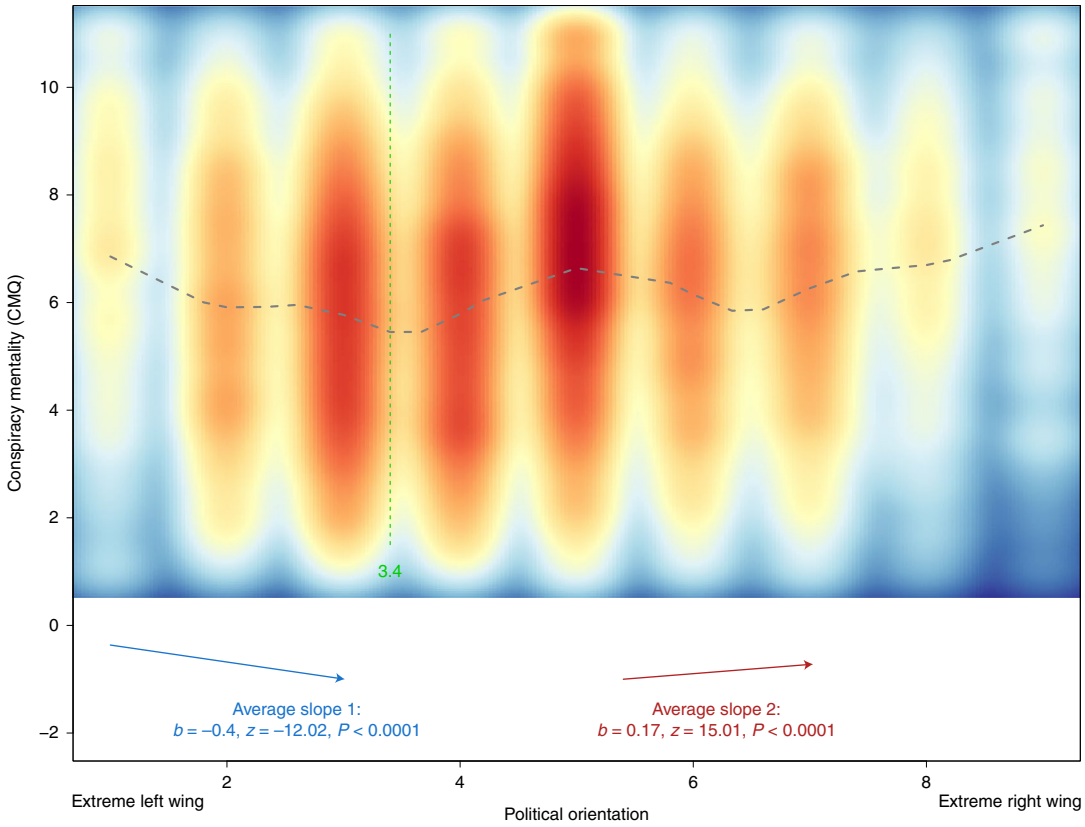

Fig. 3 | U-shaped relationship (tested with two-lines technique) of self-reported political orientation (raw) and conspiracy mentality in study 1 (*N* = 37,692). Higher density of data points is indicated by warmer colours (blue, no data points; red, a lot of data points). The dashed curve represents an unbiased but smoothed estimation of the mean at each position of the *x* axis. The dashed vertical line represents the break point from negative to positive slopes as estimated by the Robin Hood algorithm.

(sex, age and education) as control variables. Conspiracy mentality was higher for supporters of parties not in power, as well as for less educated people (with those who did not obtain a high-school degree scoring higher than those with a high-school degree, who in turn scored higher than people with a university degree), while sex and age showed inconsistent results (Table 1). Independent of these associations, however, the quadratic term of political orientation (and the linear one in study 1) remained incrementally valid predictors (Table 1). Thus, aggregated across countries, we found support for greater conspiracy mentality at the political extremes, independent of control deprivation or level of education.

On an exploratory basis, we also tested the idea that the effect of political orientation might be attenuated once the preferred party gains power. To do so, we predicted conspiracy mentality with the linear and quadratic terms of standardized political orientation, the coding of whether the preferred party was in power at time of data collection (with random slopes per country for all three variables) and their interaction. In study 1, there was no longer a main effect of party in power ($B = -0.139$, s.e. 0.108, $P = 0.208$, 95% CI −0.350 to 0.071), but an interaction with both the linear ($B = -0.184$, s.e. 0.038, $P < 0.001$, 95% CI −0.259 to −0.109) as well as the quadratic term of political orientation ($B = -0.092$, s.e. 0.026, $P < 0.001$, 95% CI −0.142 to −0.042). These interactions indicate that people at the far right are especially prone to conspiracy mentality when their party is not in power (Fig. 5). Study 2 largely replicated this exploratory finding, also in its shape (Fig. 6). The interaction with both the linear ($B = -0.164$, s.e. 0.029, $P < 0.001$, 95% CI −0.220 to −0.107) as well as the quadratic term of political orientation ($B = -0.138$, s.e. 0.022, $P < 0.001$, 95% CI −0.180 to −0.096) indicated a significant attenuation of the relation between political orientation and conspiracy mentality for supporters of parties in power. The relation to whether the voted party was in power became substantially weaker (albeit still significant) ($B = -0.497$, s.e. 0.186, $P = 0.017$, 95% CI −0.861 to −0.132).

