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Perceiving COVID-19 as a Black Swan: The Role of Negative Emotions, Family Tension, and Government decisions' support

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Abstract:

Although the term 'Black Swan' was coined by Taleb to describe unpredictable events, he himself argued that the pandemic was predictable in light of previous warnings. This study investigated public perceptions of the pandemic in relation to Taleb's three core criteria: rarity, severity and retrospective predictability. During the first lockdown in French-speaking Belgium in May 2020, 303 participants completed an online survey assessing these dimensions, as well as emotional responses, belief systems, family tensions and trust in government decisions. Hierarchical regression analyses revealed a modest association between perceptions of rarity and family tensions, while severity was predicted by age, fear of and sadness regarding the pandemic. Retrospective predictability was positively linked to anger, and negatively linked to government support and fatalistic determinism. These findings emphasise the impact of emotions and beliefs on subjective interpretations of rare events and situate Black Swan perceptions within broader frameworks, such as the 'Gray Rhino' and 'Dragon King'.

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The COVID-19 pandemic elicited unprecedented and often chaotic set of responses worldwide (Paul et al., 2021). Declared a public health emergency in January 2020, the virus disrupted every aspect of daily life, leading to widespread lockdowns, economic recession, and a rapid, unparalleled push for responses development. Together, these measures highlight the profound societal and emotional challenges posed by pandemic responses (Vicario-Molina et al., 2023). The emergence of this new Coronavirus has triggered widespread fear and anxiety, profoundly influencing human thinking and behavior on both individual and collective levels (Vermeulen, 2024). With the pandemic seen as a rare, high-impact event, COVID-19 has given rise to debate about its classification as a black swan. According to Taleb (2007), black swan events are defined by three main characteristics: they are rare and unforeseen, they have extreme consequences and they are, in retrospect, considered to be totally predictable. While events such as the December 2004 tsunami and the September 11 attacks are considered classic examples, Taleb himself rejects the use of the term “black swan” to describe the Covid-19 pandemic (Gopnik, 2020). Indeed, Taleb argued that the pandemic was not a true Black Swan event, as pandemics had been repeatedly anticipated by experts. However, this term has been used in scientific literature to describe the consequences of the pandemic in many fields, such as microbiology (Cheng et al., 2022), preventive medicine (Fiorini & La Gioia, 2021), or mental health (Wind et al., 2020). While the Black Swan theory is widely cited in economics and risk management, little empirical research has sought to operationalize or quantify public perception of such events during crises. Our study instead examines how lay people

perceived the pandemic through the lens of Black Swan criteria, highlighting the divergence between expert analyses and public perceptions. To our knowledge, no study has directly measured these perceptions during an ongoing high-impact event such as COVID-19. This represents a critical gap in understanding how emotional and cognitive factors may influence crisis perception. The aim of the present study is to quantify the perception of Covid as a black swan during the first lockdown in the general population and to assess the influence of various emotional (fear, sadness) and personality factors related to beliefs in free will (Fatalistic determinism; Unpredictability) on the magnitude of this perception.

Method

Using the Qualtrics platform, we administered a survey on a voluntary basis during the first lockdown period in French-speaking Belgium between 11 and 22 May 2020 and a total of 303 responses for this study (Gender: 226 women, 73 men and 4 "prefer not to answer"; Age: Mean= 39.14 years (SD= 17.28)). For the Black Swan construct, participants responded on a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). The first criterion was represented by the question "Covid-19 is a rare, unusual event" (Rarity), the second by the question "Covid-19 has extreme consequences for society" (Severity) and the third criteria of retrospective bias by the question "Scientifically, we had sufficient evidence to anticipate this pandemic" (Retrospectivity). Although these items do not form a unidimensional scale, we assessed their conceptual clarity and independence by examining bivariate correlations and theoretical coherence. Their use as individual

dependent variables follows Taleb's model distinguishing between the three core features of Black Swan events. Therefore, participants also answered questions related to general felt emotions (anger, sadness, joy) and to the Covid-19 situation like "How fearful are you about the health crisis linked to Covid-19?" (Covid Crisis Fear), "How much tension would you say there is in your family nucleus?" (Family Tensions) and "To what extent do you agree with the decisions made by your government?" (Government decisions' support). We also administered the French version of the 27-item questionnaire on Beliefs in free will (FAD-Plus, Caspar, Verdin, Rigoni, Cleeremans and Klein, 2017) containing fatalistic determinism (e.g. *I believe that the future has already been determined by fate*) or unpredictability (e.g. *No one can predict what will happen in this world*). Fatalistic determinism was assessed using the FAD-Plus scale, which conceptualises fatalism as a psychological belief in predetermined outcomes rather than as a religious doctrine. No information on participants' religious affiliation was collected. All the questions and facets used in this study can be consulted in the supplementary material, along with their descriptive data. We first examined Pearson correlations between Black Swan items and predictor variables. Then, we conducted separate hierarchical multiple regressions for each of the three Black Swan dimensions (Rarity, Severity, Retrospectivity) to identify the most significant predictors among emotional responses and belief systems. A post-hoc power analysis, assuming a medium effect size ($f^2 = .05$), indicated that the sample size of N = 303 provided statistical power greater than .80 for regression models with multiple predictors, thereby supporting the adequacy of

the sample. This research was approved by the local ethics committee of our Psychological Sciences Research Institute (reference number Projet2020-28).

