

**Document Version**

Final published version

**Citation (APA)**

de Vries, G., Kantorowicz-Reznichenko, E., & Kantorowicz, J. (2025). Underestimating terrorism threat: How alerts can lead to unrealistic optimism. *Crisis and Risk Communication*. <https://doi.org/10.1080/29986907.2025.2577922>

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## Underestimating terrorism threat: How alerts can lead to unrealistic optimism

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### ABSTRACT


This theoretical paper aims to unravel the psychological mechanisms explaining how terrorism threat alerts can lead to public underestimation of the risk of a terrorist attack. We discuss, compare and critique a large variety of literature from psychology, public administration, and communication science. We found that throughout the world, people find threat alerts confusing. We provide an extensive psychological explanation of how confusion can lead to optimism bias and, ultimately, to underestimating terrorism threats. Literature suggests implementing three design elements to reduce the confusion that current (leveled) threat alerts create: keep it simple, call for action, and make international agreements for standardization. We discuss these practical design suggestions and give detailed directions for future research to assess the impact of terrorism threat alerts empirically.

### KEYWORDS

Terrorism; public communication; fear management; risk perception; optimism bias

Terrorism comes with high societal costs, evoking fear that reduces public well-being beyond immediate physical and economic consequences (e.g., Breckenridge & Zimbardo, 2007; Frey et al., 2007). Public fear is often a stronger motivation for terrorists than financial loss or death because it enables them to take over power and obtain their political or religious goals (Bakker & de Graaf, 2014). More specifically, feelings of fear can disrupt societies with their impact on public health (e.g., Crijns et al., 2017; Grey & Ropeik, 2002; Richman et al., 2008), economy (e.g., Fischhoff et al., 2003; Huddy et al., 2005), and politics (Berrebi & Klor, 2008). In short, fear of a terrorist attack can cause more significant harm than the actual attack.

Because fear is so disruptive, governments must take counter-terrorism measures to prevent attacks (e.g., Braithwaite, 2013) and establish an alignment between citizens' risk perceptions and the actual risk of a terrorist attack (e.g., Bier, 2001; Tourenq et al., 2017). As stated differently, citizens need to make an accurate threat assessment and not underestimate or overestimate the probability of an attack. Risk literature shows a general social amplification of risk (Kasperson et al., 2022). More specifically, research demonstrates the overestimation of becoming a victim of a terrorism attack (e.g., Mueller, 2006) and how this can lead to psychological distress (Eisenman et al., 2009) and the pressure on governments to take unnecessarily costly or invasive counter-terrorism measures (e.g., Gierlach et al.,

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2010; Huddy et al., 2005). However, citizens should not underestimate the probability of an attack either. That is because risk underestimation could lead to a decline in public support for counter-terrorism measures and, consequently, less compliance (e.g. Bos et al., 2001; Breckenridge & Zimbardo, 2007; Caponecchia, 2012; Heldring, 2004). As a result, governments need to mitigate the over- and underestimation of risk. One way to do that is with public communication.

This paper aims to unravel the psychological mechanisms that explain how a specific form of public communication on terrorism threat (i.e. alerts) influences risk perceptions. We discuss, compare and critique literature from psychology, public administration, and communication science. Furthermore, we provide suggestions for future research and share recommendations on how governments can improve the design of their public communication to facilitate accurate terrorism risk assessment.

### **Public communication**

Public communication is an essential policy tool to inform about terrorism threats (e.g., Breckenridge & Zimbardo, 2007; Crijns et al., 2017; De Graaf, 2011; Grey & Ropeik, 2002; Heldring, 2004; Rogers et al., 2007; Sorensen, 2004). Worldwide, governments and security services publish information on terrorism risks, share counter-terrorism activities, and educate people through press releases, websites, and social media channels. Terrorism threat communication aims to motivate actors to be alert, take protective measures, report suspicious events, and cooperate with law enforcement agencies (e.g., Lindell & Perry, 2012; Mileti & Sorensen, 1990; Morss et al., 2016; Sutton & Kuligowski, 2019; Taylor et al., 2019). By stimulating these actions, public communication can mitigate the impact of terrorism threats, but only if it leads to an accurate threat assessment (e.g., Bakshi & Pinker, 2018; McDermott & Zimbardo, 2007; Shapiro & Cohen, 2007).