Analyses based on voting intentions. To address the limitations of self-placement on a political orientation scale, we also inquired about respondents' party preferences by asking which political party they would vote or had voted for if there were an election. We used these hypothetical voting intentions (study 1) or the party that participants had voted for at the last national elections (study 2) to give participants three numerical indicators (general left–right, economic left–right and green alternative libertarian versus traditional authoritarian nationalistic (GAL–TAN)) of their political orientation corresponding to the party they indicated. For each of these (standardized) indicators, we repeated the multi-level analyses to test for linear and quadratic effects of political position on the general, economic and social left–right spectrum, while statistically controlling for sex, age, education and whether the preferred/voted party was in power (for detailed results, see Supplementary Table 17).

For the analyses based on the respective party's stance on the general left–right dimension, both studies suggested a small quadratic relationship to conspiracy mentality as well as a descriptive but non-significant positive linear relation mirroring the results for self-reported political orientation (Table 2). Following up on the quadratic relation with a two-lines technique (that ignores the nested structure of the data and does not include control variables) suggested two significant interrupted regression lines with a sign change, indicating a U-shaped relationship for both studies.

Work package iv

A systematic review and meta-analysis of psychological research on conspiracy beliefs: Field characteristics, measurement instruments, and associations with personality traits

Goreis and Voracek, 2019

June 14, 2022

Task: Read the abstract and summarize the main findings of the paper. Use additional material when available. Reflect what the findings imply with respect to potential interventions to misinformation and conspiracy theories.

Abstract

In the last decade, the number of investigations of the beliefs in conspiracy theories has begun to increase in the fields of social, differential, and experimental psychology. A considerable number of variables have been suggested as predictors of conspiracy beliefs, amongst them personality factors such as low agreeableness (as disagreeableness is associated with suspicion and antagonism) and high openness to experience (due to its positive association to seek out unusual and novel ideas). The association between agreeableness, openness to experience and conspiracy beliefs remains unclear in the literature. The present study reviews the literature of psychological studies investigating conspiracy beliefs. Additionally, the association between Big Five personality factors and conspiracy beliefs is analyzed meta-analytically using random-effects models. Ninety-six studies were identified for the systematic review. A comprehensive account of predictors, consequences, operationalization, questionnaires, and most prominent conspiracy theories is presented. For meta-analysis, 74 effect sizes from 13 studies were extracted. The psychological literature on predictors of conspiracy beliefs can be divided in approaches either with a pathological (e.g., paranoia) or socio-political focus (e.g., perceived powerlessness). Generally, there is a lack of theoretical frameworks in this young area of research. Meta-analysis revealed that agreeableness, openness to experience, and the remaining Big Five personality factors were not significantly associated with conspiracy beliefs if effect sizes are aggregated. Considerable heterogeneity in designs and operationalization characterizes the field. This article provides an overview of instrumentation, study designs, and current state of knowledge in an effort toward advancement and consensus in the study of conspiracy beliefs.

