The failure of COVID-19 contact tracing apps: A psychological reactance theoretical perspective

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Abstract

COVID-19 contact tracing apps can be used to control the propagation of the virus. However, the large-scale implementation of COVID-19 tracing apps requires a deep understanding of individuals' resistance to adopting such technologies. Using psychological reactance theory, we investigate how and when the perceived threats to freedom following governmental containment measures may trigger aversive states of psychological reactance, which may ultimately motivate one's resistance to adopting COVID-19 contact tracing apps. The results of 58 in-depth semistructured interviews reveal two psychological mechanisms, i.e., reactance and helplessness, which motivate individuals' resistance to adopt COVID-19 contact tracing apps, and two psychological mechanisms, i.e., resilience and system justifications, which motivate the adoption of such technologies. The implications for theory and practice are discussed.

Keywords: *COVID-19, contact tracing apps, psychological reactance theory*

1. Introduction

COVID-19 contact tracing apps (CTAs), which use Bluetooth technology or geolocalization, are designed to alert users that they are in close proximity to people who have tested positive for COVID-19 and who use the same application (Georgiana et al., 2021). Since the beginning of the COVID-19 pandemic, European Union (EU) member states have made significant attempts to use CTAs to limit the propagation of the virus. Notable examples include the Stopp Corona app (Austria), CoronAlert (Belgium), TousAntiCovid (France), Immuni (Italy), and Radar Covid (Spain), to mention only a few (European Commission, 2021). However, COVID-19 CTAs have failed to become popular with the population, with download rates much lower than 20% in many EU countries (EIT Digital, 2021).

Some debates in international media (e.g., BBC News, 2020) and in regard to research in public policy and marketing (e.g., Brough & Martin, 2021; Wiener et al., 2020) point to the risks that these apps' intrusiveness brings to individual liberties, i.e., that such tracking may preserve safety only at the expense of fundamental privacy rights. However, others doubt that a low level of privacy protection is the only source to be blamed for the small number of downloads in the EU (Euronews, 2020) and claim that the failure of CTAs does not just depend on privacy concerns (Weird, 2020). In this work, we adopt a similar perspective. While we acknowledge the negative effects of privacy concerns on the social acceptability of COVID-19 contact tracking apps, we posit that psychological reactance (Brehm, 1989) plays a major role. We contend that citizens are experiencing unprecedented threats to their freedom amid the COVID-19 pandemic, as they are exposed to severe governmental containment measures (e.g., lockdowns, curfews, and mobility restrictions) (Kirk & Rifkin, 2020). These threats to freedom following governmental containment measures may trigger a motivational state of "reactance" (Brehm 1966, 1989), i.e., aversive emotions and attitudes towards governments, which ultimately motivate one's resistance to adopt governmental advocated behaviours (Irmak et al., 2020; Kirk & Rifkin, 2020). In this study, such a reactance is expressed in the form of the resistance to adopt advocated COVID-19 CTAs. Hence, we explore how and when perceived threats to freedom following governmental containment measures amid the COVID-19 pandemic may trigger aversive states of psychological reactance, which ultimately motivate the resistance to adopting COVID-19 CTAs.

In the next sections, we first discuss how reactance theory offers a meaningful theoretical framework to understand individuals' resistance to adopting COVID-19 CTAs. Next, we present the qualitative method used, as well as the results of 58 in-depth, semistructured interviews conducted with Italian respondents who are nonusers (vs. users) of Immuni, the COVID-19 contact tracing app released in Italy. The contributions to theory and practice are finally discussed.

2. Theoretical Background

People value freedom, autonomy, and choice. When presented with a perceived threat to their freedom, individuals may acquire an aversive motivational state, which is termed "reactance" (Brehm 1966, 1989). Psychological reactance is defined as a combination of negative affections (i.e., anger) and negative cognitions (i.e., counterarguments) that equally contribute to regaining one's threatened freedom (Dillard & Shen, 2005). Perceived threats to one's freedom may have different sources, including governmental recommendations (Laurin et al., 2012). Although governmental recommendations are based on the laudable intention of serving and promoting citizens' best interest (e.g., promoting public health and safety), such