### **Terrorism threat alerts**

Most governments use alerts to communicate terrorism threats. The National Coordinator for Security and Counter-Terrorism (NCTV) in the Netherlands uses an alert system of five leveled numbers, descending from critical (5) to minimal risk (1) (NCTV, n.d.). The Joint Terrorism Analysis Centre and the Security Service in the United Kingdom apply a similar approach (n.d.). The Australian Government's National Terrorism Threat Level is a scale of five levels that run from "certain" (red), "expected" (orange), "probable" (yellow), and "possible" (blue) to "not expected" (green) (ACT Policing [ACT], n.d.).

Another well-known example of a colored, leveled alert system is the Homeland Security Advisory System (HSAS) of the United States. Until 2011, this system was the most prominent domestic counter-terrorism tool. Just as the Australian scale, it had five threat levels: severe (red), high (orange), elevated (yellow), guarded (blue), and low (green) (Shapiro & Cohen, 2007). The US replaced the HSAS in 2011 with the National Terrorism Advisory System (NTAS), consisting of only two levels using words. *Elevated* if there is credible threat information, but only general information about timing and target. *Imminent* if the threat is credible, specific, and impending in the near term. Since 2015, NTAS has also issued bulletins about trending security issues and the general threat environment (DHS, n.d.).

### **Risk overestimation and underestimation**

Regardless of the type of alert communicated, governments must address both the overestimation and underestimation of terrorism risk. Much of the existing literature has focused on the tendency to overestimate such threats (e.g., Kaspersen et al., 2022; Mueller, 2006; Sjöberg, 2005; Sunstein, 2003). For example, research on *probability neglect*, a cognitive bias, demonstrates that individuals often discount the low likelihood of a terrorist attack. In particular, when the potential outcome is emotionally charged, such as following a personal or collective traumatic experience (Kollmann et al., 2022; Sunstein, 2003). From an evolutionary standpoint, overestimating risk may be adaptive, as it promotes self-protection. This tendency is also strategically exploited by terrorists, who aim to provoke disproportionate fear and disruption (e.g., Breckenridge & Zimbardo, 2007; Frey et al., 2007).

While overestimation has received more scholarly and public attention, a growing body of research indicates that terrorism threat alerts can also lead to the *underestimation* of risk (e.g., Caponecchia, 2012; Fischhoff et al., 2003; HMSO, 2006; Liem et al., 2018; Neußner, 2021; Salmon et al., 2003; Sunstein, 2003). However, there is a notable lack of theoretical work that explains why, and under what conditions, individuals might underestimate terrorism threats rather than overestimate them. This gap is especially striking given the importance of accurate threat perception for effective public safety and policy (e.g., Bos et al., 2001; Breckenridge & Zimbardo, 2007; Caponecchia, 2012; Heldring, 2004). The current paper seeks to address this gap by exploring the psychological mechanisms that may contribute to the underestimation of terrorism risk.

### **Optimism bias**

Some scientific papers mention optimism bias as the underlying psychological mechanism (e.g., Caponecchia, 2012; Salmon et al., 2003), which is the cognitive tendency to think that adverse events are less likely to happen to oneself than to the average person (Weinstein, 1980). Decision models, such as the Protection Action Decision Model (PADM), also acknowledge that psychological processes steer human behavior. Still, they are relatively silent about the influence of biases, such as optimism bias (e.g., Lindell & Perry, 2012). As a result, these models do not explain well how optimism bias can lead to risk underestimation, especially when people are uncertain about a situation, for example, under a terrorism threat (Tversky & Kahneman, 1974). Moreover, the papers and models above do not give a clear overview of factors that trigger the psychological processes leading to a wrongful assessment of the likelihood of a terrorist attack. In sum, a detailed psychological analysis of how threat alerts could lead to optimism bias and how governments can apply these insights to improve terrorism threat communication is lacking.

### **How terrorism threat alerts can lead to optimism bias**

According to action decision models such as the Protection Action Decision Model (PADM), people go through multiple stages after reading or hearing a threat alert. The most critical step is understanding the warning (Lindell & Perry, 2012). However, relevant literature shows that threat alerts are confusing, regardless of whether they exist in numbers,

colors or words (e.g., HMSO, 2006; Mileti & Sorensen, 1990; Neußner, 2021; Shapiro & Cohen, 2007; Taylor et al., 2019). Information-processing theory can help explain how current threat alerts can lead to confusion.