Zusammenfassung

In den letzten zehn Jahren hat die Zahl der Untersuchungen über den Glauben an Verschwörungstheorien in den Bereichen der Sozial-, Differenzial- und Experimentalpsychologie zugenommen. Eine beträchtliche Anzahl von Variablen wurde als Prädiktoren für Verschwörungsüberzeugungen vorgeschlagen, darunter Persönlichkeitsfaktoren wie niedrige Verträglichkeit (da Unverträglichkeit mit Misstrauen und Antagonismus assoziiert wird) und hohe Offenheit für Erfahrungen (aufgrund ihrer positiven Assoziation mit der Suche nach ungewöhnlichen und neuartigen Ideen). Der Zusammenhang zwischen Verträglichkeit, Offenheit für Erfahrungen und Verschwörungsglauben bleibt in der Literatur unklar. Die vorliegende Studie gibt einen Überblick über die Literatur zu psychologischen Studien, die Verschwörungsüberzeugungen untersuchen. Außerdem wird der Zusammenhang zwischen den Big-Five-Persönlichkeitsfaktoren und Verschwörungsüberzeugungen meta-analytisch mit Hilfe von Modellen mit zufälligen Effekten untersucht. Sechsundneunzig Studien wurden für die systematische Überprüfung identifiziert. Es wird ein umfassender Bericht über Prädiktoren, Konsequenzen, Operationalisierung, Fragebögen und die bekanntesten Verschwörungstheorien vorgelegt. Für die Meta-Analyse wurden 74 Effektgrößen aus 13 Studien extrahiert. Die psychologische Literatur zu Prädiktoren von Verschwörungsüberzeugungen lässt sich in Ansätze mit pathologischem (z. B. Paranoia) oder gesellschaftspolitischem Fokus (z. B. wahrgenommene Machtlosigkeit) unterteilen. Generell mangelt es in diesem jungen Forschungsbereich an theoretischen Rahmenwerken. Eine Metaanalyse ergab, dass Verträglichkeit, Offenheit für Erfahrungen und die übrigen Big-Five-Persönlichkeitsfaktoren nicht signifikant mit Verschwörungsüberzeugungen assoziiert sind, wenn man die Effektgrößen aggregiert. Das Feld ist durch eine beträchtliche Heterogenität in Bezug auf Design und Operationalisierung gekennzeichnet. Dieser Artikel gibt einen Überblick über die Instrumentierung, die Studiendesigns und den aktuellen Wissensstand, um einen Fortschritt und einen Konsens bei der Untersuchung von Verschwörungsüberzeugungen zu erreichen.

References

Goreis, A., & Voracek, M. (2019). A systematic review and meta-analysis of psychological research on conspiracy beliefs: Field characteristics, measurement instruments, and associations with personality traits. *Frontiers in Psychology*, *10*(FEB). https://doi.org/10.3389/fpsyg.2019.00205

Work package v

On the viability of conspiratorial beliefs

Grimes, 2016b and Grimes, 2016a

June 14, 2022

Task: Read the abstract and summarize the main findings of the paper. Use additional material when available. Reflect what the findings imply with respect to potential interventions to misinformation and conspiracy theories.

Abstract

Conspiratorial ideation is the tendency of individuals to believe that events and power relations are secretly manipulated by certain clandestine groups and organisations. Many of these ostensibly explanatory conjectures are non-falsifiable, lacking in evidence or demonstrably false, yet public acceptance remains high. Efforts to convince the general public of the validity of medical and scientific findings can be hampered by such narratives, which can create the impression of doubt or disagreement in areas where the science is well established. Conversely, historical examples of exposed conspiracies do exist and it may be difficult for people to differentiate between reasonable and dubious assertions. In this work, we establish a simple mathematical model for conspiracies involving multiple actors with time, which yields failure probability for any given conspiracy. Parameters for the model are estimated from literature examples of known scandals, and the factors influencing conspiracy success and failure are explored. The model is also used to estimate the likelihood of claims from some commonly-held conspiratorial beliefs; these are namely that the moon-landings were faked, climate-change is a hoax, vaccination is dangerous and that a cure for cancer is being suppressed by vested interests. Simulations of these claims predict that intrinsic failure would be imminent even with the most generous estimates for the secret-keeping ability of active participants—the results of this model suggest that large conspiracies (>1000 agents) quickly become untenable and prone to failure. The theory presented here might be useful in counteracting the potentially deleterious consequences of bogus and anti-science narratives, and examining the hypothetical conditions under which sustainable conspiracy might be possible.

Zusammenfassung

Unter konspirativem Gedankengut versteht man die Neigung des Einzelnen zu glauben, dass Ereignisse und Machtverhältnisse insgeheim von bestimmten geheimen Gruppen und Organisationen manipuliert werden. Viele dieser angeblich erklärenden Vermutungen sind nicht falsifizierbar, haben keine Beweise oder sind nachweislich falsch, dennoch ist die öffentliche Akzeptanz nach wie vor hoch. Bemühungen, die Öffentlichkeit von der Gültigkeit medizinischer und wissenschaftlicher Erkenntnisse zu überzeugen, können durch solche Darstellungen behindert werden, die in Bereichen, in denen die Wissenschaft gut etabliert ist, den Eindruck von Zweifeln oder Uneinigkeit erwecken können. Umgekehrt gibt es historische Beispiele für aufgedeckte Verschwörungen, und es kann für die Menschen schwierig sein, zwischen vernünftigen und zweifelhaften Behauptungen zu unterscheiden. In dieser Arbeit stellen wir ein einfaches mathematisches Modell für Verschwörungen auf, an denen mehrere Akteure beteiligt sind, und ermitteln die Wahrscheinlichkeit des Scheiterns einer bestimmten Verschwörung. Die Parameter für das Modell werden anhand von Literaturbeispielen bekannter Skandale geschätzt, und es werden die Faktoren untersucht, die den Erfolg und das Scheitern von Verschwörungen beeinflussen. Das Modell wird auch verwendet, um die Wahrscheinlichkeit von Behauptungen zu schätzen, die sich aus einigen weit verbreiteten konspirativen Überzeugungen ergeben, nämlich dass die Mondlandungen gefälscht wurden, dass der Klimawandel ein Schwindel ist, dass Impfungen gefährlich sind und dass ein Heilmittel für Krebs durch Interessengruppen unterdrückt wird. Simulationen dieser Behauptungen sagen voraus, dass selbst bei den großzügigsten Schätzungen für die Fähigkeit der aktiven Teilnehmer, Geheimnisse zu bewahren, ein Scheitern unmittelbar bevorsteht - die Ergebnisse dieses Modells legen nahe, dass große Verschwörungen (>1000 Agenten) schnell unhaltbar werden und zum Scheitern neigen. Die hier vorgestellte Theorie könnte nützlich sein, um den potenziell schädlichen Folgen von gefälschten und wissenschaftsfeindlichen Narrativen entgegenzuwirken und die hypothetischen Bedingungen zu untersuchen, unter denen eine nachhaltige Verschwörung möglich sein könnte.

