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Reactance against Anti-COVID Regulations – a Systematic Review

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Abstract

Objective: During the COVID-19 pandemic, many individuals perceived a threat to their freedom due to government-imposed restrictions on specific behaviors, motivating them to take actions against these limitations. The Reactance Theory (Brehm, 1981) proved valuable in explaining the motivation of these individuals to resist anti-COVID regulations. Numerous studies have been published, demonstrating that experiencing reactance against anti-COVID policy leads to actions contradictory to these measures. This article aims to describe a systematic review of studies examining the relationship between regulations aimed at limiting the pandemic and reactance to these actions.

Method: The review included works from the EBSCO, Web of Science, and Scopus databases, measuring reactance as a state or trait, along with variables directly related to combating the COVID-19 pandemic.

Results: The literature review identified 59 studies on the relationship between anti-COVID regulations and reactance to these actions. An analysis of the characteristics of the studied populations, research methodology, and obtained results was conducted. The study outlined persuasive measures encouraging actions in line with government recommendations that intensify or reduce reactance, as well as those that do not influence it. Furthermore, it described various relationships between reactance (trait and state against regulations) and the willingness to comply with anti-COVID regulations.

Conclusion: The presented literature review identified determinants of experiencing a state of reactance against anti-COVID regulations and described relationships between reactance and the effectiveness of these regulations. The results of the review may aid in designing future regulations aimed at combating epidemics.

Keywords: reactance, freedom threat, COVID-19 pandemic, protective measures, vaccinations

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The COVID-19 pandemic, caused by the SARS-CoV-2 virus, posed a significant threat to humanity, resulting in profound health, social, and economic consequences. To mitigate the pandemic, protective measures were implemented to reduce infection risks, including social isolation (e.g., social distancing, quarantine), hand hygiene (e.g., sanitizer use), face coverings (e.g., mask-wearing), virus testing, and COVID-19 vaccination (Pradhan et al., 2022). Introducing these protective measures proved effective in limiting the spread of COVID-19. However, efforts to encourage compliance with these regulations led to resistance among population segments, significantly complicating pandemic control. Scientists have sought to understand and examine the reasons for this phenomenon, often relying on psychological theories, with reactance theory being a frequently utilized framework.

Reactance

According to reactance theory, when something threatens individuals' behavioral freedom, they experience psychological reactance – a motivational state to restore freedom (Brehm & Brehm, 1981). This state involves aversive arousal, encompassing feelings of anger and negative beliefs about the source of freedom restriction (Dillard & Shen, 2005). The impact of freedom threat on reactance intensifies when: 1) restoring freedom is challenging; 2) restrictions are perceived as unjust; 3) the threatened activity is significant for the individual; 4) numerous freedoms are at stake; 5) the goals of the restricting entity (e.g., persuasive efforts) are easily identifiable (Brehm & Brehm, 1981; Rosenberg & Siegel, 2018). These characteristics relate to the implementation of protective measures in combating the pandemic. For example, quarantine was government-controlled (difficult to evade), perceived as unfair (when individuals under quarantine showed no disease symptoms), restricted contact with family (valued activity), limited various activities (numerous limited freedoms) and officially enforced (identifiable actions of authorities).

People vary in their predisposition to experience reactance, i.e., perceiving the same stimuli as threats to their freedom. Therefore, reactance can be considered and measured as a trait (Rosenberg & Siegel, 2018), often employing Hong's Psychological Reactance Scale (Hong & Faedda, 1996). Previous studies have shown that individuals with a dispositional tendency to experience reactance exhibit a stronger reactance state against health recommendations, leading to non-compliance (Reynolds-Tylus, 2019).

Reactance is operationalized not only as a state and trait but also indirectly as resistance to persuasive messages encouraging specific behaviors (Brehm & Brehm, 1981; Rosenberg & Siegel, 2018). A behavioral indicator of this resistance may be engaging in behavior whose freedom has been restricted, termed the boomerang effect. For example, in DeFranza et al.'s study (2021), an indicator of resistance to regulations limiting leaving the house was an increase in PM2.5 particulate matter associated with traffic intensity in the area. Resistance indicators may also include attacking sources of restrictions, changing attitudes

toward those sources, the intention to engage in restricted behavior, or increasing the perceived attractiveness of such behavior. In Sakai et al.'s study (2021), an indicator of resistance to lockdown was the future desire to leave the house after restrictions were lifted.

Study Aim

Since the beginning of the COVID-19 pandemic, numerous studies have examined how reactance may hinder the implementation of anti-COVID regulations. These studies are of great practical importance, as their findings can help reduce reactance in health communication, encouraging effective pandemic control. Therefore, studies on reactance against anti-COVID regulations were systematically reviewed. The review aims to analyze the described studies in terms of the characteristics of the studied populations, research methodologies, and obtained results. The main research questions addressed in the context of conducted studies on reactance to pandemic regulations are as follows: 1. What are the determinants of experiencing a reactance state against anti-COVID regulations?; 2. What relationships exist between reactance (trait and state) and willingness to comply with anti-COVID regulations? Additional research questions pertain to describing the studied populations' characteristics and how reactance is operationalized.