### **Information processing**

Ample empirical research shows that humans process information via two routes to form judgments (Evans & Stanovich, 2013). There is a slow, systematic, controlled, and conscious path and a fast lane based on efficient “mental shortcuts” that are unrelated to the content of the message and save resources such as time and mental space (e.g., Chaiken, 1980; Frankish, 2010; Kahneman, 2003, 2011; Petty & Cacioppo, 1986). Judgments made via the slow path are often stable and reliable (Petty et al., 1995) and are more likely to occur when readers have the motivation, time, and ability to process the content of a message and understand it (Chaiken, 1980; Petty & Cacioppo, 1986). In contrast, judgments made via the fast lane can easily lead to bias, mainly when people must decide about uncertain events such as terrorist attacks (e.g., Breckenridge & Zimbardo, 2007; Kahneman, 2011; Simon, 1955; Tversky & Kahneman, 1974). Whether people take the slow or fast lane is relevant for a correct threat assessment.

Public communication officers dealing with threat alerts would presumably target the slow path over the fast lane to prevent bias. They want people to understand the message and take appropriate action. Officers could argue that the relevance of an alert like: “*The risk of an attack in or against our country is Level 4 (Substantial): There is a real chance of a terrorist attack*” could motivate citizens to read it; thus, it will trigger slow and conscious information-processing (Frewer et al., 1999). However, one can also argue that short threat alerts like the above facilitate the fast lane instead of the slow path. The message lacks essential information, decreasing understandability and the reader’s motivation to process the content consciously (e.g., Mileti & Sorensen, 1990; Shapiro & Cohen, 2007). For example, the alert is silent on the specific risks and the actions people should take. It leaves the reader with questions such as: What does “a real chance” mean? How severe would this attack be? Is it likely that an attack will happen in my city? What is expected of me? This unclarity could demotivate readers to process the alert consciously via the slow path. Indeed, there is evidence that people find it difficult to understand and act upon warnings.

### **Confusion**

A parliamentary enquiry into the London terrorist attacks on July 7, 2005, concludes that people find threat alerts confusing (HMSO, 2006). The Intelligence and Security Committee Report on the enquiry states that a shared understanding of both design and purpose among users of the alert system is lacking. When officials reduced the national terrorist threat level from *severe* to *substantial* in May 2005 (two months before the attacks), citizens misunderstood the alert level. Many believed the reduction meant a drop in alertness, but this lowering did not imply that. Moreover, practitioners such as ministers found the different alert state schemes a cause for confusion and did not understand the system behind the alerts (HMSO, 2006).

Survey research in England and Wales following Storm Doris (i.e., a 2017 winter storm during which wind warnings were issued) further proves that people find it

challenging to understand warnings. Only 58% of the survey participants understood that warnings for strong winds are based on potential impacts. Moreover, the fact that weather warnings differ for different regions was poorly understood (e.g., Taylor et al., 2019). A study that interviewed 320 people in Hong Kong to assess their understanding of severe weather warnings reported similar findings. When quizzed about the meaning of different symbols, colors and numbers, most interviewees had only a fundamental knowledge of what the warnings meant. For example, the color coding used in rainstorm warnings caused misunderstanding and confusion. People found it unclear whether amber or red signifies the more significant threat (Wong & Yan, 2002). Finally, a recent review of warning schemes worldwide found that using different alerts in different countries is confusing. In our globalized world, where people travel and pick up international news, the different wordings, number of alert levels, color codes, and pictograms compromise public understanding (Neußner, 2021).

### ***Third-person effect***

Another plausible psychological mechanism that may contribute to optimism bias is the third-person effect. Initially proposed by Davison (1983), this effect describes the tendency of individuals to believe that others are more influenced by mass media messages than they are themselves. In the context of threat communication, individuals can interpret collective-level warnings (e.g., “our country is a target of a terrorist attack”) as more applicable to generalized others, such as people in different cities, demographic groups, or social circles, than to themselves (e.g., Sjöberg, 2005). As a result, their individual-level risk perception (e.g., “I might become a victim of a terrorist attack”) may be psychologically displaced. This distancing from personal to collective relevance can foster a sense of invulnerability, reinforcing the belief that they are safe and thereby contributing to an underestimation of personal risk. Unlike the confusion mechanism described above, which implies shallow information processing and reliance on cognitive shortcuts on an intra-personal level, the third-person effect operates through a social comparison lens, subtly shifting perceived vulnerability onto others.