initiatives may produce effects that work counter to their purpose, thereby leading to the rejection of advocated behaviours (Erceg-Hurn, 2008; Grandpre et al., 2003; Hornik et al., 2008; Ringold, 2002). Policymakers' attempts to regulate individuals' behaviour to ensure citizens' best interest can indeed yield contrary responses if individuals *focus on the restrictive nature of the recommendations* and perceive such recommendations as being threats to their freedom (Irmak et al., 2020). LaVoie et al. (2017), for example, investigate the development of persuasive messages in anti-smoking campaigns and find that exposure to graphic cigarette warning labels results in higher levels of perceived threats to freedom and psychological reactance, which in turn causes increased smoking behaviours. Similarly, Irmak et al. (2020) find that after individuals are exposed to governmental consumption regulations such as (1) laws that restrict the use of phones while driving and (2) warning labels designed by the Food and Drug Administration, these individuals (especially conservatives) perceive higher levels of threats to their freedom and are more likely to (1) use phones when restricted and (2) purchase unhealthy foods. Along these lines, we contend that a higher focus on the restrictive nature of governmental containment measures amid the COVID-19 pandemic may trigger perceptions of threats to freedom that result in higher levels of resistance to downloading COVID-19 CTAs advocated by governments.

Nevertheless, the focus on the restrictive nature of governmental recommendations is not the sole variable worth considering when delving into psychological reactance. The *perceived difficulty of restoring one's freedom* also plays a crucial role (Brehm & Brehm, 2013). When freedom is clearly lost as opposed to being threatened, reactance may disappear, and the individuals' belief that they had that freedom back must be given up. This proposition falls in line with the energization model of motivation (Brehm et al., 1983; Brehm & Self, 1989; Wright et al., 1990). This model proposes that when an individual's importance to freedom—and thus the perceived focus on the threats to one's freedom—is held constant, the intensity of one's reactance depends on the difficulty of restoring one's freedom. If an individual perceives that it is possible, though difficult, to restore the threatened freedom, then their level of reactance motivation should be high, as the individual will mobilize as much energy as the goal of restoring freedom is seen to be worth. However, if the person realizes that it is impossible to restore the freedom, then their reactance motivation would decrease or even disappear (Mikulincer, 1988), thereby leading the way to a passive state of discomfort, which is known as "helplessness". For instance, Fond and Hindley (2017) study the psychological consequences of threatening tourists' freedom of travelling. They find that when tourists are told that visiting a disappearing destination is still possible, though difficult, they experience psychological reactance; psychological reactance in turn increases tourists' desire to travel to the disappearing destination, although such travelling behaviour will have a negative impact on the destination's natural environment. Conversely, when tourists are told that they can no longer visit the destination (restoring freedom is impossible), they experience psychological helplessness and dismiss the value of the unavailable destination.

Along these lines, we contend that the perceived difficulty of restoring one's freedom amid the COVID-19 pandemic may activate (deactivate) psychological reactance; individuals may show reactance (helplessness) when they perceive that restoring their freedom is difficult, though possible (impossible). Specifically, in this study, we aim to investigate how the interplay between the *focus on the restrictive nature of governmental containment measures* and the *perceived difficulty of restoring one's freedom* amid the COVID-19 pandemic may influence individuals' resistance to adopting COVID-19 CTAs. We also aim to define and explain the (affective and cognitive) psychological mechanisms behind such resistance.

3. Method

To pursue the research aim, we followed a qualitative interpretative approach based on in-depth interviews (Burghausen & Balmer, 2015; Patton, 2015). This approach is appropriate given the paucity of studies that adopt psychological reactance theory to investigate individual resistance to COVID-19 CTAs. The interpretative approach invites multiple understandings of "human experience" (Welch et al., 2011), while theorising is based on abductive reasoning that presents high levels of flexibility with a continuous interaction among theory, empirical detection, and analysis (Van Maanen et al., 2007). We selected Italy as the empirical context. On the one hand, Italy represents one of the most impacted European countries in the pandemic, with over 3.3 million cases of COVID-19 infections and 111,000 deaths (from February 1 2020, to April 6 2021 – Italian Ministry of Health, 2021; Statista, 2021). On the other hand, only 19.6% of Italians have downloaded Immuni, the Italian COVID-19 contact tracing app, since its release in June 2020 (Ministry of Health, 27 March 2021). Regarding the sample, we reached potential respondents through personal contacts (Easterby-Smith et al., 2008) and focused purposively on those individuals who were more crucial to achieving the research aim (Yin, 2011). Our respondents were mainly Immuni nonusers; however, we also interviewed a minority of Immuni users to better understand nonusers' psychological mechanisms and contrast them with users' perspectives. The respondents were all millennials aged between 18 and 35 years old (Caldeira et al., 2020). We focused on this population segment because millennials show the highest intensity of use of mobile apps worldwide (Sinform, 2021). Hence, exploring why individuals who are familiar with mobile apps may conversely refuse to download covid-19 CTAs (e.g., Immuni) is crucial.