Method

A systematic literature review was conducted in several stages. Initially, criteria for including research papers in the review were established. Assuming that resistance to persuasive messages is an indirect indicator of reactance, the review would include any work that considered persuasive messages encouraging actions against COVID-19. Due to the overly inclusive and ambiguous nature of including studies examining the effectiveness of persuasive messages encouraging adherence to protective behaviors, the decision was made to include only those works in which reactance was directly measured as a trait or state. Consequently, the review will be limited solely to self-report data and will not consider behavioral forms of resistance to anti-COVID regulations, constituting the consequence of experiencing reactance (Rosenberg & Siegel, 2018). Furthermore, it was decided to include in the review only those works that examined variables directly related to fighting the pandemic (adherence to protective behaviors, COVID-19 vaccination, compliance with government regulations). The analysis did not include studies examining indirect indicators of the effectiveness of anti-COVID regulations, such as the perceived effectiveness of persuasive messages encouraging adherence to protective behaviors or pandemic fatigue (e.g., Chen, Yu, & Cao, 2022). In summary, the analysis included studies

that simultaneously measured: 1) reactance as a state or trait; 2) variables directly related to the fight against the COVID-19 pandemic.

The next stage of the literature review was to determine the keywords entered into scientific databases. It was decided to use simple sets of words that generate a larger number of results but simultaneously limit the risk of omitting works that meet the inclusion criteria. Three pairs of English words were entered into the database search engines: a) reactance, COVID-19; b) reactance, coronavirus; c) reactance, SARS-CoV-2. These word sets generated the following number of results (as of June 13, 2023) for each database: EBSCO: a) 108; b) 15; c) 3; Web of Science: a) 136; b) 15; c) 4; SCOPUS: a) 114; b) 36; c) 25. After removing duplicates, a total of 153 items were identified. From this set, applying the inclusion criteria for the review, a total of 49 scientific articles describing 59 studies were selected. The articles included in the review are presented in alphabetical order in Table 1. The table provides the first author's surname, publication year, the size of the study sample, the percentage of female participants, the average age of the study participants, the operationalization method of reactance, independent variables for reactance, dependent variables for reactance, and a summary of the main findings of the studies related to the objectives of this review.

Analysis and Discussion

Below is presented the analysis of a systematic review of 59 studies on reactance against anti-COVID regulations, along with its discussion, encompassing the following aspects: sample characteristics (country, sample size, age, and gender), operationalization of variables (reactance, independent and dependent variables), and a summary of research results regarding the relationships between reactance (state and trait) and the effectiveness of anti-COVID regulations, as well as determinants of experiencing state reactance. All analyzed studies were conducted online, presumably due to the constraints of conducting research during pandemic restrictions.

Most of the analyzed studies were conducted in the USA (33). Other countries where studies were conducted include Germany (7), the United Kingdom (4), Australia (3), Canada (2), France (2), Austria (2), Turkey (2), the Netherlands (1), South Korea (1), Hong Kong (1), Saudi Arabia (1), Pakistan (1), and Poland (1). The review of their locations indicates the dominance of countries with an individualistic culture, which may influence the observation of greater reactance processes in these countries compared to countries with a collectivist culture (Jonas et al., 2009).

Sample sizes varied from 142 to 5305 participants (average = 763), with a total of 45,033 individuals examined. The proportion of women in individual samples ranged from 21% to 85% (median 51%), with an average of 54%. Both the median and mean age of the participants were approximately 39.5 years. The demographic characteristics of the studied population suggest that the obtained results are representative in terms of gender and age.

Table 1

Review of studies on the relationship between reactance and compliance with COVID-19 pandemic policies, Part 1

Authors	Year	Country	N	F%	Age	Reactance	Independent Variables	Dependent Variables	Summary of Results
Albarracin et al. (study 3)	2021	USA	357	51	37.48	trait	manipulation: mandatory vaccinations (vs. encouragement vs. control of freedom of choice), norms (30% vs. 70% of people support vaccination)	intention to get vaccinated	1[a]. no significant interaction of reactance with vaccination duty and norms; 2. in the condition of 30% supporting vaccinations, individuals with low reactance showed no impact of vaccination duty on intention, while those with high reactance experienced an increase in the intention to get vaccinated; 3. with an increase in reactance, the intention to get vaccinated decreased
Albarracin et al. (study 4)			606	51	50.63		manipulation: mandatory vaccination (vs. encouragement))	intention to get vaccinated; perceived benefits of vaccination, perceived vaccination norms, perceived fairness of vaccinations, perceived moral obligation to vaccinate	1. no interaction of reactance with manipulation on the intention to get vaccinated; 2. with an increase in reactance, the perceived moral obligation to get vaccinated, perceived vaccination norms, and perceived fairness of vaccinations decreased; 3. no significant relationship between reactance and the intention to get vaccinated or perceived benefits of vaccination

Continuation of table 1

Authors	Year	Country	N	F%	Age	Reactance	Independent Variables	Dependent Variables	Summary of Results
Ball & Wozniak	2022	USA	298	73	39.61	state (anger and negative beliefs)	pandemic validity, fatigue from news about the pandemic	declared adherence to hygiene practices, declared adherence to social distancing	1. with an increase in the importance of the pandemic and fatigue from pandemic news, reactance increased; 2. with an increase in reactance, adherence to hygiene and social distancing decreased
Bigsby & Morrow	2022	USA	224	–	39.04	trait, state (towards messages encouraging protective behaviors)	manipulation: message threat (low vs. high), effectiveness of protective behavior (vs. lack), increasing one's own effectiveness (vs. lack)	intention to wear masks, intention to wash hands	1. no influence of manipulation on reactance-state; 2. reactance-trait positively correlated with reactance-state but did not correlate with the intention to wear masks and wash hands; 3. with an increase in reactance-state, the intention to wear masks and wash hands decreased
Bokhari & Shahzad	2022	Saudi Arabia	604	56	–	trait	–	declared adherence to various protective behaviors	1. with an increase in reactance, the frequency of handwashing increased; 2. no significant dependencies with other variables
Böhm & Orth (study 2)	2022	Germany	236	73	32.81	state (anger and threat to freedom)	–	intention to revaccination	1. with an increase in reactance, the intention to receive additional vaccinations decreased