Although the third-person effect offers a compelling explanation for the underestimation of terrorism threats, there is empirical evidence indicating that confusion can lead to biased risk assessments (e.g., De Vries et al., 2014; Neußner, 2021; Shepperd et al., 2002; Sutton & Kuligowski, 2019). Importantly, unlike the third-person effect, which may be more resistant to change, confusion-based biases are potentially more amenable to intervention through clear and consistent policy design. For this reason, the present paper focuses on how confusion contributes to optimism bias and offers practical recommendations for improving the clarity and effectiveness of threat alerts.

### ***From confusion to optimism bias***

As previously explained, a confusing threat alert could decrease a reader’s motivation to process the content consciously and to pay attention to its message (e.g., Mileti & Sorensen, 1990; Shapiro & Cohen, 2007). The human brain tends to solve attention gaps with mental shortcuts in the form of cognitive bias, a systematic but flawed

thought process causing judgment and decision problems (e.g., Breckenridge & Zimbardo, 2007; Haselton et al., 2015; Kahneman, 2011; Simon, 1955; Tversky & Kahneman, 1974).

Mileti and Sorensen (1990), in their comprehensive review of warning systems, emphasize that individuals often rely on cognitive biases to make sense of ambiguous alerts. While they highlight that such biases can distort judgment and lead to inaccurate risk evaluations, they do not specify which particular biases are at play, nor do they elaborate on the underlying psychological mechanisms. But, regardless of its underlying mechanism, the most important reason we think optimism is dominant is scientific evidence proving that this bias has appeared strong for many adverse events, including terrorist attacks.

The first empirical evidence for optimism bias was found in 1980 when psychologist Neil Weinstein asked a large sample of college students to estimate the difference between their chances of experiencing future life events and their classmates. He found that for positive events (e.g., living past age 80), students rated their chances to be significantly above average. They placed their chances below average for adverse events (i.e., heart attack before age 40). In later research, Weinstein mentions that optimism bias may particularly arise when the risk is ambiguous, such as in an unclear threat alert (Weinstein, 1989).

Over the years, more evidence for optimism bias has arisen. First, an online survey of a representative sample of Dutch citizens ( $N = 1077$ ) showed that respondents estimated their chance of becoming the victim of a terrorist attack as lower than that of other residents in their city. In other words, they unrealistically underestimated their vulnerability (Liem et al., 2018). An Australian online survey demonstrated the same results. Residents of Sydney ( $N = 164$ ) thought they were less likely to experience terrorist attacks than other Australians (Caponecchia, 2012). Recent experimental research on samples in the UK and the Netherlands ( $N = 6315$ ) provides further evidence for underestimating terrorism risks (i.e. optimism bias). It demonstrates that people strongly focus on the severity of attacks and underestimate probabilities (Kantorowicz et al., 2025). Finally, the report on the London terrorist attacks found that people underestimated the risks, although the authors did not specifically attribute that to optimism bias (HMSO, 2006).

Neuroscientific research explains that optimism bias is such a strong bias because positive expectations have evolutionary benefits regarding people's physical and mental health (Sharot, 2011; Sharot et al., 2007, 2011). So, from a *psychological* point of view, an optimism bias is functional, whether created by unclear information or by another cause. To protect ourselves from the salience of our mortality, when terrorism threat alerts confront us with the possibility of an attack, we quickly—and automatically—create an illusion of invulnerability (e.g., Greenberg et al., 1997; Weinstein, 1989). This form of self-deception saves cognitive resources (e.g., Bateson, 2016; Johnson & Fowler, 2011; Von Hippel & Trivers, 2011) and can shield us from depression, negative emotions and (related) health issues (e.g., Forgeard & Seligman, 2012; Weinstein, 1989).