Übersetzt mit www.DeepL.com/Translator (kostenlose Version)

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Grimes, D. R. (2016a). Correction: On the Viability of Conspiratorial Beliefs. *PLOS ONE*, *11*(3). https://doi.org/10.1371/journal.pone.0151003

Grimes, D. R. (2016b). On the viability of conspiratorial beliefs. *PLoS ONE*, *11*(1). https://doi.org/10.1371/journal.pone.0147905

for the conspirators ($p = 4.09 \times 10^{-6}$), we can apply the model outlined to several popular and enduring conspiracy theories and ascertain their viability with time. As discussed in the previous section, this estimate is intentionally optimistic for conspirators, and corresponds to a case where the average expected number of fatal leaks for a conspiracy is as low as roughly 4 in a million. In keeping with "best case scenario" estimates for conspiracies, we also neglect the upper figure of $p = 2.45 \times 10^{-4}$, which is roughly 60 times greater than the minimum projected probability of failure per conspirator per year as outlined in Table 1.

Results

Table 2 lists non-exhaustive estimations of the number of conspirators required for the anti-science belief outlined. Critically, the estimates for $N(t)$ shown here assume all scientists involved would have be aware of an active cover-up, and that a small group of odious actors would be unable to deceive the scientific community for long timescales; the rationale for this assumption is expanded further in the discussion section. In most of these cases, constant upkeep would be required to maintain secrecy, so $N(t) = N_o$. In the case of the NASA hoax conjecture, it could be argued that the conspiracy was a single-event fiction, and thus the Gompertzian population form in Eq 5 could apply. This is not a very realistic assumption, but is

Table 2. Non-exhaustive estimates of minimum numbers needed for conspiracy.

Conspiracy	Employed	Total
Moon-landing Hoax		
Peak NASA employment (1965) [40]	411,000	**411,000**
Climate-change fraud†		
American Geo-Physical Union [41]	62,000	
NASA (Current) [42]	58,000	
American academy for Advancement of Science [43]	120,000	
Royal Society Fellows [44]	16,000	
European Physical Society [45]	120,000	
Published Climate Scientists [46]	≈29,083	
Total		**≈405,000**
Vaccination Conspiracy*		
Centre for Disease Control (CDC) [47]	15,000	
World Health Organisation (WHO) [48]	7,000	
Total		**22,000**
Suppressed Cancer cure⋆		
Novartis	65,262	
Pfizer	116,500	
Roche	78,604	
Sanofi	105,000	
Merck and Co.	70,000	
Johnson and Johnson	122,200	
GlaxoSmithKline	99,000	
AstraZeneca	57,500	
Total		**≈714,000**

† Estimated from sample memberships of scientific organisations supporting AGW consensus.

* Assuming only major international public health bodies involved in cover-up.

⋆ Peak staff numbers for 8 top pharmaceutical companies.