Continuation of table 1

Authors	Year	Country	N	F%	Age	Reactance	Independent Variables	Dependent Variables	Summary of Results
Clarke et al. (study 1)	2021	Australia	451	48	32.12	state (towards pandemic restrictions; negative emotions)	aggression, submission, dominance, conventionalism, anti-egalitarianism	support for pandemic restrictions	1. with an increase in submission (b1 and b2) and a decrease in dominance (b1 and b2), conventionalism (b2), and anti-egalitarianism (b2), reactance decreased; 2. with an increase in reactance, support for pandemic restrictions decreased (b1 and b2)
Clarke et al. (study 2)			838	50	31.50				
Chen et al.	2022	Pakistan	491	73	–	trait	social distance, spatial distance, temporal distance	declared adherence to protective behaviors intention to wear a mask	1. with an increase in social, spatial, and temporal distance, reactance increased; 2. with an increase in reactance, declared adherence to protective behaviors increased (doubts about the result)
Chung & Kim	2023	USA	776	60	–	state (threat to freedom)	idealism, relativism	intention to wear a mask	1. with an increase in relativism and a decrease in idealism, reactance increased; 2. with an increase in reactance, the intention to wear a mask decreased
Courtice et al.	2023	Canada	1527	82	45.59	trait	–	frequency of mask-wearing in the last week; attitude towards the obligation to wear masks	1. the relationship between reactance and the frequency of mask-wearing was insignificant; 2. with an increase in reactance, a positive attitude towards the obligation to wear masks decreased (after May 20, 2020; before May 20, the relationship was insignificant)

Continuation of table 1

Authors	Year	Country	N	F%	Age	Reactance	Independent Variables	Dependent Variables	Summary of Results
Diaz & Cova (study 1a)	2022	USA	228	43	39.47	trait	–	number of breaks in quarantine (1a, 1b), past & future efforts to comply with recommendations (1a, 1b, 2a, 2b), not going to an event due to fear of getting sick (2a, 2b)	1. with an increase in reactance, past and future efforts to comply with official recommendations increased (1a, 1b, 2a, 2b); 2. the relationships between reactance and the number of breaks in quarantine and not attending events due to fear of getting sick were insignificant
Diaz & Cova (study 1b)			273	49	46.57				
Diaz & Cova (study 2a)		France	289	57	42.67				
Diaz & Cova (study 2b)			287	50	40.80				
Dillard et al.	2021	USA	681	55	19.66	state (towards a campaign encouraging mask-wearing, anger, critical beliefs)	descriptive norms against mask-wearing, prescriptive norms against mask-wearing, campaign duration, political views	mask-wearing in the last week	1. with an increase in descriptive norms against mask-wearing, prescriptive norms against mask-wearing, campaign duration, and with intensified conservative views, reactance increased; 2. with an increase in reactance, the frequency of mask-wearing in the last week decreased
Doğan	2021	Turkey	463	55	–	trait	–	declared adherence to protective behaviors	1. with an increase in reactance, adherence to protective behaviors decreased

Continuation of table 1

Authors	Year	Country	N	F%	Age	Reactance	Independent Variables	Dependent Variables	Summary of Results
Drążkowski & Trepanowski; Trepanowski & Drążkowski	2022	Poland	551	50	45.34	trait	–	intention to get vaccinated, norms, attitude, perceived control over getting vaccinated	1. with an increase in reactance, social norms, positive attitude, perceived control over vaccination, and intention to get vaccinated decreased
Gerace et al.	2022	USA	332	21	45.42	trait	–	declared adherence to restrictions	1. with an increase in reactance, adherence to restrictions decreased
Gillman et al.	2022	USA	600	51	32.55	state (questioning the message, inducing threat, feeling anger towards the message, credibility of the message, attitude towards the message)	manipulation: self-affirmation (on values vs. on health vs. none), orientation of health message (on others vs. on participants)	intention to get vaccinated, intention to adhere to protective behaviors, willingness to test for COVID-19	1. lower levels of message questioning when the message was oriented towards others (vs. participants); 2. lower levels of message questioning when the message was oriented towards participants who engaged in health self-affirmation (vs. values); 3. other effects of manipulation on various reactance indicators were insignificant; 4. no information on the relationship between reactance and dependent variables