However, from a rational point of view, an optimism bias is not functional. As said in the introduction, it would be more serving to *overestimate* the risk and protect oneself than to *underestimate* the risk and do nothing if someone's life might be in danger (e.g., Aplin & Rogers, 2020; Forgeard & Seligman, 2012). Indeed, research shows that pessimists, who overestimate risks, take more self-protective measures than realists or optimists. So, pessimism could certainly spur action. The few articles we found indicated that, in general, pessimism bias only occurs when it is clear that the danger is inevitable and close (e.g.,

Dolinski et al., 1987; Huddy et al., 2002; Kantorowicz et al., 2023; Klar et al., 2002; Taylor et al., 2019).

As stated differently, terrorists can effectively create disproportional fear (i.e., over-estimation of risk) when explicit and concrete. When communication informs that the danger is avoidable or at a distance, or it is silent on if, when, and where a possible attack occurs, as is the case with the current threat alerts, fear is less likely to occur. In contrast, following the line of reasoning above, unclear terrorism threat communications can lead to downplaying the risk. In conclusion, current (confusing) threat alerts can lead to under-estimating terrorism risk and lead to optimism bias.

## Threat alert design improvement

Even though optimism bias is functional for daily life, communication officers aiming for a realistic terrorism threat assessment can regard it as an unwanted design flaw (Haselton et al., 2015). To prevent optimism bias, the analysis above is conclusive: a threat alert must be clear (e.g., Bier, 2001; Frewer, 2004; Mileti & Sorensen, 1990; Sorensen, 2004). As Neußner points out (2021, p. 2): *“If a system is not clear and concise, even a credible warning might be ignored because the alert is not fully understood by a recipient.”*

The Sendai Framework for Disaster Risk Reduction 2015–2030 explicitly states that information should be understandable for everyone. This framework is the outcome of stakeholder consultations and inter-governmental negotiations from July 2014 to March 2015, supported by the United Nations Office for Disaster Risk Reduction at the request of the UN General Assembly. The framework was adopted at the Third UN World Conference in Sendai, Japan, on March 18, 2015 (Sendai Framework, 2015). Moreover, in some countries, clear governmental information is a legal right. For example, in 2010, the Plain Writing Act (Public Law 111–274) was passed to enhance citizens’ access to government information and services in the United States. The law requires that federal agencies use clear government communication that the public can understand and use the first time they read or hear it. Therefore, communication officers involved in risk communication have a moral obligation and sometimes a legal obligation to design terrorism threat alerts that every citizen can understand.

Literature suggests implementing three design elements to reduce the confusion that current (leveled) threat alerts create: (1) language simplicity, (2) call to action, and (3) standardization. We will elaborate on these elements below.

### Keep it simple

Scholars and practitioners agree that simple messages use familiar, everyday words, have a non-ambiguous core message, are in active voice, and are short. These ingredients make it easier for people to understand information (e.g., De Vries, 2017, 2020; Kayam, 2018; Neußner, 2021; Zarcadoolas, 2011). When people understand a threat alert, they process the message more systemically (i.e., via the slow path), leading to a realistic threat assessment and more stable behavior (e.g., Petty et al., 1995).

Rhetoric expert Orly Kayam suggests that simple messages are low in (1) the average number of words per sentence, (2) the percentage of *polysyllables* (words consisting of more than three syllables) in a sentence, (3) the average number of syllables per word, and (4) the

average number of characters per word. Thus, a threat alert must contain short, understandable words in a short sentence. However, when is a message short enough to be legible and still informative?

An example that Zarcadoolas (2011) brings up in her (socio)linguistic analysis of simple messages is the anti-terrorism slogan “If You See Something, Say Something®.” New York City’s Metropolitan Transportation Authority (MTA) initially implemented this slogan after the terrorist attacks on the World Trade Center Twin Towers on September 11, 2001. The MTA later licensed its use to the US Department of Homeland Security (DHS). DHS launched a national campaign in July 2010 to raise public awareness of indicators of terrorism and terrorism-related crime and to emphasize the importance of reporting suspicious activity to law enforcement authorities ([www.dhs.gov/see-something-say-something](http://www.dhs.gov/see-something-say-something)) Although the “If You See Something, Say Something®” slogan does not inform people about a threat level (i.e., it is not a threat alert), it illustrates the power of a message with a few simple words in a short sentence. Besides its simplicity, the slogan includes a call to action, an essential ingredient for an adequate warning (e.g., Wong & Yan, 2002).

