



Implicit Terror: A Natural Experiment on How Terror Attacks Affect Implicit Bias

Filip Olsson

Stockholm University

Abstract: Sociology has recently seen a surge of interest in implicit culture, which refers to knowledge, habits, and feelings that are largely automatic and habitual. In this article, I argue that certain expressions of implicit culture may be more contextual and malleable than previously thought. The argument is illustrated by showing how terror attacks in France affect implicit bias toward Arab Muslims. By analyzing the longevity and specificity of this effect, I also detail when and why implicit bias might change. The article consists of two studies. Study 1 shows that the attacks significantly increased implicit bias in France ($n = 449$), whereas Study 2 shows that the attacks had a similar effect globally ($n = 25795$). There was no corresponding effect on explicit bias in either study. I discuss the implications of the findings for research on terror attacks, implicit bias, and implicit culture.

Keywords: implicit bias; implicit culture; natural experiment; terror attacks; prejudice

Replication Package: All data used are publicly available at <https://osf.io/y9hiq/> and <https://osf.io/kaqi5/>. A replication package with R code is available at <https://osf.io/j5wxu/>

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DUAL-PROCESS models (DPM) have become increasingly popular within cognitive and cultural sociology. These models point to the existence of two separate (but intertwined) modes of culture: explicit and implicit culture. Implicit culture refers to (among other things) knowledge and habits that are largely automatic and habitual. By detailing how implicit culture is acquired, stored, and activated, DPMs have been used to bridge the gap between cultural sociology and cognitive psychology (Lamont et al. 2017; Vaisey 2009).

This article focuses on a specific expression of implicit culture: implicit bias. Implicit bias includes different sentiments, beliefs, and attitudes toward a social group or concept. Most research within both psychology and sociology perceives implicit bias as a highly stable disposition acquired early in life (Gawronski 2019). Few sociological studies have thus focused on the malleability of implicit bias. By consolidating research from both psychology and sociology, I argue that implicit bias might be more unstable and contextual than previously thought, and demonstrate this argument by looking at how large-scale events affect the activation and expression of implicit bias.

To this end, I use a natural experiment to assess how three terror attacks in France — the 2015 Charlie Hebdo attack, the November 2015 Paris attack, and the 2016 Nice truck attack — affected implicit bias toward Arab Muslim people. Terror attacks are used as an example of a sudden, large-scale event that affects most people in an afflicted country (Brouard, Vasilopoulos, and Foucault., 2018).

Although relatively few people are directly exposed to the attacks, most will be exposed to the coverage and fallout of the attacks (Muñoz, Falcó-Gimeno, and Hernández 2019). Terror attacks can thus affect the physical, symbolic, and social context of a large part of a population (Lequesne 2016; Faucher and Boussaguet 2017; Chetty and Alathur 2018).

Recent developments within cognitive psychology (e.g., Payne et al. 2017) also suggest that implicit bias might be *more* sensitive to, for example, terror attacks than explicit bias, but this assumption is largely untested. To assess this assumption, the article compares the effect of the attacks on both implicit and explicit bias. The study thereby uses real-world data to show whether implicit bias is 1) sensitive to large-scale contextual changes, and 2) more sensitive to contextual changes than explicit bias.

The article consists of two studies. In Study 1, I test whether the attacks affected implicit and explicit bias among French respondents, focusing on the direction, longevity, and specificity of the effect. In Study 2, I replicate the study using respondents from 181 different countries and analyze if proximity to France moderates the effect of the attacks.

The article aims to make several contributions, both theoretically and empirically. Theoretically, it adds to the sociological debate on the nature of implicit culture. Although much of the literature has focused on the role of dispositions learned early in life (e.g., Vaisey 2009; Lizardo et al. 2016), the article shows how large-scale events can affect the activation of implicit bias both nationally and globally. The article thus demonstrates the role (and importance) of contextual changes for personal culture, but also how these contextual changes might uniquely impact expressions of implicit culture.

Empirically and methodologically, the article adds to the literature on terror attacks by showing how and when attacks affect bias. Natural experiments are increasingly used to study the effect of terror attacks on explicit attitudes, but evidence has been mixed (e.g., Brouard et al. 2018; Savelkoul, te Grotenhuis, and Scheepers 2022). No natural experiment has, to the best of my knowledge, been used to analyze the effect of terror attacks on implicit cognitions (but see Arnoult et al., forthcoming, for a correlational approach). As I attempt to show in the article, terror attacks might primarily (and sometimes exclusively) affect implicit bias. Combining natural experiments with explicit measures might, then, be a mismatch between design and measurements.¹

The remainder of the article is organized in the following way. I begin by giving a theoretical overview of public and personal culture, with an emphasis on the acquisition and activation of implicit culture. I account for both dispositional and situational approaches and show how they correspond to existing divides within cognitive psychology. I then move on to the empirical analysis, where I test whether terror attacks affect explicit and implicit bias both in France and globally. The article ends with a discussion of the theoretical and empirical implications of the study findings.

Theoretical background

Implicit culture and implicit bias

There have been numerous sociological attempts to create a framework of public and personal culture, but many of them have neglected or under-theorized the role of implicit culture (Lizardo et al. 2016). In response to these shortcomings, dual-process models and similar offshoots have become increasingly popular (Leschziner 2019). These models provide a framework for understanding the link (or lack thereof) between culture and actions (e.g., Vaisey 2009). They generally point to the existence of four interconnected modes of culture: public, personal, implicit, and explicit culture (Lizardo 2017; Strandell 2019).