doi:10.1371/journal.pone.0147905.t002

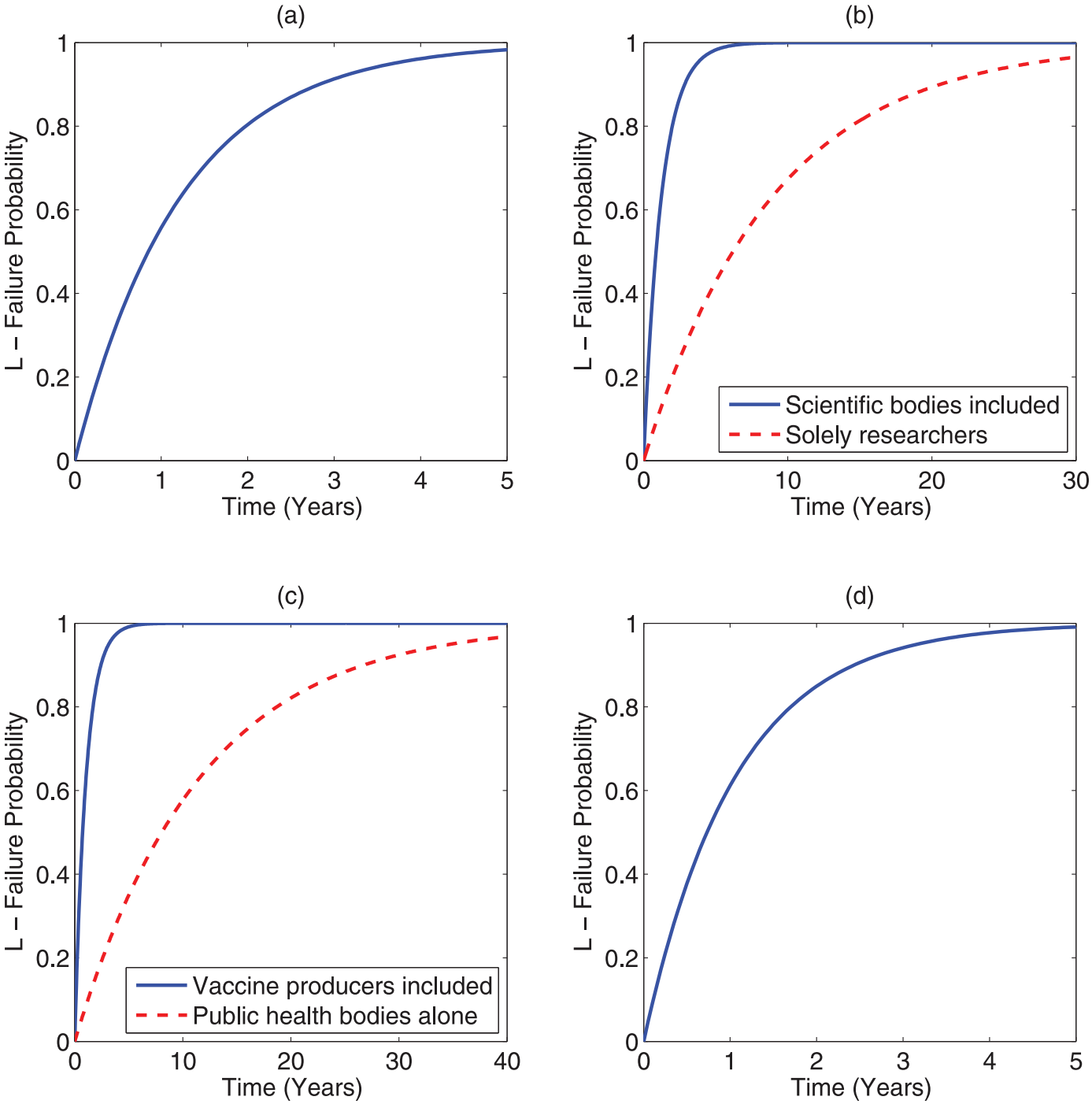


Fig 2. Failure curves for (a) NASA moon-landing hoax—results for both constant population and Gompertzian function are so close as to be non-resolvable visually (b) Climate change hoax—The blue solid line depicts failure probability with time if all scientific bodies endorsing the scientific consensus are involved, the red-dotted line presents the curve if solely active climate researchers were involved (c) Vaccination conspiracy—blue solid line showing failure probability with time for a combination of public health bodies and major drug manufacturers and the red-dotted line depicting case if only public health bodies were conspiring (d) Failure with time for a suppressed cancer cure conspiracy.

doi:10.1371/journal.pone.0147905.g002

Work package vi

The debunking handbook 2020

Lewandowsky et al., 2020

June 14, 2022

Task: Please describe how misinformation should be debunked according to the authors on the basis of a self-chosen conspiracy theory (e.g., 5GCoronavirus conspiracy theory).