Continuation of table 1

Authors	Year	Country	N	F%	Age	Reactance	Independent Variables	Dependent Variables	Summary of Results
Guan et al.	2023	USA	744	51	45.63	state (anger, creating counterarguments to pandemic messages)	fatigue from news about the pandemic	intention to wear masks, intention to practice social distancing, intention to wash hands, intention to seek information about COVID-19	1. with an increase in pandemic news fatigue, reactance decreased; 2. with an increase in reactance, the intention to wear masks, practice social distancing, and wash hands decreased; 3. insignificant relationship between reactance and the intention to seek information about COVID-19
Hamerman et al. (study 1)	2021	USA	312	38	37.0	trait	–	compliance with health recommendations	1. with an increase in reactance, the intention to comply with health recommendations decreased
Hamerman et al. (study 2)			253	40	36.6		manipulation: requirements (vs. recommendations) for mask-wearing	intention to wear masks	1. insignificant interaction of reactance with experimental manipulation; 2. insignificant relationship between reactance and the intention to wear masks
Henkel et al.	2023	Germany Austria	5305	51 53	44.5 51.3	state (anger, attitude towards vaccination obligation)	manipulation: vaccination obligation (vs. voluntary); vaccination status; identification with vaccination status	intention to engage in actions against mandatory vaccinations (signing petitions, demonstrations, mobilizing others, avoiding vaccinations)	1. mandatory vaccination manipulation led to an increase in reactance; 2. stronger identification with vaccination status and being vaccinated were associated with lower reactance; 3. with an increase in reactance, the intention to engage in actions against mandatory vaccinations increased

Continuation of table 1

Authors	Year	Country	N	F%	Age	Reactance	Independent Variables	Dependent Variables	Summary of Results
Huang & Liu	2022	USA	382	55	38.08	state (anger, creating counterarguments to messages)	manipulation: message type (losses vs. benefits), message source (local vs. nationwide), uncertainty (low vs. high)	intention to get vaccinated	1. loss-framed message (vs. benefits) led to an increase in anger; 2. no impact of message type manipulation on creating counterarguments; 3. for individuals with low uncertainty, a loss-framed message led to an increase in reactance; 4. with an increase in reactance, the intention to get vaccinated decreased
Horner et al.	2021	USA	411	47	32.07	trait	perceived threat of COVID-19; manipulation: threat (mortality vs. COVID-19 reminder vs. control), message orientation (autonomy vs. control vs. neutral)	intention to adhere to protective behaviors	1. with an increase in reactance, the intention to adhere to protective behaviors decreased; 2. this relationship was significant only among individuals perceiving a low threat associated with COVID-19
Kang et al.	2021	South Korea	324	54	41.00	state (negative beliefs about the message)	manipulation: normative messages (descriptive vs. prescriptive)	attitude towards wearing masks in restaurants and limiting conversations	1. manipulation with messages did not affect reactance; 2. with an increase in reactance, a positive attitude towards wearing masks in restaurants and limiting conversations decreased

Continuation of table 1

Authors	Year	Country	N	F%	Age	Reactance	Independent Variables	Dependent Variables	Summary of Results
Kleitman et al.	2023	Australia	582	58	34.68	trait	-	attitude and willingness to get revaccinated	1. with an increase in reactance, the attitude and willingness to get revaccinated decreased.
Knapp et al.	2021	USA	301	77	35.88	state (perceived freedom restriction, aggressive intentions, negative beliefs)	manipulation: restriction orientation (individual vs. community); political orientation, sense of community, pandemic-related financial stress, income, gender	declared practice of social distancing	1. no impact of manipulation on reactance; 2. in the condition where restrictions were oriented towards the individual, an increase in financial stress led to an increase in reactance; 3. with an increase in psychological sense of community and degree of liberalism, reactance decreased; 4. no significant relationship between income and gender with reactance; 5. with an increase in reactance, declared practice of social distancing increased
Kriss et al.	2022	USA	371	63	20.73	state (anger, negative beliefs about vaccinations)	manipulation: threat (direct vs. indirect), sanctions (present vs. absent); political ideology	attitude towards vaccination requirements	1. reactance was higher in the condition with sanctions (vs. without sanctions); 2. no significant effect of threat on reactance; 3. in the condition with sanctions, reactance was higher when the threat was indirect (vs. direct); 4. with an increase in conservatism, reactance increased; 5. with an increase in reactance, a positive attitude towards vaccination requirements decreased

Continuation of table 1

Authors	Year	Country	N	F%	Age	Reactance	Independent Variables	Dependent Variables	Summary of Results
Kulcar et al.	2022	Austria Germany	614	70	23.25	state (threat to freedom)	–	attitude towards vaccinations, compliance with restrictions	1. with an increase in reactance, a positive attitude towards vaccinations and compliance with restrictions increased
Krpan & Dolan (study 2)	2022	UK	1719	63	41.13	state (anger, negative beliefs, threat to autonomy, and others)	manipulation: commands (vs. encouragement vs. control)	execution of recommended behaviors, intention to engage in these behaviors	1. commands led to an increase in reactance; 2. with an increase in reactance, declared execution of recommended behaviors and intention for recommended behavior decreased (a complex pattern of results)
Krpan & Dolan (study 3)			1969	68	37.05				
Lee et al.	2023	USA	1000	50	46.2	state (towards regulations; negative beliefs)	–	intention to get vaccinated again	1. increasing reactance was associated with a decrease in the intention to get vaccinated again
Luo et al.	2021	USA	201	–	–	state (towards wearing masks in stores; negative beliefs, anger, freedom threat)	manipulation: mask mandate in stores (vs. voluntary), language (thanking vs. apologizing)	intention to wear masks in stores	1. when thanked for wearing masks, the obligation (vs. voluntariness) to wear them generated less reactance; 2. however, an increase in reactance was linked to a decreased intention to wear masks