Public culture refers to extra-personal culture, such as public discourses, norms, and institutions. Public culture affects the individual through an “enculturation process” where for example, social norms become internalized over time (Lizardo 2017). Internalized, personal culture includes elements of both explicit and implicit culture. Explicit culture consists of “know-that” knowledge, which we strategically use and reflect on. Implicit culture consists of “know-how” knowledge, which is largely automatic and habitual (Lizardo 2017).²

Although implicit culture is often described as unconscious, the degree of unconsciousness will vary between different skills and attitudes. We sometimes use implicit culture without being conscious of its content, source, or effect, but we can also (automatically) use it while being knowledgeable about either part (Lizardo 2022). An attitude or belief can thus be implicit without being wholly unconscious, which is often the case with attitudes measured with implicit measures (Gawronski, Hofmann, and Wilbur 2006).

This study focuses on a specific expression of implicit culture: implicit bias. Implicit bias refers to a positive or negative evaluation of a certain social group or concept. It includes both specific stereotypes (e.g., “Arabic” + “Violent”) and more generalized positive or negative feelings (e.g., “Arabic” + “Unpleasant”) (Bursell and Olsson 2021). Similar to other types of implicit culture, implicit bias often overlaps with explicit bias. It is, however, fully possible for implicit bias to run counter to explicit bias. It can sometimes result in large disconnects between what we say and what we do (Vaisey 2009; Lizardo 2017).

Acquisition and activation of implicit culture

We experience public culture via cultural symbols and beliefs from both media, other individuals, and physical encounters. We internalize public culture by interacting with, reconstructing, and reproducing, for example, a belief or a stereotype (Lizardo 2017).

The internalization process affects both explicit and implicit culture, but in different ways. Whereas explicit culture can be internalized relatively instantaneously, implicit culture is often the result of repeated long-term exposure (Greenwald and Banaji, 2005; Lizardo 2017).³ Repeated exposure will form associations between different concepts. The strength of an association depends on how often these concepts co-occur; every time two concepts co-occur, the association between them will

strengthen (De Houwer, Thomas, and Baeyens 2001).⁴ Being exposed to repeated negative portrayals of, for example, Arab Muslims will result in a negative implicit bias towards Arab Muslims. The internalization of implicit culture is thus largely unconscious and passive and includes both skills and taken-for-granted attitudes.

The activation of implicit culture is closely connected to the acquisition of implicit culture. Once a strong association between two concepts has been established, the occurrence of one concept will increase the chance of activating the associated concept (Shepherd and Marshall 2018). If we internalize an association between “Arab Muslims” and “terrorism”, we are more likely to think of terrorism when encountering an Arab Muslim person and vice versa. On a neural level, this corresponds to Hebb’s axiom of “fire together wire together” (Shepherd 2019).

The primacy of context

Throughout our lifetime, we internalize different implicit associations related to the same concept (Shepherd 2011). We will thus have many and often conflicting associations related to, for example, Arab Muslims. We might, for example, implicitly associate Arab Muslims with both “good” and “bad”, “victim” and “perpetrator”, and “hardworking” and “lazy”. What, then, determines whether a given association becomes activated or suppressed? Most sociologists emphasize the importance of contexts, but differ when it comes to the primacy of contexts.

DiMaggio (1997) primarily focuses on the role of situations. Individuals come to store many (potentially conflicting) associations⁵, and different associations are deployed depending on “cultural cues available in the environment” (1997:274). Although DiMaggio acknowledges the existence of “chronically available” (1997:274) cross-situational associations, he argues that their activation mainly depends on environmental cues and the interaction between environmental cues and mental structures (cf. also DiMaggio and Bonikowski 2016). Integrating insights from psychology and sociology, Shepherd (2011) provides a similar framework for the relationship between implicit bias and context.

Other sociologists (e.g., Vaisey 2009; Lizardo 2017) put more emphasis on durable, unconscious dispositions and habits that are internalized early on in life. Some associations will be stronger and more internalized than others, and we automatically respond to different situations based on the strength and depth of these associations. Although we do not always act in the same way, these dispositions will “reproduce similar judgements to cultural objects over time” (Vaisey and Lizardo 2016:3).

The primacy of context has several implications for the activation of implicit culture and implicit bias. Most agree that the activation depends on an interaction between context and disposition, but different accounts predict different levels of intra-individual stability and cross-contextual variation. Do people react similarly in the same context, or do reactions depend on more durable (and cross-contextual) dispositions? Does a prejudiced person implicitly perceive minorities as threatening, or does threat perception rely on additional cues that affect most people in a similar way?

Contextual accounts predict that a change in context will lead to a change in the activation of implicit associations; durable changes in context will thus lead to durable changes in the activation and expression of, for example, implicit bias. This account can help explain rapid changes in cultural orientations following major collective events (DiMaggio 1997), such as terror attacks, natural disasters, or even the collapse of a state, as these events change both contextual cues and the availability of existing associations.

Dispositional dual-process models predict significantly more individual-level stability in the expression of, for example, implicit bias. Cultural changes and the expression of attitudes primarily depend on past social conditions (Vaisey and Lizardo 2016; Vaisey and Kiley 2021).⁶ Although contemporary events can temporarily affect attitudes, these events will (often) not have any long-lasting effects.

Convergence between psychology and sociology

A parallel debate has been taking place within cognitive psychology (Shepherd 2019). The field has historically been dominated by dispositional accounts of implicit cognitions: individuals internalize different associations early on in life, and the strength of an association determines if it becomes activated or not in any given situation (Vuletic and Payne 2019). Many implicit cognitions, such as implicit bias, were treated as a stable disposition that largely transcends (but sometimes interacts with) situational factors (Shepherd 2011; Greenwald, McGhee and Schwartz 1998).

This perspective has, however, become increasingly questioned within both psychology (Payne, Vuletic, and Lundberg 2017; Gawronski 2019) and sociology (Shepherd 2011; Lamont et al. 2017) for failing to explain a number of empirical puzzles. Numerous studies show how individual-level implicit bias varies greatly between situations while “situation-level” bias remains highly stable (Payne et al. 2017; Payne et al. 2020). Studies similarly show how small contextual changes can “elicit systematic shifts in people’s implicit attitudes and beliefs” (Dasgupta 2013:273) while leaving explicit beliefs unchanged.