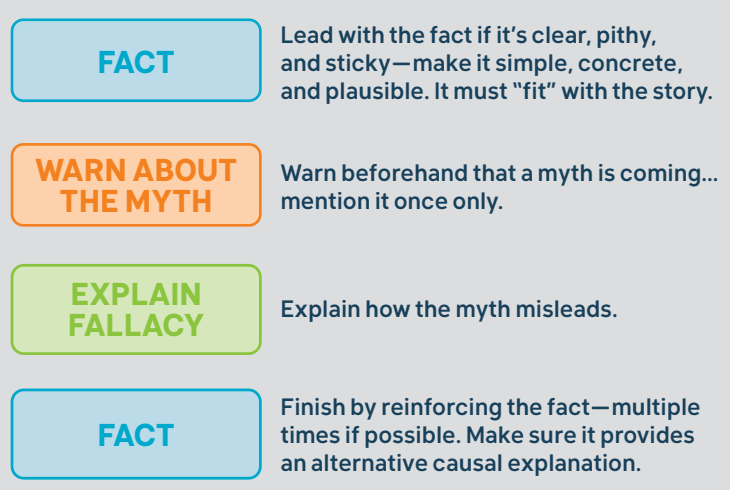
References

Lewandowsky, S., Cook, J., Ecker, U., Albarracin, D., Amazeen, M., Kendou, P., Lombardi, D., Newman, E., Pennycook, G., Porter, E., & al. (2020). *The debunking handbook 2020*. https://doi.org/10.17910/b7.1182

Debunk often and do it properly

Simple corrections on their own are unlikely to fully unstick misinformation. Tagging something as questionable or from an untrustworthy source is not enough in the face of repeated exposures.

Debunking is more likely to be successful if you apply the following 3 or 4 components:



FACT: State the truth first

If it's easy to do in a few clear words, state what is true first. This allows you to frame the message—you lead with your talking points, not someone else's.

The best corrections are as prominent (in the headlines, not buried in questions) as the misinformation.

Do not rely on a simple retraction ("this claim is not true").

Providing a factual alternative, that is an alternative that fills a causal "gap" in explaining what happened if the misinformation is corrected, is an effective method of debunking. Having a causal alternative facilitates "switching out" the inaccurate information in an individual's initial understanding and replaces it with a new version of what happened.

The alternative should not be more complex and should have the same explanatory relevance as the original misinformation [1, 80, 81].

There may, however, be circumstances in which the facts are so nuanced that they escape pithy summary. In those cases, it may be better to lead with an explanation of why the myth is false before explaining the facts.

MYTH: Point to misinformation

Repeat the misinformation, only once, directly prior to the correction. One repetition of the myth is beneficial to belief updating [27, 71, 82, 83].

But needless repetitions of the misinformation should be avoided: Although backfire effects are uncommon, we know that repetition makes information appear true [84, 85, 86].

Corrections are most successful if people are suspicious, or made to be suspicious, of the source or intent of the misinformation [87].

FALLACY: Explain why misinformation is wrong

Juxtapose the correction with the mistaken information. Ensure the rebuttal is clearly and saliently paired with the misinformation. It should be virtually impossible for the individual to ignore, overlook, or not notice the corrective element, even when skimming [27, 88, 89].

Rather than only stating that the misinformation is false, it is beneficial to provide details as to why. Explain (1) why the mistaken information was thought to be correct in the first place and (2) why it is now clear it is wrong and (3) why the alternative is correct [81, 90, 91]. It is important for people to see the inconsistency in order to resolve it [71, 83].

Such detailed corrections promote sustained belief change over time and protect against belief regression (i.e., a return to pre-correction beliefs [2, 52, 92]).

If possible, explain why the misinformation is wrong not only by providing a factual alternative but by pointing out logical or argumentative fallacies underlying the misinformation. A practical advantage of uncovering fallacies [66] is that they are not domain specific, and people can therefore benefit from the debunking in other content domains as well. Once you know that climate misinformation relies on cherry-picking [79] or incoherence [93], you may detect similar bad argumentation among anti-vaccination activists.

FACT: State the truth again

Restate the fact again, so the fact is the last thing people process.

Even with detailed refutations, the effects will wear off over time [3, 52], so be prepared to debunk repeatedly!

Example of a Refutation

FACT

Scientists observe human fingerprints all over our climate

The warming effect from greenhouse gases like carbon dioxide has been confirmed by many lines of evidence. Aircraft and satellites measure less heat escaping to space at the exact wavelengths that carbon dioxide absorbs energy. The upper atmosphere cools while the lower atmosphere warms—a distinct pattern of greenhouse warming.

Lead with the fact if it's clear, pithy, and sticky—make it simple, concrete, and plausible.

Provide a factual alternative that fills a causal "gap", explaining what happened if the misinformation is corrected.

Do not rely on a simple retraction ("this claim is not true").

MYTH

A common climate myth is that climate has always changed naturally in the past, therefore modern climate change must be natural also.

Warn that a myth is coming.

Repeat the misinformation, only once, directly prior to the correction.

FALLACY

This argument commits the single cause fallacy, falsely assuming that because natural factors have caused climate change in the past, then they must always be the cause of climate change.

This logic is the same as seeing a murdered body and concluding that people have died of natural causes in the past, so the murder victim must have also died of natural causes.

Explain how the myth misleads.

Point out logical or argumentative fallacies underlying the misinformation.

FACT

Just as a detective finds clues in a crime scene, scientists have found many clues in climate measurements confirming humans are causing global warming. Human-caused global warming is a measured fact.