### **Call to action**

The “If You See Something, Say Something®” slogan urges people to increase their vigilance and report suspicious events. Clarity about what people need to do in a particular situation improves perceptions of self-efficacy and effectiveness, which can prevent bias and lead to appropriate behavior (e.g., De Vries, 2020; Manstead & Van Eekelen, 1998). Suppose there is little clarity on what behavior is expected, such as in the alert: “*The risk of an attack in or against our country is Level 4 (Substantial): There is a real chance of a terrorist attack.*” In that case, people are uncertain about their ability to take the right action (i.e., a lack of perceived self-efficacy) or their appraisals of the usefulness of these actions (i.e., a lack of perceived effectiveness).

A meta-analysis of research on self-efficacy and performance found that calls to action work best when accompanied by accurate information and clear, concise instructions, such as the “If You See Something, Say Something®” slogan (Stajkovic & Luthans, 1998). We are unaware of any peer-reviewed study on the actual effectiveness of this particular slogan, but there is a reference to Zarcadoolas (2011), Homeland Security’s claims, and news reports ([reason.com/2012/03/19/ten-years-of-if-you-see-something-say-so/](http://reason.com/2012/03/19/ten-years-of-if-you-see-something-say-so/)). Furthermore, a survey among a statistically representative sample of the population of the continental United States emphasizes the importance of telling people what to do in case of a terrorist threat. The survey findings indicate that people are most likely to prepare themselves if they know what action to take (i.e., stockpiling supplies, purchasing things to be safer, etc.), and they perceive these actions as effective and doable (Wood et al., 2012).

Generally, a threat alert must not only be simple, but it also needs to be specific about what people can do. Without an action perspective, people can quickly process the message via the fast lane and, consequently, assess a threat wrongfully. To formulate an action perspective, communication officers must decide what behavior to elicit with a specific threat alert level. For example, they must be clear on what behavior is expected from citizens when a threat level is “*elevated*” and what behavior is expected when the level is “*imminent*.” To make threat alerts even more straightforward, governments could consider standardizing them.

### **Standardize threat alerts**

Standardization is the third design element that reduces the confusion that current (leveled) threat alerts can create. Neußner (2021) found various wordings, numbers, levels, colors, and pictograms in his review of worldwide warning alerts. This wide range makes it difficult for citizens to understand the warning and take adequate action. Standardized threat alerts that are similar in every country increase recognition and can enhance realistic threat assessment. Survey research on the understandability and usefulness of information about uncertain events demonstrates that people prefer familiar formats (Taylor et al., 2015).

Standardization is essential because people move quickly across borders for trade, labor, and leisure, and they can encounter threat alerts in a foreign country. When visitors are unfamiliar with the threat alerts in the country they are visiting, they presumably do not process the message well and fall victim to optimism bias instead of taking appropriate action. For example, a Dutch businesswoman in the United States might not grasp the severity of an “imminent” threat because she is only familiar with a five-level alert in her country of residence. In summary, we recommend three core design strategies for improving terrorism threat alerts: Keep it simple, include a call to action, and standardize alerts internationally.

### **Discussion**

Drawing on a broad spectrum of literature from various scientific disciplines, this paper offers a psychological analysis of how terrorism threat alerts may contribute to the underestimation of risk. Our findings indicate that, globally, individuals often perceive current terrorism alerts as unclear or confusing, which can foster an optimism bias in their risk assessment.

This study is the first to explain *why* individuals may underestimate terrorism threats, integrating insights from psychology and communication science with counter-terrorism management (public administration). Public communication remains an underexplored area within counter-terrorism research (e.g., Bakker & de Graaf, 2014), and studies specifically examining the psychological dimensions of such communication are even more limited (Breckenridge & Zimbardo, 2007). However, a psychological lens is crucial for understanding the decision-making processes that follow the reception of a threat alert. This is particularly relevant for governments that have a rationalist view of human behavior, assuming wrongfully that citizens will comprehend the meaning of alerts and respond appropriately (e.g., Lindell & Perry, 2012; Mileti & Sorensen, 1990; Morss et al., 2016; Sutton & Kuligowski, 2019; Taylor et al., 2019).