Keith Payne (and colleagues) responded to this criticism by introducing the “Bias of the Crowds” (BotC) model (Payne et al. 2017; Payne and Hannay 2021). Similar to other DPMs within both sociology and psychology, the model relies on the idea of concept accessibility: the activation of one concept will increase the chances of activating related concepts. Exposure to for example, a specific minority stereotype will increase the association between the group and the stereotype.

The BotC model differs from other DPMs in its emphasis on context. In light of accruing evidence, Payne and colleagues argue that “most of the systematic variance in implicit biases appears to operate at the level of situations” (2017:236). Although some people might be chronically more biased than others, a person’s implicit bias will *mainly* vary as a result of the context they are in.

Implicit measures will thus not primarily tap into individual prejudice, but contextual or situational prejudice. If we measure individuals in a context that remains unchanged, we expect to find considerable stability in test results. If we measure individuals who enter new or changing contexts, we expect to find

significant variability in test results (cf. Dasgupta 2013 for a similar argument⁷).⁸ Importantly, aggregated scores across a sample of subjects will reflect the context's "most widely shared associations" (Payne et al. 2017:237) and not personally held attitudes. Implicit attitudes are thus primarily viewed as a type of "priming effect" rather than a stable trait (Payne et al. 2020; Shepherd 2011).

Although some argue that the BotC model over-emphasizes the role of context and situations (see Gawronski, Brownstein, and Madva 2022⁹), many share its critique of traditional dual-process models (Payne et al. 2017). The model departs in important ways from more traditional understanding of implicit culture,¹⁰ but closely mirrors DiMaggio's and Shepherd's privileging of context over disposition.

The debate within both sociology and psychology is far from over, but some expressions of implicit culture—such as implicit bias — seem significantly more context-dependent than previously thought (Payne and Hannay 2021). In the next section, I discuss how a real-world change in context might affect the activation and activation of implicit bias.

The effect of terror attacks on implicit bias

What kind of effect will a sudden change in context have on implicit bias, and how durable or short-lived will this effect be? Lab-based studies suggest that contextual changes can temporarily alter implicit bias (Shepherd and Marshall 2018; Lai et al. 2016), but research on real-world contexts almost exclusively rely on correlational data (Payne and Hannay 2021).

In this article, I study how terror attacks in France affect the activation of implicit bias, viewing terror attacks as examples of sudden events that can cause "large-scale, more-or-less simultaneous frame switches" (DiMaggio 1997:280). Terror attacks are particularly beneficial to study as they are both unexpected and will, to an extent, affect everyone in an afflicted country. The article focuses specifically on how terror attacks might affect the direction, specificity, and longevity of implicit bias, while also specifying when and why terror attacks might cause a divergence between implicit and explicit bias.

The direction of the effect

Although many have pre-existing negative associations towards Arab Muslim people (Park, Felix, and Lee 2007), the BotC and similar approaches assume that the strength and activation of these associations will depend on additional contextual cues (Shepherd and Marshall 2018; Payne et al. 2017). These cues can consist of media portrayals, everyday conversations, and physical encounters with Arab Muslims. Positive portrayals or encounters will activate positive associations, whereas negative portrayals or encounters will activate negative associations.

Terrorist attacks have a significant impact on the physical, symbolic, and social context of a population. Following terror attacks by Arabic-Muslim perpetrators, people are increasingly exposed to negative portrayals of Arab Muslims through, for example, everyday conversations and media coverage (Solheim 2019). These negative portrayals will likely prime and strengthen the association between "Arab

Muslims” and any negative attribute (Matthes and Schmuck 2015). People will also be exposed to changes in their physical environment, such as security checks and increased policing, that serve as reminders of the attacks. These contextual changes can make certain (negative) associations more accessible than others. In addition to contextual changes, terror attacks will typically be accompanied by emotions such as fear and anger (Vasilopoulos et al. 2019). Heightened fear and anger can directly increase the activation of implicit bias (Dasgupta et al. 2009) but could potentially also interact with contextual changes to create even larger effects.¹¹

Terror attacks can thus both create contextual changes that prime negative associations, and prime negative emotions that strengthen these associations. If variations in implicit bias mainly depend on contextual factors, we would expect terror attacks to have a significant effect on the activation of implicit bias. Specifically, we would expect terror attacks to increase negative implicit bias toward Arab Muslims.

The longevity of the effect

Lab-based studies on the malleability of implicit bias show relatively short-lived effects (Lai et al. 2016), and the effect of an attack may be similarly short-lived. As Payne et al. (2017:244) point out, there are numerous contextual factors that “systematically exert a pressure on average implicit bias scores”. Although attack-related discussions, thoughts, and feelings will dominate the public discourse during the first few days or weeks, interest will eventually subside. The association between “Arab Muslim” and negative attributes will lessen in importance, and other associations, concepts, and events will likely become more relevant (see Shepherd and Marshall 2018 on cognitive inhibition). Media coverage—and the co-occurrence of “Arab Muslim” and negative attributes—will never be as intense as right after an attack.¹² The effect of the attacks might thus dissipate over time as the context reverts to a pre-attack baseline.

There could, however, be other factors that sustain the effect of terror attacks. Some contextual changes—increased policing, a prolonged state of emergency, or a changed media landscape—can persist and even increase over time. Although explicit mentions of the attacks will go down, subtle reminders of the attack might not. These durable contextual changes could, possibly, result in more durable changes to implicit bias. The nature of the media coverage can also change in the weeks following the attack. Analyzing the 2005 London Bombings, Epifanio, Giani, and Ivandic (2023) found that overall media coverage of the attacks peaked right after the bombing, but tabloid coverage peaked in the weeks following the attack. The study also found that the attack, partially due to changes in media coverage, took weeks to affect public opinion. Bove, Efthyvoulou, and Pickard (2023) similarly found that the effect on negative emotions and risk perceptions was higher in the 2-4 weeks following the attack than during the first week after the attack.