Continuation of table 1

Authors	Year	Country	N	F%	Age	Reactance	Independent Variables	Dependent Variables	Summary of Results
Lu & Sun	2022	USA	465	52	41.62	state (towards a post encouraging vaccination; negative beliefs, anger)	manipulation: comments (for vaccinations vs. against), emoticons (positive vs. negative); perceived evaluation of the message by others and assessment of the message's effectiveness	reluctance to get vaccinated	1. posts encouraging vaccination with comments against vaccination led to an increase in reactance; 2. positive emoticons resulted in lower reactance when comments supported vaccination (vs. opposed it); 3. no significant impact of negative comments on reactance was observed; 4. as the perceived positive evaluation of the message by others and the effectiveness of the message increased, reactance decreased; 5. an increase in reactance was associated with a greater reluctance to vaccination
Lu, Sun, & Oktavianus	2022	USA	413	45	39.76	state (towards a post encouraging mask-wearing; negative beliefs, anger)	manipulation: comments (for masks vs. against), tone of comments (censorious vs. not); anger towards comments; perceived evaluation of the message by others	intention to wear masks	1. uncensored posts (vs. censored) and posts supporting mask-wearing (vs. opposing) increased reactance towards the post; 2. an increase in anger towards comments was linked to higher reactance; 3. perceived evaluation of the post by others had no significant effect; 4. an increase in reactance was associated with a decreased intention to wear masks

Continuation of table 1

Authors	Year	Country	N	F%	Age	Reactance	Independent Variables	Dependent Variables	Summary of Results
Ma & Miller	2021	USA	207	35	35.59	state (negative beliefs, anger, freedom threat, counterarguments, questioning the message)	manipulation: attribution of blame for spreading (virus vs. people), reference point (self vs. self-others)	intention to adhere to protective behaviors	1. attributing the cause of covid-19 infection to the virus (vs. people) led to an increase in reactance; 2. no significant impact of the reference point on reactance was observed; 3. an increase in reactance was associated with a decreased intention to adhere to protective behaviors
Ma & Miller	2022	USA	447	51	41.68	state (negative beliefs, anger)	manipulation: eliciting fear (vs. none), eliciting disgust (vs. none), language control (low vs. high)	intention to get vaccinated	1. eliciting fear, disgust, and high language control (orders) led to an increase in reactance; 2. an increase in reactance was associated with a decreased intention to get vaccinated
Mallinas et al. (study 2)	2021	USA	372	44	–	trait and state combined into one factor	–	attitudes toward wearing masks and against it	1. with increasing reactance, the attitude against wearing masks increased; 2. no significant relationship between reactance and the attitude in favor of wearing masks
Massey et al.	2022	USA	1004	50	–	state (towards messages; negative beliefs, anger, threat to freedom)	manipulation: threat (smoking vs. COVID-19 vs. smoking and COVID-19 vs. none)	intention to adhere to protective behaviors	1. no impact of experimental manipulation on reactance; 2. lack of information about the relationship between reactance and the intention to adhere to protective behaviors

Continuation of table 1

Authors	Year	Country	N	F%	Age	Reactance	Independent Variables	Dependent Variables	Summary of Results
McGuire &Ball	2022	USA	220	68	31.81	state (anger, negative beliefs)	–	intention to adhere to protective behaviors	1. with increasing reactance, the intention to adhere to protective behaviors decreased
Pavey et al. (study 1)	2023	UK	142	85	–	state (sense of resistance to messages)	manipulation: order to comply with restrictions vs. prohibition of non-compliance with restrictions; perceived legitimacy of restrictions	intention to adhere to restrictions	1. the manipulation (main effects) had no impact on reactance; 2. with increasing legitimation of restrictions, reactance decreased; 3. when perceived legitimacy of restrictions was high, reactance was lower when disobedience was prohibited than when compliance was mandated (study 2); 4. with increasing reactance, the intention to adhere to restrictions decreased
Pavey et al. (study 2)			307	49	42.36				
Reinhardt & Rossmann	2021	Germany	281	51	50.1	state (towards messages; negative beliefs, anger, threat to freedom)	manipulation: message focused on benefits (vs. losses) of vaccination; age	attitudes toward vaccination; intention to get vaccinated	1. no impact of manipulation on reactance; 2. reactance decreased with increasing age; 3. no information on the correlation of reactance with dependent variables
Resnicow et al.	2021	USA	1074	55	–	trait	–	declared adherence to protective behaviors; restriction of going out	1. with increasing reactance, the declared adherence to protective behaviors decreased, and the number of outings outside the home increased

Continuation of table 1

Authors	Year	Country	N	F%	Age	Reactance	Independent Variables	Dependent Variables	Summary of Results
Salali et al.	2022	Turkey	1013	67	35.95	trait	manipulation: information about vaccination coverage (control vs. 30% vs. 60% vs. 90%)	intention to get vaccinated	1. with increasing reactance, the intention to vaccinate decreased; 2. reactance did not moderate the impact of manipulation on vaccination intentions
Smith et al.	2021	USA	976	67	49.27	trait	–	intention to adhere to protective behaviors	1. with increasing reactance, the intention to adhere to protective behaviors decreased
Sprengholz, Betsch, & Böhm (study 1)	2021	Germany	973	49	44.07	state (anger and perceived threat to freedom)	manipulation: restriction non-vaccination through mandates vs. vaccination limitation due to limited vaccine supply vs. control; a priori intention to vaccinate	intention to avoid vaccination, intention to actively oppose vaccination policy, intention to adhere to protective behaviors, intention to vaccinate against chickenpox	1. highest reactance when the a priori intention to vaccinate was low and when mandates for non-vaccination were presented, as well as when the a priori intention to vaccinate was high and the vaccine supply was limited; 2. reactance increased with the rise of a priori vaccination intention in the control condition and in the limited vaccine supply condition