The structure of the interview guide was the same for users and nonusers to ensure the comparability of the findings. The first part of the interview elicited the participants' spontaneous perceptions about the governmental containment measures and the difficulty of restoring one's freedom amid the COVID-19 pandemic. The second part solicited the expression of personal evaluations and experiences concerning the usage (resistance to usage) of Immuni. Theoretical saturation (Glaser & Strauss, 2017) was reached after interviewing 58 participants (41 nonusers, 17 users), as no new patterns or themes came up through the interviews. Approximately 51% of the respondents were female and had different occupations (e.g., clerk, student, teacher, unemployed, artist, and consultant). The interviews were carried out in the period November 2020 - March 2021 (a period characterised by strict containment measures), had an average duration of 40 minutes, and took place through video conferencing systems. We analysed the full transcriptions of the recorded interviews by applying the thematic content analysis technique (King & Horrocks, 2010). First, we defined the "descriptive codes" (high degree of detail), starting with a line-by-line analysis of the text. Then, we identified more general themes through a logical path of progressive abstraction, i.e., "interpretive themes" and "overarching themes". The conceptual categories that gradually emerged were consistently connected with the existing literature by following abductive reasoning (Van Maanem et al., 2007); unexpected insights also emerged, which did not "fit prior conceptions or hypotheses" (Welch et al., 2013, p. 251). The coding process was conducted separately by two members of the research team, who compared their results at the end of each work phase. Finally, to improve the level of trustworthiness of the analysis, two independent expert coders were involved, who were asked to confirm the coding results. The interjudge reliability was calculated through the "agreement ratio", which proved to be satisfactory (87%).

4. Main findings

The findings of the content analysis revealed four psychological mechanisms (overarching themes), which resulted from the interplay between the *focus on the restrictive nature of governmental containment measures* and the *perceived difficulty of restoring one's freedom* (Figure 1). *Reactance* and *helplessness* are the psychological mechanisms that motivate individual-level resistance to adopting Immuni (nonusers). Conversely, *resilience* and *system justifications* are the psychological mechanisms that reflect Immuni users' perspectives. Importantly, each mechanism is defined by a specific mix of negative emotions and negative cognitions (integrative themes).

4.1 Nonusers' reactance

The interplay between *high focus on the restrictive nature of governmental containment measures* and *moderate to high perceived difficulty in restoring one's freedom* determines nonusers' *reactance*. Regarding the first driver, informants denounced that their freedom was deprived, as the governmental containment measures restricted the achievement of *self-actualisation* needs (e.g., limited freedom of choice) and *intimacy* needs (e.g., deprivation of intimate relationships and social contacts). Regarding the second driver, the perceived difficulty of restoring freedom was rather high, though mitigated by the hope for vaccines: "*We will be vaccinated one day, but today we bear severe restrictions. There might be hope, but the current situation is not positive*" (Interviewee 51, nonuser).