The specificity of the effect

All three attacks were explicitly linked to Islam and Muslims (Połońska-Kimunguyi and Gillespie 2016; Wolfreys 2018). Respondents were thus primarily exposed to content that activated associations between Arab Muslims and negative attributes.

The attacks could potentially have a “spill-over” effect on other out-groups, especially if they trigger emotions associated with these groups (Dasgupta et al. 2009).

These effects are, however, indirect: the attacks did not directly increase negative portrayals of for example, Black or Gay people. Although we might see a general uptick in out-group bias, the effect will likely be weaker than the direct effect on Arab Muslim bias (cf. Hugenberg et al. 2010). We would thus expect the attacks to primarily affect implicit bias towards Arab Muslims and not unrelated out-groups.

Divergence between implicit and explicit bias

Explicit bias is generally less malleable and context-dependent than implicit bias (Dasgupta 2013). Some cultural events will “initially trigger emotions and automatic cognitions” (Cerulo, Leschziner, and Shepherd 2021:76), and only slowly turn into more elaborate and stable attitudes. Terror attacks are particularly effective in heightening emotions such as fear and anger (Vasilopoulos et al. 2019), and these emotions tend to be more strongly associated with implicit bias (Lee, Lindquist and Payne 2018). Although some studies have found relatively instantaneous effects of terror attacks on explicit bias, most results have been mixed (Savelkoul et al. 2022). Brouard et al. (2018) found no effect on attitudes towards immigrants in France, whereas Solheim (2019) and Savelkoul et al. (2022) found an effect on attitudes towards immigrants and Muslims globally, but not within France. Analyzing attacks in 30 different countries, Turkoglu and Chadeaux (2022) similarly found no overall effect on anti-immigrant attitudes.

The effect on explicit bias might also, as shown by Solheim (2019), be more dependent on framing effects and social desirability bias. If an attack is met with calls for openness, solidarity, and tolerance (see e.g., Ekström, Patrona, and Thornborrow 2022; Solheim 2019), people become less willing to report an increase in explicit bias (Singh and Tir 2021). In some cases—such as in France—we might even see increasingly positive attitudes towards Arab Muslims following the attacks (Castanho Silva 2018; Savelkoul et al. 2022). The effect of social desirability will likely have a lower effect on implicit bias (Greenwald et al. 1998).

Explicit bias thus tends to be less malleable and more sensitive to social desirability bias than implicit bias. Both factors could explain why previous studies have sometimes failed to find an effect. Based on these findings, we would expect the effect of terror attacks to be more substantial for implicit bias, at least short-term.

Empirical expectations

In summary, the study consists of three specific expectations. First, the attacks are expected to increase negative implicit bias towards Arab Muslims. Second, the attacks are expected to primarily affect implicit bias towards Arab Muslims and not other out-group. Third, the attacks are expected to have a more substantial effect on implicit bias than explicit bias. It is unclear how long-lasting the effect will be. The effect could dissipate over time as the physical, symbolic, and social context returns to a pre-attack baseline, but the effect could also remain stable and even increase over time.

Study 1 – Terror attacks and implicit bias in France

Three attacks: Charlie Hebdo, November 2015 Paris, and Nice

Between 2015-2016, France experienced three of the deadliest terror attacks of the 21st century: the Charlie Hebdo attack, the November 2015 Paris attack, and the Nice truck attack. The attacks resulted in 238 casualties and more than 800 wounded, with Hebdo being the first large-scale attack by Arab Muslim perpetrators in Europe since the 2005 London bombings.

The first attack took place on January 7th, 2015, and targeted the satirical magazine *Charlie Hebdo*. The attack was initially met in France with calls for national unity, solidarity, and tolerance (Solheim 2019; but see Todd 2015) and gave rise to large marches in several cities. The organizers of these marches were careful to condemn islamophobia and distanced themselves from anti-immigrant movements and parties. President Hollande similarly labeled the assailants as “crazy fanatics” that had “nothing to do with Islam” (Faucher and Boussaguet 2017:17).¹³

The two other attacks took place in November 2015 and in July 2016. Unlike the attack on Hebdo, the attacks were almost immediately framed as an act of war by Muslim radicals (Fragnon 2019). The political opposition, which mostly united behind President Hollande during the Hebdo attack, was highly critical of the governmental response (Faucher and Boussaguet 2017). Both politicians and the media portrayed Muslims in an increasingly negative light, framing Muslims as both an external and internal threat (Wolfreys 2018). Following the three attacks, France entered a prolonged state of emergency and saw the passing of several anti-terror laws (Dück and Lucke 2019). The attacks resulted in a substantial increase in both physical (Kallis 2018) and symbolic (Britton 2015; Giani and Merlino 2020) violence toward French Arab Muslims, and potentially helped normalize support of right-wing populist movements (Vasilopoulos et al. 2019; Wolfreys 2018).

The four predictions are tested by analyzing how the attacks affected French respondents.

The three attacks are combined in the main analysis to increase the sample size and limit the risk of, for example, unrelated simultaneous events (Muñoz et al. 2019; Nägel and Nivette 2022), but a separate analysis of each attack is presented in the online supplemental material.

Data and Method

Sample and bandwidth. The sample consists of respondents from the International Project Implicit website (Charlesworth et al. 2022). Project Implicit is an online laboratory where participants can complete a range of explicit and implicit measures. The International website has collected data for the past 20 years, resulting in a data set of more than 2.3 million participants. The continuous data collection allows researchers to analyze natural experiments without relying on the accidental co-occurrence of specific events and data collection.