Continuation of table 1

Authors	Year	Country	N	F%	Age	Reactance	Independent Variables	Dependent Variables	Summary of Results
Sprengholz, Betsch, & Böhm (study 2)	2021	USA	1394	40	33.36	state (anger and perceived threat to freedom)	manipulation: restriction non-vaccination through mandates vs. vaccination limitation due to limited vaccine supply vs. control; a priori intention to vaccinate		1. in the limited vaccine supply condition, higher reactance was associated with a greater intention to vaccinate against chickenpox, adherence to protective behaviors, and a reduced intention to actively avoid vaccination; 2. in the mandatory vaccination condition, higher reactance was linked to a decreased intention to vaccinate against chickenpox, adherence to protective behaviors, and active vaccination avoidance; 3. with increasing reactance, the intention to avoid vaccination and actively oppose vaccination policies increased, especially in the mandatory vaccination condition.
Sprengholz, Siegers et al.	2021	Germany	997	51	45.44	state (anger and perceived threat to freedom)	manipulation: introduction of curfew (vs. absence); perception of the effectiveness of the curfew	intention not to comply with the curfew	1. implementing a curfew during the pandemic led to an increase in reactance; 2. as the perception of the curfew as ineffective increased, reactance also rose; 3. with an increase in reactance, there was a greater intention to disregard the curfew.

Continuation of table 1

Authors	Year	Country	N	F%	Age	Reactance	Independent Variables	Dependent Variables	Summary of Results
Sprengholz et al. (study 2)	2022	Germany	993	–	–	state (anger and perceived threat to freedom)	manipulation: vaccination mandate (vs. voluntary), communication emphasizing public health benefits (vs. economic vs. absence); attitude toward vaccination mandate (pre-manipulation)	intention to get vaccinated against the flu	1. mandatory vaccinations led to an increase in reactance; 2. under mandatory vaccination conditions, a positive attitude towards vaccination obligations and highlighting the benefits of vaccination reduced reactance, while under voluntary vaccination conditions, they increased reactance; 3. emphasizing public benefits reduced reactance to mandatory vaccinations; 4. with an increase in reactance, there was a decrease in the intention to get vaccinated.
Sprengholz et al. (study 3)	2022	USA	579	–	–	state (anger and perceived threat to freedom)	manipulation: vaccination mandate (everyone vs. healthcare workers); support for mandatory vaccination	actions against mandatory vaccination policies, avoidance of subsequent COVID-19 vaccinations, adherence to protective behaviors, and getting the flu vaccine	1. higher reactance levels were observed when support for mandatory vaccination was low, especially when vaccination mandates applied to everyone (vs. healthcare workers); 2 As reactance increased, actions against mandatory vaccination policies and avoidance of subsequent COVID-19 vaccinations increased, while the frequency of adhering to protective behaviors and declaring the intent to get the flu vaccine decreased

Continuation of table 1

Authors	Year	Country	N	F%	Age	Reactance	Independent Variables	Dependent Variables	Summary of Results
Sprengholz et al.	2023	Germany	2701	48	48.96	state (anger towards vaccination regulations)	manipulation: vaccination regulation (mandate, penalties for non-compliance, and rewards for vaccination – individualized manipulation scheme); vaccination status	support for vaccination policies and the intention to get vaccinated	1. no influence of manipulation on reactance was found; 2. individuals vaccinated multiple times in response to regulations exhibited lower reactance than unvaccinated individuals; 3. no differences in reactance were observed between unvaccinated and singly vaccinated individuals; 4. as reactance increased, support for vaccination policies and the intention to get vaccinated decreased
Sun & Lu	2023	USA	344	42	38.75	state (anger, negative beliefs)	manipulation: corrections of anti-vaccination comments (experts vs. other internet users vs. none)	intention to get vaccinated, change in attitudes toward vaccinations	1. corrections of misinformation by experts led to a reduction in reactance; 2. no impact of corrections from other internet users on reactance was observed; 3. as reactance increased, the intention to get vaccinated also increased
Taylor & Asmundson	2021	USA Canada	2078	40	54	state (one item „I dislike being forced to wear a mask")	declared mask-wearing	attitudes, and beliefs about masks	1. individuals declaring mask-wearing showed weaker reactance compared to those not wearing masks; 2. as reactance increased, negative attitudes and beliefs about masks also increased

Continuation of table 1

Authors	Year	Country	N	F%	Age	Reactance	Independent Variables	Dependent Variables	Summary of Results
Verpaalen et al.	2023	Netherlands	1411	49	–	state (negative emotions)	–	intention to get vaccinated, declared vaccination	1. as reactance increased, the intention to get vaccinated decreased; 2. no association between reactance and intention through the declared vaccination was found in longitudinal studies, but vaccinated individuals exhibited lower reactance than unvaccinated ones
Ye et al.	2023	Hong Kong	264	60	–	state (sense of resistance to messages)	–	attitude toward vaccinations, declared revaccination	1. as reactance increased, the attitude toward vaccinations and the declared intention for revaccination decreased
Young et al.	2022	USA	1778	65 46	–	trait	age (18–49 vs. > 49)	declared frequency of wearing masks	1. as reactance increased, the declared frequency of wearing masks decreased only in the group of individuals aged 18-49

Note. Subsequent Arabic numerals group the main study results related to reactance; F% – percentage of females in the studied sample.