Concerning the key components of reactance, the content analysis revealed three integrative themes: 1) *negative active emotions,* 2) *negative passive emotions,* and 3) *negative cognitions*. 1) *Negative active emotions* are predominant and consist of *anger towards the government* and *anger towards journalists*. The former was the prevailing emotion and is linked to the perceived institutional inability to adopt valid restrictive measures: "*I am angry! I am mad at the government and other institutions because this pandemic could have been managed better. The restrictive measures adopted were useless!*" (Interviewee 6, nonuser). Anger towards journalists emerges as a complementary feeling to anger towards the government because many interviewees posited that some journalists avoided reporting the government's shortcomings and thus failed to provide truthful information: "*I am also angry towards some journalists because their communication is biased; no one talks about the shortcomings of the government*" (Interviewee 43, nonuser). 2) Although residually, two different *negative passive emotions* arose from the interviewees' words: isolation-related *sadness* and *fear* of contagion: "*This kind of freedom deprivation makes me sad sometimes because I feel lonely*" (Interviewee 6, nonuser); "*In the first wave, I was very scared because the virus was unknown... now we have vaccines, and the virus is better known, so my fear has decreased*" (Interviewee 39, nonuser). 3) Furthermore, six *negative cognitions* were identified: *contest source credibility*, *technical issues*, *communication issues*, perceived *app intrusiveness and privacy concerns*, self-*blame attributions* and *wilful ignorance*. Informants strongly contested the credibility of the government and related institutions, which have mismanaged public health for years. Importantly, the negative perceptions about the government were also expanded to include Immuni: "*Governments have been neglecting public health too long. Our current public health system results from all the scams they [institutions] made in the past! With a health system that has been completely damaged, what credibility could Immuni have?* (Interviewee 5, nonuser). Concerning technical issues, the main findings concerned the absence of a centralized app data management system. Moreover, according to the interviewees' opinions, communication about Immuni failed to explain the app's usefulness. The informants' words also revealed perceptions of high levels

of app intrusiveness and privacy concerns, which were mostly related to tracking one's movements: *"Immuni knows where I am 24/7"* (Interviewee 39, nonuser). Furthermore, the content analysis disclosed low levels of self-blame attributions, since respondents asserted that they have not downloaded Immuni due to the app's uselessness and the reduced numbers of current users: *"I do not blame myself for not using Immuni, because this app is useless. Additionally, many people haven't downloaded it. Therefore, why should I blame myself?"* (Interviewee 16, nonuser). Finally, the respondents expressed wilful ignorance, which is the self-protective tendency to avoid information that may create anxiety; the respondents posited that they would prefer avoiding notifications of contact with COVID-19 positive subjects, as this information may trigger anxiety: *"If an app warned me that I was in contact with someone confirmed positive for COVID, I would panic! It's better not to know!"* (Interviewee 56, nonuser).

4.2 Nonusers' helplessness

The interplay between *high focus on the restrictive nature of governmental containment measures* and the *extremely high perceived difficulty of restoring one's freedom* determines nonusers' *helplessness*. Interviewees expressed strong freedom deprivation in terms of *self-actualisation* and *intimacy*. Moreover, they showed a very pessimistic view towards how soon their personal freedom may return before the end of the pandemic, with many stating, *"I can't see the light at the end of the tunnel"* (Interviewee 1, nonuser).

Helplessness is composed of 1) *negative active emotions*, 2) *negative passive emotions* and 3) *negative cognitions*. 1) Concerning the first theme, informants felt *moderate anger towards the government,* which *"have put younger generations' concerns on the backburner"* (Interviewee 4, nonuser). 2) Furthermore, four prevailing *negative passive emotions* emerged: *sadness*, *anxiety*, *fear*, and *discomfort*. Interviewees revealed high levels of sadness associated with loneliness and intense anxiety related to high levels of uncertainty over the enduring nature of the pandemic: *"There is no certainty about when this pandemic will end, no news that gives us faith. This uncertainty causes me anxiety. What am I going to do?"* (Interviewee 2, nonuser). Moreover, the words of those informants emphasized a severe fear of contracting the virus and a profound level of discomfort linked to the perception of having made efforts in vain: *"I am afraid of the virus, especially of the new variants. In the past months, the enemy was just one. Now it's proliferating"* (Interviewee 38, nonuser); *"All my efforts are wasted! [...] I feel discouraged because I can't do anything else to get out of this situation"* (Interviewee 18, nonuser). 3) The *negative cognitions* consist of *contest source credibility*, *technical issues*, *communication issues*, *app intrusiveness and privacy concerns*, *self-blame attributions* and *wilful ignorance*. Regarding the first theme, respondents strongly contested the government's credibility and its competence to adopt adequate measures, which also included the contestation of Immuni: *"Since the very beginning of the pandemic, they [governments] have improvised. I doubt that the decision to launch Immuni has been based on a reasoned, valid criterion"* (Interviewee 40, nonuser). Moreover, technical issues refer to Immuni's Internet and Bluetooth-based operations, while communication issues relate to the lack of citizens' awareness (because of the government's ineffective level of communication). According to the interviewees' opinion, Immuni was perceived as *"highly intrusive"* (Interviewee 36, nonuser), and *"personal data are not stored safely"* (Interviewee 41, nonuser). Furthermore, in terms of self-blame attributions, which are low for these respondents, informants claimed that *"we already comply with government mandates. Immuni is unnecessary"* (Interviewee 11, nonuser). Finally, respondents expressed high levels of wilful ignorance, as many respondents claimed, *"I prefer ignorance to living in a constant state of anxiety"* (Interviewee 20, nonuser).