With our theoretical explanation, we contribute to decision models, such as the Protection Action Decision Model (PADM), that acknowledge psychological processes but do not explain well how public communication can lead to terrorism risk underestimation. However, one of the limits of a literature review is that claims about causal relations should be taken carefully. While this paper focuses on the role of confusion, an intrapersonal mechanism, as a cause of optimism bias in response to terrorism threat alerts, it is important to acknowledge that other psychological processes may also be at play. For instance, as mentioned earlier, the third-person effect, rooted in social comparison, may lead individuals to perceive such alerts as more relevant to others than to themselves,

thereby fostering a sense of personal invulnerability. Moreover, it is possible that additional, yet unidentified, psychological mechanisms may influence how individuals evaluate personal risk in response to threat alerts, such as *motivated reasoning*, where personal motivations shape the interpretation of information, or even outright denial of the threat.

To better understand the psychological mechanisms underlying optimism bias in response to threat alerts, future studies could employ randomized experimental designs that isolate and compare the effects of different mechanisms. For example, the effects of confusion via variations in wording, numerical presentation, or visual elements. Similarly, framing alerts to emphasize personal versus collective risk could help isolate the role of social comparison.

Addressing optimism bias not only improves public responsiveness to terrorism threat alerts but also strengthens support for more rational and cost-effective counter-terrorism policies (e.g., Bos et al., 2001; Breckenridge & Zimbardo, 2007; Caponecchia, 2012; Heldring, 2004). Moreover, it contributes to democratic resilience by enabling citizens to make more realistic and autonomous assessments of terrorism threats (e.g., Jenkin, 2006).

To reduce confusion in current (leveled) alert systems, our study suggests applying three core design principles: language simplicity, inclusion of a call to action, and standardization. While standardization aligns with global frameworks such as the *Sendai Framework for Disaster Risk Reduction* (2015), it presents significant challenges. Coordinating across countries requires consensus on terminology, symbols, and color schemes; elements that may carry different meanings across cultures (e.g., Wong & Yan, 2002). Randomized experimental designs, as proposed above, can be used not only to test psychological mechanisms but also to evaluate the effectiveness of different alert formats across countries. For example, researchers could systematically vary message length, clarity, use of color, and inclusion of action prompts to assess which combinations are most effective across diverse populations. In this design, simplicity and conveying a clear call to action can be assessed.

### **Generalisability**

Our findings have implications that extend beyond the domain of terrorism, offering insights for improving public communication in a broader range of crisis contexts. Inadequate risk evaluation following crisis information is not unique to terrorism; rather, the underlying psychological mechanisms, as discussed in this paper, are broadly generalizable to other types of crises and disasters. For instance, during the early stages of the COVID-19 pandemic, ambiguous and inconsistent messaging about risks and consequences may have confused individuals or led them to assume that others, rather than themselves, were vulnerable. This likely contributed to an underestimation of personal risk and, consequently, unsafe behavior (Holford et al., 2022; Hopkins et al., 2023), although there are studies showing it led to overestimation of vulnerability to health risks (Dryhurst et al., 2022; Simonovic & Taber, 2022).

However, it is important to acknowledge that terrorism possesses psychologically distinctive features that may amplify or alter these mechanisms. Unlike natural disasters or pandemics, terrorist attacks are intentional and human-driven, often evoking intense emotional responses and moral judgments. Their deliberate and symbolic nature, combined with extensive media coverage, may uniquely intensify both overestimation and underestimation of risk. Therefore, while the psychological mechanisms discussed are

transferable, their expression and impact are likely to vary depending on the nature of the crisis (e.g., Kollmann et al., 2022).

### ***Sociopolitical dynamics***

Beyond individual psychological mechanisms, sociopolitical dynamics can play a critical role in shaping public responses to terrorism threat alerts. These dynamics refer to the broader societal, cultural, and political contexts that influence how individuals interpret and react to risk communications. In societies where terrorism is perceived as a distant threat, either geographically or culturally, individuals may psychologically dissociate from the perceived target group, a phenomenon akin to the third-person effect. This distancing can diminish the perceived need for personal vigilance or compliance with counter-terrorism measures, thereby reinforcing optimism bias. In contrast, in societies where terrorism is a more immediate or normalized threat, individuals may overestimate their personal risk, potentially leading to heightened anxiety and overcompliance.