The data set consists of self-recruited volunteers. Although studies (e.g., Charlesworth et al. 2022) have shown that the data set generally replicates known effect sizes, the participation pool tends to be younger and more left leaning than the general

population. Table 1D of the online supplement provides the demographic details of the sample. The sample is overall younger, more left leaning, and better educated than the general population of France (Eurostat 2022). The sample also consists of a much larger proportion of students (51 percent), and a slightly lower proportion of Muslims (5.3 percent).¹⁴

These characteristics raise questions about the generalizability of the results. Based on the outlined theoretical framework, the overall effect of the attacks should be relatively independent of specific demographic characteristics.¹⁵ The magnitude of the effect could, however, still be due to the sample's non-representativeness. Self-recruited participants could also lead to a self-selection bias that violates the so-called "ignorability assumption". This issue is addressed in the next section.

The sample in Study 1 consists of data from the French version of the Project Implicit website, excluding participants who did not complete the implicit measure or who lived outside of France. The final sample consists of 449 participants who completed the implicit measure 1-30 days before or after an attack.

A 30-day bandwidth was chosen for two reasons. The first reason is methodological. As Muñoz et al. (2019) point out, a narrow bandwidth can sometimes reduce statistical power without reducing bias. In the next section, I show that a 30-day bandwidth gives sufficient statistical power¹⁶ and balanced pre- and post-treatment groups. A bandwidth of for example, 15 days would have insufficient statistical power, whereas a 60-day bandwidth would have unbalanced groups (see online supplemental material for further details).

The second reason is empirical. The effect of a terror attack will likely change over time. Some effects will become weaker, whereas others might take weeks to manifest. A very narrow bandwidth would fail to detect some of these slower changes. Based on previous studies (e.g., Shanaah et al. 2021), the bandwidth should be sufficient to capture both the overall effect and changes over time. As most studies rely on a 30-day bandwidth, it also makes the findings more comparable to existing research.

Possibilities of Causal Inference. The study consists of a natural experiment that is analyzed with an "Unexpected Event during Survey Design" (UESD). The UESD is a research design that compares survey respondents before and after an event and has become widely used to assess the effect of terror attacks (Muñoz et al. 2019; Nägel and Nivette, 2022). The UESD primarily consists of two assumptions: ignorability and excludability. As long as these assumptions are not violated, the UESD can produce valid causal estimates.

The ignorability assumption requires that the treatment status of participants is independent of any relevant cause of the outcome. In an ideal design, participants have the same probability of being assigned to control and treatment groups. In an UESD, the control group consists of respondents who completed the survey before the event, and the treatment group consists of respondents who completed it after the event. Participants are almost never randomly assigned in an UESD, which can result in potential imbalances between treatment and control groups. Certain participants might be more accessible during early data collection (Legewie 2013), whereas other participants might become more or less likely to participate as a result of the attack, making the control and treatment groups incomparable.

There are several ways to address the ignorability assumption in an UESD. The first step is usually to test for observable differences between the treatment and control groups (Nägel and Nivette 2022). If there are no significant differences between the groups on different observable variables, we can more readily assume that treatment status is independent of outcomes. If we find significant differences between the groups, we can address the issue with matching procedures, controlling for covariates, or reducing the bandwidth.

Potential violations of the ignorability assumption are tested by analyzing the covariate distributions for the control and treatment groups. As Table 2A of the online supplement shows, there are no significant differences between the two groups.¹⁷ As an additional test of the ignorability assumption, I also include entropy balanced samples in each analysis. Entropy balancing matches the mean, variance, and skewness of covariates between the control and treatment groups (Hainmueller 2012).

The excludability assumption requires that other time-varying trends are unrelated to the outcome: the timing of the survey should only be related to implicit prejudice via the event itself. I first test the assumption by controlling for seasonal time-trends. If significant findings are due to seasonal or annual time-trends, we would expect to find a similar effect the year before. I thus run a placebo test a year before each attack, but find no significant effect on implicit bias in the entire sample (Table 2B of the online supplement) or after any of the attacks (Table 3B of the online supplement).

The results could, however, be due to other pre-existing time-trends. If implicit prejudice was increasing before the attacks, an uptick in bias might simply reflect a continuous increase in bias. To test this potential violation, we start by looking at the entire sample (2008-2016). Figure 1 depicts overall changes in implicit bias for the entire data set, showing no increase (but a significant decrease) in implicit bias over time ($d = -0.000018$, $p < 0.0001$).

I also conduct a second placebo test to control for time-trends and unrelated events closer in time to the attacks. Following the recommendations in Muñoz et al. (2019), the control group is divided at its empirical median to create two evenly sized groups. The first group completed the survey 3-4 weeks before the attacks, and the second group completed the survey 0-2 weeks before the attacks. The first group is recoded into the control group, and the second group is recoded into the treatment group. There is no effect in this sample (Table 4B), and there is no overall relationship between time and implicit prejudice in the control group (Figure 2, $d = -0.0003$, $p = 0.916$).

In summary, the study design does not seem to violate the ignorability and excludability assumption.¹⁸

Variables. Implicit bias was measured with a version of the Implicit Association Test (IAT) called the Arab-IAT. The Arab-IAT measures implicit sentiments towards Arab Muslims relative to a reference group. This specific Arab-IAT measures sentiments towards people of Maghreb origin compared to people of French origin.

Throughout the IAT, participants were instructed to pair French or Maghreb names with either positive or negative words. The Maghreb names consisted of

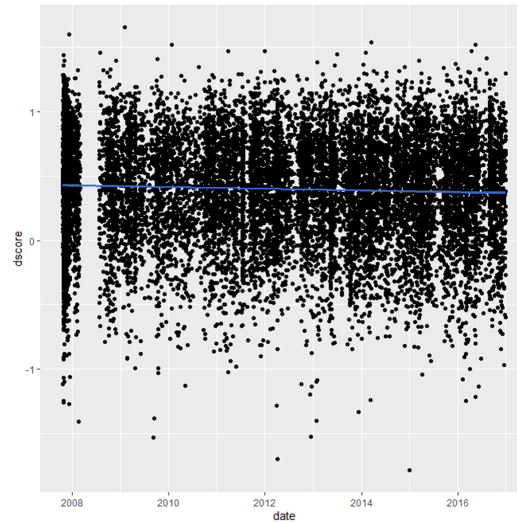


Figure 1: Overall time-trend for the data set.