Finish by reinforcing the fact.

Repeat the fact multiple times if possible.

Work package vii

Understanding and countering the spread of conspiracy theories in social networks: Evidence from epidemiological models of Twitter data

Kauk et al., 2021

June 14, 2022

Task: Read the abstract and summarize the main findings of the paper. Use additional material when available. Reflect what the findings imply with respect to potential interventions to misinformation and conspiracy theories.

Abstract

Conspiracy theories in social networks are considered to have adverse effects on individuals' compliance with public health measures in the context of a pandemic situation. A deeper understanding of how conspiracy theories propagate through social networks is critical for the development of countermeasures. The present work focuses on a novel approach to characterize the propagation of conspiracy theories through social networks by applying epidemiological models to Twitter data. A Twitter dataset was searched for tweets containing hashtags indicating belief in the "5GCoronavirus" conspiracy theory, which states that the COVID-19 pandemic is a result of, or enhanced by, the enrollment of the 5G mobile network. Despite the absence of any scientific evidence, the "5GCoronavirus" conspiracy theory propagated rapidly through Twitter, beginning at the end of January, followed by a peak at the beginning of April, and ceasing/disappearing approximately at the end of June 2020. An epidemic SIR (Susceptible-Infected-Removed) model was fitted to this time series with acceptable model fit, indicating parallels between the propagation of conspiracy theories in social networks and infectious diseases. Extended SIR models were used to simulate the effects that two specific countermeasures, fact-checking and tweet-deletion, could have had on the propagation of the conspiracy theory. Our simulations indicate that fact-checking is an effective mechanism in an early stage of conspiracy theory diffusion, while tweet-deletion shows only moderate efficacy but is less time-sensitive. More generally, an early response is critical to gain control over the spread of conspiracy theories through social networks. We conclude that an early response combined with strong fact-checking and a moderate level of deletion of problematic posts is a promising strategy to fight conspiracy theories in social networks. Results are discussed with respect to their theoretical validity and generalizability.

Zusammenfassung

Es wird davon ausgegangen, dass Verschwörungstheorien in sozialen Netzwerken negative Auswirkungen auf die Befolgung von Maßnahmen des öffentlichen Gesundheitswesens im Zusammenhang mit einer Pandemie haben. Ein tieferes Verständnis dafür, wie sich Verschwörungstheorien in sozialen Netzwerken verbreiten, ist entscheidend für die Entwicklung von Gegenmaßnahmen. Die vorliegende Arbeit konzentriert sich auf einen neuartigen Ansatz zur Charakterisierung der Verbreitung von Verschwörungstheorien in sozialen Netzwerken durch die Anwendung epidemiologischer Modelle auf Twitter-Daten. Ein Twitter-Datensatz wurde nach Tweets durchsucht, die Hashtags enthielten, die auf den Glauben an die "5GCoronavirus"-Verschwörungstheorie hinweisen. Diese besagt, dass die COVID-19-Pandemie eine Folge der Einführung des 5G-Mobilfunknetzes ist oder durch diese verstärkt wird. Trotz fehlender wissenschaftlicher Beweise verbreitete sich die "5GCoronavirus"-Verschwörungstheorie rasch über Twitter, beginnend Ende Januar, gefolgt von einem Höhepunkt Anfang April und einem Ende/Verschwinden etwa Ende Juni 2020. Ein epidemisches SIR-Modell (Susceptible-Infected-Removed) wurde mit akzeptabler Modellanpassung an diese Zeitreihe angepasst, was auf Parallelen zwischen der Ausbreitung von Verschwörungstheorien in sozialen Netzwerken und Infektionskrankheiten hinweist. Erweiterte SIR-Modelle wurden verwendet, um die Auswirkungen zu simulieren, die zwei spezifische Gegenmaßnahmen - Faktenüberprüfung und Löschung von Tweets - auf die Ausbreitung der Verschwörungstheorie gehabt haben könnten. Unsere Simulationen deuten darauf hin, dass die Überprüfung von Fakten ein wirksamer Mechanismus in einer frühen Phase der Verbreitung von Verschwörungstheorien ist, während die Löschung von Tweets nur eine mäßige Wirksamkeit zeigt, aber weniger zeitabhängig ist. Generell ist eine frühzeitige Reaktion entscheidend, um die Verbreitung von Verschwörungstheorien in sozialen Netzwerken zu kontrollieren. Wir kommen zu dem Schluss, dass eine frühzeitige Reaktion in Kombination mit einer strengen Faktenüberprüfung und einer moderaten Löschung problematischer Beiträge eine vielversprechende Strategie zur Bekämpfung von Verschwörungstheorien in sozialen Netzwerken ist. Die Ergebnisse werden im Hinblick auf ihre theoretische Gültigkeit und Verallgemeinerbarkeit diskutiert.