In 24 studies, reactance was operationalized as a trait, measured using one of the versions of Hong's Psychological Reactance Scale. In 37 studies, reactance was operationalized as a state. It is not possible to precisely determine how state reactance was measured in all analyzed studies because adequate descriptions of the measurement tools were only sometimes provided. However, based on available information, it can be stated that state reactance was measured at least 23 times by examining perceived anger towards freedom restriction, 17 times by assessing negative beliefs about the source of freedom restriction, and 12 times by measuring the sense of freedom threat. The latter component of reactance, perceived threat to freedom, may pose interpretational challenges as in some studies this variable was used as an indicator of state reactance (e.g., Sprengholz, Betsch, & Böhm, 2021; Sprengholz et al., 2022), while in others, it was treated as a distinct factor being a direct determinant of reactance (e.g., Kang et al., 2021; Kriss et al., 2022). Most frequently, dependent variables were operationalized as vaccination-related attitudes (vaccination intention, attitudes towards vaccination; 23 studies) and adherence to various protective behaviors, primarily mask-wearing (13 studies).

Regarding the independent variables, it was identified that in two studies, a higher level of conservatism predisposed individuals to experience stronger state reactance (Kriss et al., 2022; Knapp et al., 2021). Additionally, decreased pandemic-related financial stress and increased psychological sense of community were associated with increased reactance (Knapp et al., 2021). Other determinants of state reactance were directly related to the assessment of persuasive communication (e.g., evaluations of its effectiveness, Lu & Sun, 2022) or the evaluation of anti-COVID regulations that triggered reactance (e.g., assessments of their legitimacy, Pavey et al., 2023; assessments of their effectiveness, Sprengholz, Siegers et al., 2021; prior attitudes towards them, Sprengholz, Betsch & Böhm, 2021; Sprengholz et al., 2022).

In describing the operationalization of independent variables, it is noteworthy that out of the analyzed 59 studies, 28 were conducted in an experimental design, 29 in a cross-sectional design, and 2 studies had a longitudinal nature. Experimental manipulations aiming to induce a state of reactance in the context of promoting adherence to anti-COVID regulations were analyzed. The following methods were identified to decrease the state of reactance toward these regulations: correcting online misinformation by experts (Sun & Lu, 2023), directing persuasive communication to others (rather than the participants themselves), health affirmation (Gillman et al., 2022), indicating public benefits of adhering to regulations (compared to not indicating benefits, Sprengholz et al., 2022), expressing gratitude (rather than apologies) for wearing required masks (Luo et al., 2021), and using positive emoticons under comments supporting vaccinations (Lu & Sun, 2022). On the other hand, methods increasing the state of reactance toward regulations include uncensored (compared to censored) posts about mask-wearing (compared to posts opposing it) (Lu et al., 2022), penalties (sanctions) (Kriss et al., 2022; Sprengholz, Betsch & Böhm, 2021), commands (Krpan & Dolan, 2022; Ma & Miller, 2022), mandatory vaccinations for everyone (Henkel et al., 2023; Sprengholz et al., 2022), imposing curfew (Sprengholz,

Siegers et al., 2021), attributing COVID-19 infection to the virus (rather than people) (Ma & Miller, 2021), inducing fear and disgust (Ma & Miller, 2022), and limited vaccine availability (Sprengholz, Betsch, & Böhm, 2021). It should be noted that limited vaccine availability induced reactance towards this restriction, which may affect greater vaccination intention. In the case of another category of persuasive measures, no impact on reactance was observed: type of normative messages (descriptive vs. injunctive) (Kang et al., 2021), restriction focus (on the individual vs. on the community) (Knapp et al., 2021), type of threat (direct vs. indirect, Kriss et al., 2022; smoking vs. COVID-19 vs. smoking and COVID-19 vs. no threat, Massey et al., 2022; low vs. high, Bigsby & Morrow, 2022), orders for compliance with restrictions (compared to bans on non-compliance, Pavey et al., 2023), negative online comments under posts (Lu & Sun, 2022), message recipient focus (compared to focusing on the recipient and other people, Ma & Miller, 2021), emphasizing the effectiveness of recommended actions and the effectiveness of the recipients of persuasion itself (Bigsby & Morrow, 2022). The last category of analyzed methods is those where conflicting results were observed. For example, in the study by Huang and Liu (2022), directing persuasion toward the benefits of vaccinations compared to emphasizing the costs of not getting vaccinated resulted in less anger toward the persuasive message. However, it had no impact on creating counterarguments against the message. In the study by Reinhardt and Rossmann (2021), no differences in reactance were observed between types of targeted persuasion.

Crucial for the proper interpretation of the impact of persuasive communication on arousing reactance are the studies by Krpan and Dolan (2022), which demonstrate that mandating vaccinations can lead to an increase in the intention to get vaccinated despite a simultaneous increase in reactance. In other words, mandating compliance with specific regulations may generate an increased intention to follow those mandates while simultaneously eliciting resistance. Therefore, observing an increase in reactance state in response to a persuasive message does not necessarily imply the ineffectiveness of the tested persuasion in changing behaviors. Additionally, it is worth noting that the presented list of persuasive measures is not a comprehensive compilation of tested methods that can aid in the fight against the pandemic. Reactance was not measured in all studies assessing the effectiveness of anti-COVID communication. For instance, the presented list does not include studies on self-persuasion, which have shown that persuading oneself to practice social distancing (Drążkowski et al., 2020) and get vaccinated against COVID-19 (Drążkowski et al., 2022) can be more effective in combating the pandemic than persuasion from others or institutions. Self-persuasion achieves its effectiveness, among other things, by minimizing reactance compared to persuasion from other sources.