Arabic names such as Mohamed and Fatima, whereas the French names consisted of typical French names such as Vincent and Brigitte.¹⁹

The outcome of the IAT is usually referred to as a “d-score” (Nosek, Greenwald, and Banaji 2005). Participants can receive a d-score between -2 to 2, although most participants typically score between -0.5 to 0.5 (Olsson 2023). Participants with a high d-score exhibit more negative implicit bias towards Arabic names and vice versa.

Explicit bias was measured by asking participants whether they prefer people of French or Maghreb origin. It was measured on a 7-point scale from 1 (“I strongly

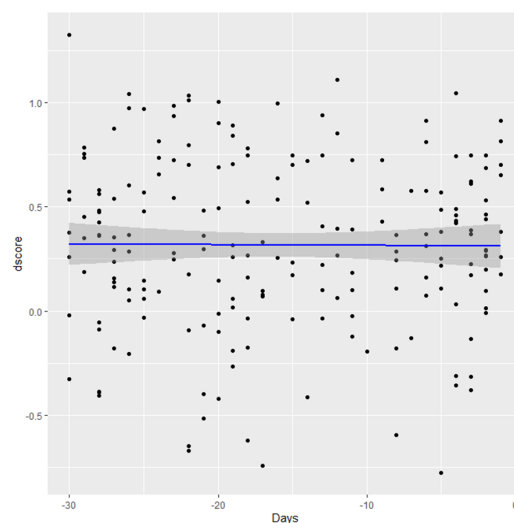


Figure 2: Time-trend for the control group.

prefer people of Maghreb origin over people of French origin”) to 7 (“I strongly prefer people of French origin over people of Maghreb origin”). To compare the magnitude of implicit and explicit bias, I also present the standardized effect size of each measure.

The entropy balanced regression makes use of a set of covariates, namely age, gender, education, student status, foreign background, and religious background (Muslim/not Muslim). These covariates are associated with the outcome variable but should be unaffected by the treatment variable.

Results

We begin the analysis by comparing participants 1-30 days before and after the three attacks. The results are presented in Table 1 using an ordinary least squares (OLS) model that only includes the treatment variable. As can be seen in model 1, respondents had a 0.114 (**) increase in prejudice towards Arab Muslims following the attacks. The effect differs across the three attacks, ranging from an increase of 0.07 to 0.17 (see Table 1C of the online supplement). The attack increased the average implicit bias from 0.317 to 0.431, which equates to a standardized effect size of 0.26. The change is comparable to other pre-existing group differences, such as the difference between left- and right-wing people (0.31) or men and women (0.27).²⁰

In line with previous research, there is no corresponding effect for explicit bias in any of the models. Explicit bias increased by 0.206 on a 7-level point scale, which equates to a standardized effect size of 0.03. This change was neither significant nor substantial. Terror attacks thus affected implicit but not explicit bias, supporting two of the initial predictions.

I performed an additional robustness check by re-analyzing the data using an entropy balanced sample in model 2 and 4. The control and treatment groups were thereby balanced on the mean, variance, and skewness of the six covariates. The results remain largely unchanged for both implicit and explicit bias, although the coefficient for implicit bias increases to 0.140.

Table 1: The effect of terror attacks on implicit and explicit Arab Muslim bias in the French sample.

	Implicit Bias		Explicit Bias	
	Model 1	Model 2	Model 3	Model 4
Constant	0.317 [†] (0.028)	0.300 [†] (0.027)	4.513 [†] (0.068)	4.501 [†] (0.066)
Terror attacks	0.114 [†] (0.038)	0.140 [†] (0.039)	-0.009 (0.093)	-0.006 (0.094)
Number of observations	449	431	427	410
R2	0.020	0.030	0.000	0.000
R2 adjusted	0.018	0.027	-0.002	-0.002

[†] $p < 0.01$; * $p < 0.05$.

Standard errors in parentheses. Model 2 and 4 include an entropy balanced sample.