4.3 Users' resilience

The interplay between *low focus on the restrictive nature of governmental containment measures* and *low perceived difficulty in restoring one's freedom* elicits users' *resilience*. Regarding the first driver, respondents perceived low levels of freedom deprivation in terms of both *self-actualisation* and *intimacy*: "*Containment measures are necessary. To be safe is to be free*" (Interviewee 25, user). Regarding the second driver, respondents perceived a moderate level of difficulty in regard to restoring their freedom. Two main integrative themes underlie the psychological mechanism of resilience: 1) *negative passive emotions* and 2) *negative cognitions*. 1) The first theme consists of *sadness, anxiety*, and *fear*. Informants showed low levels of sadness related to loneliness and moderate levels of anxiety about the future and the fear of contracting the virus. These emotions were mitigated by the desire to be challenged and savour one's life despite the threats: "*I gathered my energy and felt motivated in the pursuit of new possibilities, I felt challenged*" (Interviewee 22, user). 2) Looking at the *negative cognitions*, the analysis revealed *perceived app intrusiveness and privacy concerns,* and other-*blame attributions.* Respondents who experienced resilience generally welcomed Immuni; they accepted being tracked by this app because it is a fair price to pay to be safe (very low levels of intrusiveness and privacy concerns). External attributions of blame are the prevailing negative cognitions; interviewees strongly blamed Immuni nonusers for their uncooperative behaviour and described them as *"people lacking any sense of responsibility"* (Interviewee 24, user).

4.4 Users' system justifications

The interplay between *low focus on the restrictive nature of governmental containment measures* and *extremely high perceived difficulty in restoring one's freedom* elicits users' *system justification* mechanism. The first driver refers to low perceptions of freedom deprivation (*self-actualisation deprivation* and *intimacy deprivation*), while the latter is related to *"a strong ambiguity about the future and the absence of ways out"* (Interviewee 54, user). Regarding the key components of system justifications, the analysis highlighted two integrative themes: 1) *negative passive emotions* and 2) *negative cognitions*. 1) The first theme consists of *resignation*, *sadness, boredom* and *fear*. Resignation appeared to be the prevailing emotion and was concerned with the individual-level impossibility of resolving the pandemic situation: *"I am resigned since I've accepted the situation. I can't do anything else"* (Interviewee 34, user). Additionally, informants expressed high levels of sadness and boredom related to feelings of loneliness. Finally, they also expressed high levels of fear of being infected, as well as high levels of concerns about themselves being a risk factor for *"the most vulnerable people"* (Interviewee 3, user). 2) Concerning *negative cognitions*, the analysis led to the identification of *contest source credibility*, *technical issues*, *communication issues*, *app intrusiveness and privacy concerns*, *other-blame attributions* and *wilful ignorance*. Interviewees partly justified the efforts made by the government: *"The solutions proposed by our government were far from being perfect. However, any political party would have faced huge problems under such critical circumstances"* (Interviewee 45, user). Furthermore, the respondents mentioned some technical issues (e.g., the app localization is not always accurate) and communication issues (e.g., the government's choice of the wrong media platforms for promoting the app). In terms of Immuni's intrusiveness and privacy concerns, respondents felt *"a form of control, but it is essential to ensure citizen safety"* (Interviewee 30, user). Moreover, the respondents blamed citizens who refused to use Immuni and called them *"irresponsible"*; however, they justified the nonuse of older population segments because these individuals *"lack technological literacy"* (Interviewee 27, user).