Übersetzt mit www.DeepL.com/Translator (kostenlose Version)

References

Kauk, J., Kreysa, H., & Schweinberger, S. R. (2021). Understanding and countering the spread of conspiracy theories in social networks: Evidence from epidemiological models of Twitter data (S. Cresci, Ed.). *PLOS ONE*, *16*(8), e0256179. https://doi.org/10.1371/JOURNAL.PONE.0256179

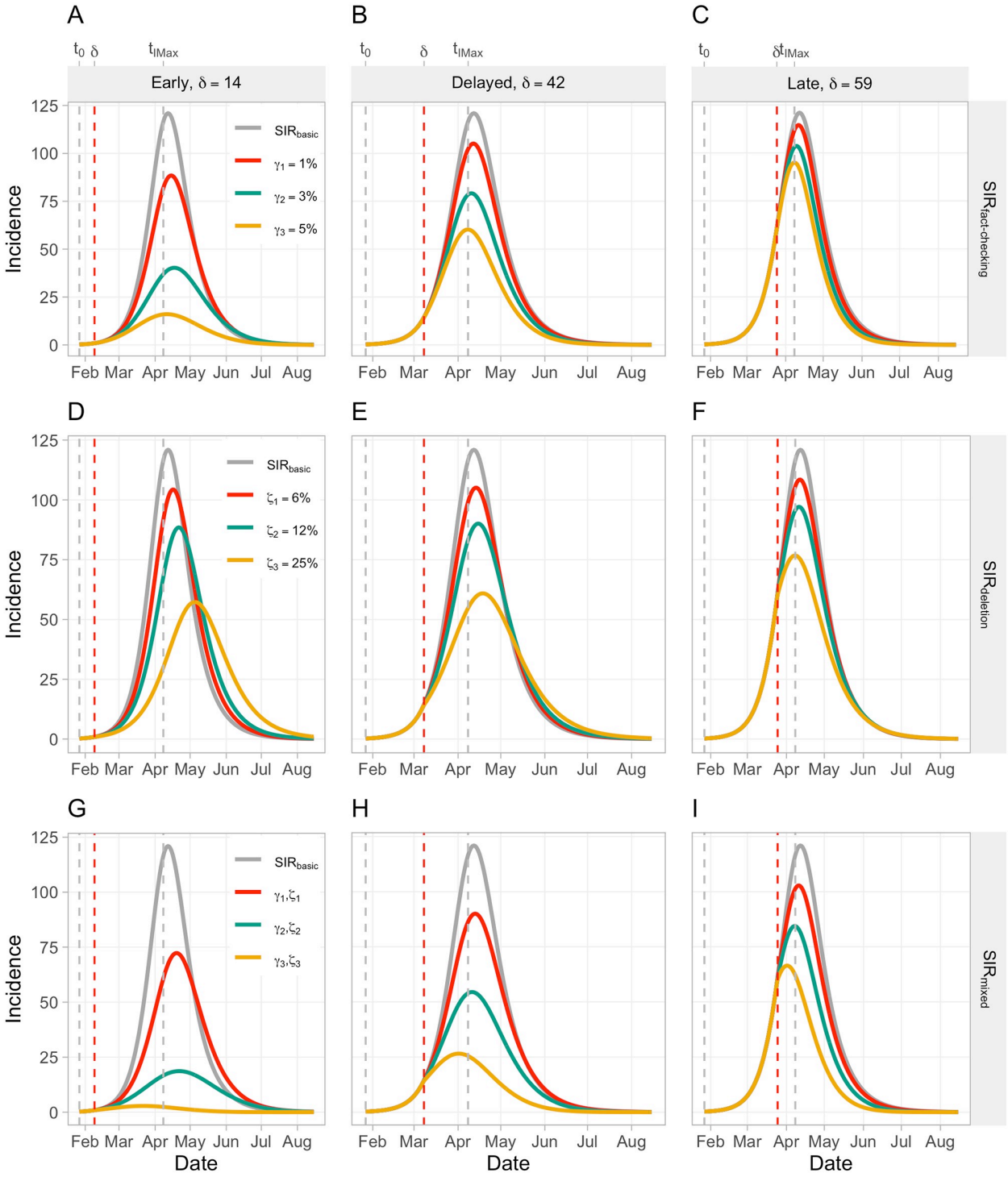


Fig 2. Predicted incidence over time across different extended SIR models and parameters. Note that different levels of δ are depicted column-wise, while different extended SIR models are depicted row-wise. Different levels of γ and ζ vary within each panel A-I. Please also note that, in the interest of simplicity, only corresponding parameter combinations, i.e. (γ_1, ζ_1), (γ_2, ζ_2) and (γ_3, ζ_3), are depicted.

https://doi.org/10.1371/journal.pone.0256179.g002