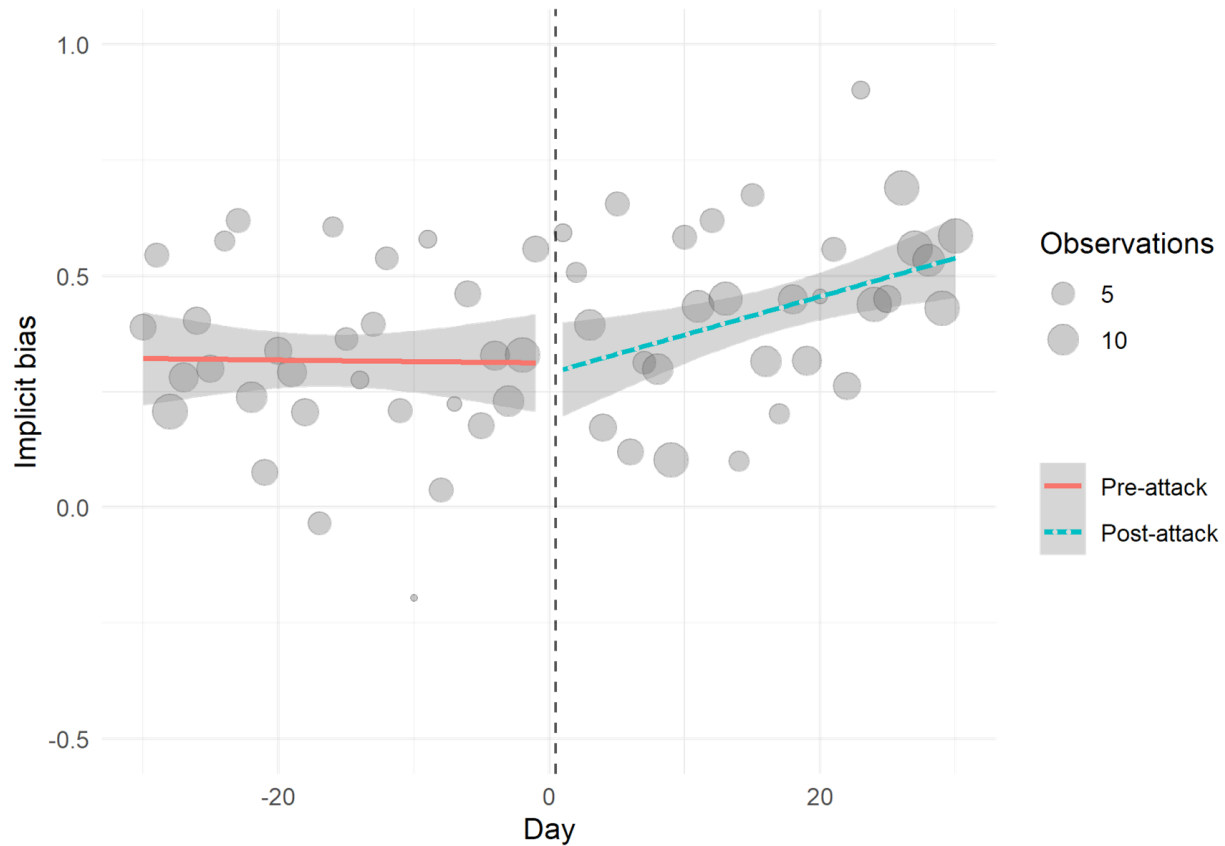


Figure 3: The effect of the attacks on implicit bias over time in France.

The next step is to look at changes over time. To assess whether post-attack implicit bias decreased over time, survey date is recoded into a running variable ranging from -30 to +30, where 0 is the day of the attack. This enables us to analyze the interaction between the running variable and exposure to terror attacks (Muñoz et al. 2019). The results are presented in Figure 3, which depicts observed values of implicit bias 1-30 days before and 1-30 days after the attacks.

There is no significant threshold effect²¹ nor a decrease over time. Implicit bias was expected to decrease over time if the physical, social, and cultural context returned to some pre-attack baseline. The results indicate that this return to normalcy did not happen, at least not within our 30-day timeframe. As Figure 3 shows, implicit bias even significantly increased throughout the month ($d = 0.009$, $p = 0.037$, see Table 2C of the online supplement for details).

The last step is to look at the specificity of the effect. Did the attacks uniquely affect implicit prejudice towards Arab Muslims, or did they also affect other prejudiced attitudes? Using the same methodology and database, a separate pool of respondents ($n = 521$) were used who completed the Race IAT 1-30 days before and after the attacks. The Race IAT measures positive and negative sentiments towards Black people relative to white people.

Table 2: The effect of terror attacks on implicit and explicit racial bias toward Black people in the French sample.

	Implicit Bias		Explicit Bias	
	Model 1	Model 2	Model 3	Model 4
Constant	0.402 [†] (0.026)	0.407 [†] (0.028)	4.241 [†] (0.050)	4.199 [†] (0.053)
Terror attacks	-0.012 (0.038)	-0.019 (0.039)	0.001 (0.073)	0.052 (0.075)
Number of observations	521	494	488	463
R2	0.000	0.001	0.000	0.001
R2 adjusted	-0.002	-0.002	-0.002	-0.001

[†] $p < 0.01$; * $p < 0.05$.

Standard errors in parentheses. Model 2 and 4 include an entropy balanced sample.

The results, presented in Table 2, show no significant effect on implicit or explicit bias towards Black people.²² In model 2 and 4, I re-do the analysis using an entropy balanced sample, but the results remain unchanged. The attacks thus had a significant effect on implicit bias towards Arab Muslims but not Black people.²³

Study 2 – Does the effect spread across borders?

Study 1 showed that the three terror attacks had a significant effect on implicit bias within France. The attacks also received substantial international attention, with much of the world being exposed to some coverage of the attacks. Reading or hearing about distant attacks can sometimes be enough to affect attitudes (Legewie 2013). In Study 2, I therefore test whether the results can be replicated using an international sample.

Empirical expectations

In line with Study 1 and previous research, the attacks are expected to primarily affect implicit bias. Exposure to the coverage of the attacks should activate (and strengthen) the association between Arab Muslims and negative attributes for most respondents, although the effect on explicit bias might be relatively low or non-existent. The attacks are similarly expected to primarily affect the activation of bias towards Arab Muslims and not unrelated out-groups.

The effect is, however, expected to be both weaker and less durable than in France. Previous studies show that the “contagious” effect of terror attacks depends on both distance and media coverage. Being close to an attack, either physically or emotionally, will increase the perceived threat and salience of the attack (Böhmelt, Bove, and Nussio 2019). Media coverage will similarly be more intense and long-lasting in the afflicted country (Solheim 2019). Although media outlets all across the world will cover a terror attack, international interest usually subsides relatively quickly. We would thus expect any contextual changes to be smaller, less durable,

and sometimes non-existent compared to France²⁴, resulting in a more rapid return to normalcy.

The international sample consists of participants from 181 countries. In addition to replicating the analysis in Study 1, I also use this heterogeneity to directly study whether proximity moderates the effect on implicit bias.

Proximity to the attacks. Proximity is often divided into two factors: physical and personal (Avdan and Webb 2018). We care more about terror attacks that happen close to us (physical proximity) or to people we feel close to (personal proximity). Personal and physical proximity tend to overlap, where we identify and care more about people who live close to us.²⁵ This study focuses on physical proximity, which is expected to moderate the effect of terror attacks in a few different ways.