Finally, informants stated that *"using Immuni may generate anxiety; although it is better to be anxious than to be infected"* (Interviewee 21, user).

Figure 1 - Psychological mechanisms that resulted from the interplay between the focus on the restrictive nature of governmental containment measures and the perceived difficulty of restoring one's freedom

		Perceived difficulty of restoring one's freedom	
		Moderate -High	Extremely high
Focus on the restrictive nature of governmental containment measures	High	**Psychological Reactance** **Negative emotions** Active emotions: anger (P) Passive emotions: sadness, fear (M) **Negative cognitions** Contest source credibility (P), technical issues (P), communication issues (P), app's intrusiveness and privacy concerns (P), self-blame attributions (L), wilful ignorance (P) **Behaviours:** Downloaded Immuni: No	**Passive Discomfort** **Negative emotions** Active emotions: anger (M) Passive emotions: sadness, anxiety, fear, discomfort (P) **Negative cognitions** Contest source credibility (P), technical issues (P), communication issues (P), app's intrusiveness and privacy concerns (P), self-blame attributions (L), wilful ignorance (P) **Behaviours:** Downloaded Immuni: No
	Low	**Resilience** **Negative emotions** Passive emotions: sadness, anxiety, fear (P) **Negative cognitions** App's intrusiveness and privacy concerns (M), other-blame attributions (P) **Behaviours:** Downloaded Immuni: Yes	**System Justifications** **Negative emotions** Passive emotions: resignation, sadness, boredom, fear (P) **Negative cognitions** Contest source credibility (M), technical issues (M), communication issues (M), app's intrusiveness and privacy concerns (M), other-blame attributions (P), wilful ignorance (M) **Behaviours:** Downloaded Immuni: Yes

Note: M = minor; P = prevailing

5. General discussion and implications for theory and practice

Our findings reveal that individuals exhibit higher resistance to adopting COVID-19 CTAs when they perceive that governmental containment measures pose serious threats to their freedom. These findings are consistent with previous empirical evidence regarding individuals rejecting governmental recommendations when the latter are perceived to restrict individual autonomy, freedom, and choice (Taylor & Asmundson, 2021). Moreover, in line with the energization model of motivation (Brehm & Self, 1989; Wright et al., 1990), we observe two distinct psychological mechanisms that motivate resistance, i.e., reactance and helplessness. Reactance occurs when individuals perceive that restoring the threatened freedom is moderately to highly difficult, though possible. Reactance is directed towards the government (and related institutions) and is mainly expressed through agonistic emotions of anger and negative counterarguments. The respondents contest the government's credibility and the validity of governmental containment measures, including the usage of COVID-19 CTAs. Helplessness occurs when individuals perceive that restoring the threatened freedom is extremely difficult if not impossible. Helplessness is mainly expressed through the retreat emotions of discomfort, anxiety, fear, and sadness (Menon & Dubé, 2007). Retreat emotions express the uncertainty felt about the present pandemic and the near future. Individuals experiencing helplessness devalue governmental recommendations and protect themselves by passively living in the pandemic, though they show uncooperative attitudes (Springett et al., 2007). Our findings also reveal strong contrasts between the mechanisms of reactance and helplessness, on the one hand, and resilience and system justifications, on the other hand.

Resilience and system justifications reflect individuals' low level of concern for the impact of governmental containment measures on personal freedom because such measures are needed to serve higher goals of public safety. Along these lines, COVID-19 CTAs represent a means towards reaching public safety and are welcomed. While the resilient respondents seem more active in facing the pandemic (e.g., they focus on the hidden opportunities that the pandemic may bring), respondents experiencing system justifications are more passive and bored, though they still patiently follow governmental mandates, recommendations, and use CTAs.