Results

Respondents evaluated Rarity with a mean score of 5.89 (SD = 1.38) and a mean Severity score of 6.28 (SD = .97), underlining the extent to which the Covid crisis was perceived as rare, unusual and having severe consequences for society. The third criterion, retrospective predictability, was more balanced, with a mean score of 4.00 (SD = 1.64). We therefore ran correlations in order to identify factors influencing these Black Swan perceptions (See Table 1). Rarity was positively correlated with Family tensions (r = .15, p = .009) and with Covid crisis related fear (r = .13, p = .02). Severity was positively correlated with Age, Covid crisis related fear, Anger, and Unpredictability (.13 > all r < .27, p < .02) and negatively correlated with Joy (r = -.18, p = .001). Retrospectivity correlated positively with Anger (r = .13, p = .03) and negatively with Fatalistic determinism, Unpredictability and Government decisions' support (-.13 > all r < -.21).

Hierarchical multiple regression analyses were conducted for each Black Swan dimension. For Rarity, the final model explained 5.1% of the variance. The only significant predictor was family tensions (β = .15, p = .031), indicating that stronger perceptions of the rarity of the event were associated with higher levels of domestic conflict. For severity, the final model accounted for 15.9% of the variance (p < .001). The significant predictors were fear of the virus (β = .18, p = .005) and sadness (β = .15, p = .028), with age emerging as a marginal predictor (β = .12, p = .079). This

indicates that emotional responses and demographic factors both contributed to perceptions of the severity of the pandemic. For retrospective predictability, the final model accounted for 11.1% of the variance ($p < 0.001$). Predictors included anger ($\beta = .14$, $p = .043$) as a positive predictor, while support for government decisions ($\beta = –.18$, $p = .002$) and fatalistic determinism ($\beta = –.12$, $p = .065$) were negative predictors. These results suggest that retrospective perceptions of predictability were shaped by emotional reactions, as well as by trust in institutions and belief systems.

Discussion

While the Black Swan Event Theory is widely used and cited, to our knowledge, it has never been directly quantified during a major event. Our study quantified the magnitude of the three facets of these events (rarity, severity and retrospective bias) during the course of a high-impact event such as Covid pandemic. Our results underline the extreme and consensual perception of Covid as Rare and Severe. The retrospective aspect was assessed in a less extreme way, with respondents ranging along the retrospectivity continuum from one extreme to the other. The perception of COVID-19 as a ‘black swan’ event appears to reflect the underlying cognitive and emotional processes that influence many perceptions (Blanchette & Richards, 2010). Hence, our results highlight the role of fear, sadness and anger in determining perception about the rarity, severity and retrospective predictability of the pandemic. Weaker adherence to government’s decision and greater fatalistic determinism were associated with greater retrospective predictability, suggesting that institutional trust and fatalistic worldview may influence retrospective biases. These findings highlight the subjective nature of ‘black swan’ classifications, influenced by personality,

emotions and more broadly belief systems. The explained variance was modest, which is consistent with the multifactorial nature of crisis perceptions. In particular, anger was found to be a predictor of retrospective predictability. According to attribution theory, anger arises when negative events are perceived as being under the control of others, with responsibility for them being attributed externally (Weiner, 1985). As Weiner (1985, p. 562) notes, anger is often elicited when barriers imposed by others are judged to be arbitrary or avoidable. In the context of the pandemic, such anger may have activated the psychological need to restore a sense of control. Consequently, individuals who felt more anger were more likely to reinterpret the crisis as being both foreseeable and preventable, which is a pattern consistent with hindsight bias (Roese & Vohs, 2012). In this way, anger appears to amplify retrospective judgements by fostering perceptions of responsibility, blame and efforts to re-establish controllability. Beyond pandemics, Black Swan thinking has been applied to crises such as stock market's prediction (Bhanja & Das, 2022), terrorist attacks, geopolitical conflicts, and natural disasters (Taleb, 2007). Understanding how such perceptions are shaped across contexts could help develop more adaptive crisis communication strategies. Beyond Taleb's model, alternative theoretical frameworks offer additional insights. The book presenting the 'gray rhino' metaphor (Wucker, 2016) describes 'highly probable, high-impact yet (too often) neglected threats': large, visible risks that societies often ignore until they cause crises. From this perspective, pandemics were foreseeable and repeatedly signaled by epidemiologists, yet institutions failed to address them adequately. The Dragon King framework (Sornette & Ouillon, 2012) emphasises extreme events that, unlike black

swans, emerge from identifiable systemic mechanisms and can therefore be analysed and sometimes predicted. Applying these perspectives suggests that the severity and societal impact of the SARS-CoV-2 crisis were extreme yet embedded in structural vulnerabilities. It was a crisis that had been anticipated for a long time, rather than being a pure Black Swan event. By integrating these alternative frameworks, our study reveals that public perceptions of crises do not align neatly with expert classifications. Instead, they reflect emotional states, worldviews, and trust in institutions. This underscores the importance of studying perceptions as dynamic psychological constructs that influence societal responses to large-scale crises, not merely as reflections of objective probability. In line with Taleb's theoretical framework, the three Black Swan items were treated as conceptually distinct, making internal consistency metrics inappropriate. Still, the observed variance and meaningful correlations suggest each item captured a relevant aspect of perceived Black Swan characteristics. Although the reliance on single-item measures constitutes a limitation, it reflects the direct operationalization of Taleb's criteria. Importantly, because the data were collected during the first lockdown, it would be impossible to reproduce such a unique context retrospectively. As such, the present study offers a valuable and timely contribution to understanding how the Black Swan framework applied to the perception of COVID-19. Future research should also explore how cognitive biases and socio-political attitudes interact to shape crisis perception and decision-making.

Conflict of Interest.

On behalf of all authors, the corresponding author states that there is no conflict of interest.

Data availability

Data from this study is available in the supplementary material section.

Ethical statement

The author declares that he has complied with the ethical rules, the study was subject to an ethical clearance by the local ethics committee and the participants signed a free and informed consent form before accessing the first questions in the study.

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