The relationship between reactance and dependent variables was analyzed in the subsequent stage of the included research review. This analysis requires caution as some research designs proved complex, and observed dependencies between reactance and dependent variables were significant under certain conditions but not others. Nevertheless, conclusions can be drawn from this analysis. Firstly, most studies observed that the willingness to comply with anti-COVID

regulations decreases as state reactance increases. Only in two cases were these dependencies insignificant, and they pertained to specific dependent variables, such as the intention to seek information about COVID-19 (Guan et al., 2023) and the mediation between the intention to vaccinate and the declaration of vaccination in a longitudinal study (Verpaalen et al., 2023). Furthermore, these studies confirmed significant dependencies between reactance and other dependent variables. In another study, it was found that as reactance toward limited vaccine supply increases, the intention to vaccinate against chickenpox and adherence to protective behaviors increase, while the intention to actively avoid vaccinations decreases (Sprengholz, Siegers, et al., 2021, Study 2). This relationship aligns with reactance theory predictions (Brehm & Brehm, 1981) as freedom restriction (limited vaccine availability) arouses reactance, leading to a greater inclination to counteract this restriction (reduced intention to avoid COVID-19 vaccinations) and to undertake related actions (intention to vaccinate against chickenpox and adherence to protective behaviors).

Regarding trait reactance, the pattern of results is less clear. On the one hand, 22 significant negative dependencies between trait reactance and dependent variables were identified (Gerace et al., 2021). However, on the other hand, 7 dependencies were statistically insignificant (e.g., Courtice et al., 2023), and 2 showed that as trait reactance increases, the willingness to comply with protective behaviors increases (Bokhari & Shahzad, 2022; Chen et al., 2022). However, the interpretation of these two studies requires more caution. Firstly, both studies were conducted in Arab countries where a higher level of collectivism is observed than in other states, which may affect reactance attenuation (Jonas et al., 2009). Secondly, in Chen et al.'s (2022) study, there are inconsistencies in describing the relationship between reactance and adherence to protective behaviors (between hypothesis description and study results description). In Bokhari and Shahzad's (2022) study, positive dependencies were also found between dependent variables and trait reactance measured using questions developed by the authors.

The reactance theory posits that persuasive messages are less effective for individuals with high trait reactance, a notion supported by several previous studies (Reynolds-Tylus, 2019). Consequently, trait reactance would moderate the effectiveness of persuasion, encouraging the fight against the COVID-19 pandemic. However, an analysis of studies indicates that none of them demonstrated a significant moderating role of trait reactance on the effectiveness of persuasive messages (Albarracin et al., 2021, Studies 3 and 4; Hamerman et al., 2021, Studies 1 and 2; Salali et al., 2022).

The above analysis suggests that more consistent negative relationships between adherence to protective behaviors and state reactance are observed than with trait reactance. Such a pattern of relationships should not be surprising since trait reactance refers to a general tendency to experience resistance against freedom restrictions. In contrast, state reactance relates to reactions to specific sources of freedom limitation, which in the analyzed studies concerned specific anti-COVID regulations. Moreover, most scales used to measure dependent variables assessed participants' attitudes toward these specific regulations.

Furthermore, when state reactance towards general pandemic regulations was examined, weaker relationships were observed than for state reactance towards specific mandates (Krpan & Dolan, 2022).

The presented systematic literature analysis has several limitations. Firstly, one of the operationalizations of reactance – resistance to persuasive measures – was not considered. This analysis incorporated reactance measured directly as a state and trait. Future literature reviews could focus on identifying boomerang effects against anti-COVID regulations as indirect indicators of experiencing reactance. Secondly, the scope of the conducted analysis is limited by the choice of databases for article searches and the English language used for literature exploration. Future analyses may overcome these limitations by utilizing different databases and languages.

In summary, the COVID-19 pandemic posed a significant threat to humanity. However, by implementing protective measures based on scientific knowledge, efforts were undertaken to limit the transmission of the virus, protect public health, and combat the pandemic. Despite these efforts, some individuals did not adhere to the recommendations of anti-COVID policies, partly due to resistance against the perceived infringement on their freedom by such policies. The systematic literature review described in this paper aimed to synthesize research on the relationship between resistance to these freedom limitations, known as reactance, and compliance with anti-COVID policies. Based on predefined criteria, databases were searched, resulting in the selection of 59 studies examining the relationship between reactance and the fight against the COVID-19 pandemic. The synthetic analysis of these results revealed that an increase in reactance was associated with a decrease in willingness to adhere to protective behaviors against COVID-19 regulations. However, the relationships between reactance traits and compliance with anti-COVID regulations were less straightforward, although a predominantly negative direction was observed in most studies. The review's findings identified persuasive measures influencing the experience of reactance against anti-COVID regulations, which can contribute to understanding the factors underlying the rejection of government actions to combat the COVID-19 pandemic. The studies described, where persuasive measures elicited lower levels of reactance, serve as recommendations to reduce reactance against policies addressing the pandemic.

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