Our findings make three relevant contributions to existing knowledge. First, we contribute to the research that delves into consumer behaviour in times of the COVID-19 pandemic, with a focus on analysing individual psychological states and coping strategies (Campbell et al., 2020; Kirk & Rifkin, 2020; Sheth, 2020). Adding to this research is important because understanding individuals' coping mechanisms helps clarify why individuals exhibit certain behaviours when they perceive COVID-19-related threats. Recent studies show that perceived fear and scarcity amid the COVID-19 pandemic elicit reactions to panic buying (Prentice et al., 2020), hoarding and stockpiling (Gupta & Gentry, 2019; Fisher et al., 2021). We focus on the perceived threat to freedom induced by governmental containment measures and conceive resistance to adopting a COVID-19 CTAs as a coping strategy to restore one's threatened freedom. Second, we add to the reactance theory literature by delving into the diverse emotional and cognitive states of reactance (Brehm & Brehm, 2013). While previous studies point to anger as the main emotion felt (e.g., Dillard & Shen, 2005), our findings reveal the emergence—under certain circumstances—of strong retreat emotions. Delving into the emotional states of reactance is crucial, as violations of the ethics of autonomy in the sense of the disregard of individual freedom may lead to a set of agonistic and retreat emotions that, together, provide a more nuanced picture of individuals' coping mechanisms in the face of freedom deprivation. Similarly, while previous empirical studies have assessed the negative cognitions of reactance as a list of theoretically unspecified counterarguments, we identify and define them as a set of distinguishable constructs. Furthermore and importantly, we unveil the boundary conditions necessary for reactance to occur. Our findings reveal that reactance is replaced by a profound state of discomfort when individuals experience the impossibility of restoring their threatened freedom. We therefore add to the research on psychological helplessness (e.g., Gelbrich, 2010; Fond & Hindley, 2017) by exploring its emotional and cognitive dimensions, as well as its downstream effects. Third, we add to the literature that investigates the social acceptability of tracing apps (Georgiana et al., 2021). We find that intrusiveness and privacy concerns play a role in the acceptability of tracing apps (Wiener et al., 2020; Brough & Martin, 2021); however, our findings reveal that intrusiveness and privacy concerns are present in people's mind as expressions of deeper levels of freedom deprivation experienced during the pandemic.

Our practical contribution is twofold. First, we provide policymakers with a deeper understanding of why citizens may show resistance to advocated behaviours, such as the adoption of COVID-19 CTAs. Our insights offer preliminary support for how a more general psychological state of freedom deprivation that is induced by governmental containment measures (e.g., lockdowns, curfews, and domestic and global movement restrictions) may reduce citizens' compliance with governmental recommendations. The debate over the failure of contact tracing apps, as well as the development of concrete measures to promote social acceptability of these technologies in the near future, should take into account the broader perceptions of freedom deprivation and the subsequent psychological mechanisms that citizens have been experiencing. Measures that only look at privacy and usability will likely offer an incomplete solution to the problem. Second, our findings provide early evidence to guide policymakers towards developing more effective persuasive communication messages when promoting the adoption of COVID-19 CTAs. Diverse groups of citizens, even though

they are all composed of rather young generations (e.g., millennials), may still have different motivational barriers when confronted with the use of CTAs. Therefore, the adoption of a "one-fits-all" communication strategy that focuses on all younger generations with the same communication content seems far from being an effective approach to promoting the adoption of COVID-19 CTAs. Policymakers may consider segmenting individuals based on the prevailing psychological mechanism they exhibit (reactance, helplessness, resilience, and system justifications) and communicate with them with tailored communication strategies. For example, when targeting the first group, policy-makers may reduce reactance by developing retrospective explanations; conversely, when targeting the second group, policymakers may mitigate helplessness by providing this target group with prospective explanations (Gelbrich, 2010). Additionally, policymakers may consider developing tailored communication when targeting CTAs users; they may provide these citizens with a moral reward that motivates these individuals to be peer-to-peer ambassadors of COVID-19 CTAs.

In conclusion, contact tracing apps can be used to control the propagation of the virus. However, the large-scale implementation of COVID-19 CTAs requires a deep understanding of individuals' resistance to these technologies. In addition to the (necessary) debates on the usability and intrusiveness of these apps, future research should consider investigating resistance to COVID-19 CTAs as a potential side effect of perceived threats to one's freedom that are induced by the pandemic and related governmental containment measures. As a part of an ongoing multimethod study, the present qualitative study is a first attempt towards reaching this goal.

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