A key sociopolitical factor influencing these dynamics is trust in the source issuing the alert. Research consistently shows that trust in institutions such as national governments or security agencies significantly affects how threat information is processed (e.g., Neufßner, 2021; Stevens et al., 2011; Taylor et al., 2019). High trust can mitigate optimism bias (e.g., Bier, 2001; Crijns et al., 2017; Frewer, 2004; Palenchar & Heath, 2007; Rogers et al., 2007; Sorensen, 2004) by encouraging individuals to engage in systematic processing of even ambiguous messages (Chaiken & Maheswaran, 1994; Sutton & Kuligowski, 2019). For example, individuals with high trust are more likely to seek additional information, consult peers, or explore official channels to clarify the alert's meaning. Conversely, low trust (or uncertainty about the source's identity) can lead to heuristic processing, where individuals rely on cognitive shortcuts or confirmation bias, potentially reinforcing underestimation of risk (De Vries et al., 2014; Shapiro & Cohen, 2007; Van Der Does et al., 2021). It is noteworthy to mention that political ideology can interact with trust and shape risk perception, emphasizing that the influence of trust is context-dependent mainly (Dryhurst et al., 2022). These findings underscore the need for culturally and politically sensitive approaches to threat communication and further support the idea that both psychological and sociopolitical mechanisms must be considered when evaluating public responses to terrorism alerts. Although we chose not to include threat-proximity, trust, and political ideology in our current framework due to their country-specific variability, we recognize their importance. Therefore, we would recommend incorporating these variables as moderating variables in experimental research to examine their effect on terrorism threat perception.

### ***Mobile populations***

In the previous section, we discussed cross-national differences in risk perception. It is equally important to consider how individuals who move across borders, such as frequent international travelers and expatriates, perceive and respond to terrorism threat alerts. These populations may be particularly vulnerable to optimism bias due to unfamiliarity with local alert systems, cultural variations in interpreting symbols and language, and potential desensitization from repeated exposure to warnings. Such

mismatches in expectations and interpretations can result in underreaction or inaction during critical moments. Understanding how mobile populations interpret and respond to terrorism threat alerts is essential for developing inclusive and effective communications. To explore these dynamics, future research could include travelers and expatriates in their sample.

### **Future research**

As outlined above, we recommend data-driven, cross-cultural experimental studies to advance this field. We propose the establishment of international research consortia, ideally involving collaboration among universities and institutions across multiple countries. These consortia could design randomized experiments that systematically vary key features of threat alerts. Participants would include residents from diverse global regions, including travelers and expatriates. Experimental manipulations could involve variations in visual design (e.g., color schemes, numerical formats), message framing (e.g., emphasis on personal vs. collective risk, inclusion vs. exclusion of action prompts, or use of simple vs. complex language). To explore individual differences, surveys could assess potential moderators such as trust in government, country of residence, political orientation, and prior exposure to terrorism. Mediators might include perceived clarity, self-efficacy, emotional response, and whether the message is perceived as personally relevant. The primary outcome variable would be perceived terrorism risk, with secondary outcomes such as willingness to act on the alert. To examine how alert effectiveness varies by crisis type, the context of the alert could also be manipulated (e.g., terrorism, health, weather). Open-ended survey questions or follow-up interviews could further explore cultural interpretations and uncover additional mediators and moderators. This line of research would help identify which components of alert systems are universally effective and which require cultural or contextual adaptation, ultimately contributing to more standardized and globally accessible threat communication.

### **Conclusion**

This literature review revealed that current terrorism threat alerts can be confusing. As a result, people might be overly optimistic about the risk of becoming a victim of an attack. This optimism bias is a problem because it could lead to a decline in support for counter-terrorism measures and, consequently, less compliance with national policy. To debias alerts, communication officers need to keep them simple, give a clear call to action, and aim to make threat alerts the same all over the world. We provide recommendations for that. We further discussed that experimental research is needed to provide empirical proof for the causal relations that the current paper assumes, and to reveal the influence of other factors that influence public responses to terrorism threat alerts. We call out to scholars across the globe to experiment, bring this research further, and disseminate its findings to relevant stakeholders within our society. That is needed because public communication is an essential counter-terrorism instrument to keep the world safe.

## Disclosure statement

No potential conflict of interest was reported by the author(s).

## Funding

This paper is part of a research project called “Perceived Risk of Terrorism and its Implications for (Counter-Terrorism) Communication Strategies.” This project has received funding (€ 30,000) from the Centre for Safety and Security under the Leiden-Delft-Erasmus Strategic Alliance in the Netherlands.

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