Being physically close to an attack increases stress, fear, and threat perception (Braithwaite 2013). People are typically also more familiar with physically proximate countries, which decreases the emotional and psychological distance to the affected victims. Both of these factors can, in turn, increase negative attitudes towards out-groups (Nussio, Bove, and Steele 2019; Avdan and Webb 2018; Schaller 2003).

Countries that are geographically close to a terror attack or natural disaster will typically also cover the event more intensely (Sui et al. 2017; Koopmans and Vliegthart 2010). The association between “Arab Muslim” and negative attributes may, as a result, be more prevalent in countries closer to France. Respondents closer to the attacks are thus expected to both be more affected by the attacks (through e.g., increased fear) *and* exposed to more coverage of the attacks.

Data and Method

Sample and bandwidth. Study 2 uses the same 30-day bandwidth as Study 1 and consists of participants who completed the Arab-IAT on the International Project Implicit website (Xu et al. 2023). The data set contains a substantially larger pool of participants from all across the world. Participants who did not complete the Arab-IAT were excluded, resulting in a sample of 25,795 respondents from 181 different countries.

Possibilities of Causal Inference. To analyze the effect of the attacks on implicit bias, I use the same study design (UESD) as in Study 1. The ignorability assumption is tested by analyzing the distribution of covariates for the control and treatment groups. As Table 4A shows, there are some minor significant differences between the control and treatment groups (but these differences are primarily significant due to the large sample size). To ensure that these differences do not affect the results, all regressions are also run using an entropy balanced sample.

The excludability assumption is tested by controlling for various time-varying trends in the online supplemental material. In line with Study 1, there is a significant decrease in implicit bias over time in the entire sample (Table 5B). Any potential uptick can thus not be explained by an overall increase in implicit bias. To rule out any seasonal or annual time-trends, a placebo test is done a year before the attacks, but there are no effects on implicit bias in the entire sample (Table 6B) or after individual attacks (Table 7B). A final placebo test is done by only analyzing the

control group. There is no overall relationship between time and implicit prejudice in this group (Table 5B). The control group is, lastly, divided into a control and treatment group, but there are no differences in implicit bias between these two groups (Table 6B). There are thus no significant violations of the ignorability or excludability assumption.

Variables. The procedure and variables are largely identical to Study 1, with a few important exceptions. The IAT in Study 1 evaluated sentiments towards Arab Muslim names and French names, whereas the IAT in Study 2 evaluates sentiments towards Arab Muslim names and “Other” names. The “Other” category consists of a mix of different nationalities, including Spanish, Dutch, Japanese, and French names. The IAT in Study 2 thus measures relative bias between two out-groups, whereas the IAT in Study 1 measured relative bias between an in-group and an out-group. Although this difference makes it difficult to directly compare, for example, coefficients between the two data sets, both tests are designed to measure anti-Arabic sentiments.

Explicit bias was similarly measured by asking participants if they prefer Arab Muslims or “Other” people. It was measured on a 7-point scale from 1 (“I strongly prefer Arab Muslims over Other people”) to 7 (“I strongly prefer Other people over Arab Muslims”).

Proximity was operationalized by calculating the average distance in kilometers between a respondent’s country’s centroid and France’s centroid. A person in Italy was assigned a value of 930 kilometers, whereas a person in the U.S. was assigned a value of 7689 kilometers.

The entropy balanced sample consisted of the same covariates as Study 1, with the exception of foreign background.²⁶

Results

Using an OLS regression, I compare participants who completed the test 1-30 days before and after the attacks. There is, as shown in Table 3, an overall increase in implicit bias following the attacks. Average implicit bias increased from 0.006 to 0.057, which equates to a standardized effect size of 0.11. The effect is significant but substantially lower than the effect size of 0.26 found in Study 1. The effect is also substantially lower than the difference between for example, left- and right-wing respondents in the overall sample (0.27).

The increase in implicit bias was largest following the first attack (Charlie Hebdo) and smallest following the third attack (Nice truck attack). Although the two first attacks had a significant effect on implicit bias, the third attack had neither a substantial ($d = 0.013$) nor significant ($p = 0.277$) effect (see Table 1C of the online supplement).²⁷

Model 3 shows the effect of the attacks on explicit bias. There is a small but significant effect: explicit bias increased by an average of 0.038 on a 7-point scale. The change equates to a standardized effect size of around 0.04, which is considerably smaller than the effect size of 0.11 for implicit bias. In model 2 and 4, the analysis is re-done using an entropy balanced sample. Both coefficients decrease, and the effect of terror attacks on explicit bias becomes insignificant ($p = 0.597$). In line with

Table 3: The effect of terror attacks on implicit and explicit Arab Muslim bias in the international sample.

	Implicit Bias		Explicit Bias	
	Model 1	Model 2	Model 3	Model 4
Constant	0.006 (0.004)	0.018 [†] (0.004)	4.433 [†] (0.01)	4.464 [†] (0.009)
Terror attacks	0.051 [†] (0.006)	0.039 [†] (0.006)	0.038 [†] (0.013)	0.013 (0.013)
Number of observations	25,795	21,831	22,070	20,514
R2	0.003	0.002	0.000	0.000
R2 adjusted	0.003	0.002	0.000	0.000

† $p < 0.01$; * $p < 0.05$.

Standard errors in parentheses.

both Study 1 and theoretical expectations, there is thus a larger and more robust effect for implicit bias.

Effects over time are analyzed using the same procedure as in Study 1. In Study 1, there was an increase in implicit bias over time, but the same trend was not necessarily expected in the international sample. The results are presented in Figure 4, which depicts observed values of implicit bias before and after the attacks (see Table 2C of the online supplement for further details). The figure shows a clear threshold effect ($d = 0.104$) and a decay over time ($d = -0.004$): implicit bias increased right after the attack and decreased with each day, reverting to pre-attack levels after around three weeks. There was thus an increasing effect in France (Study 1) and a decreasing effect in the world (Study 2) in the month following the attacks.²⁸

To determine if the attacks had a spill-over effect towards unrelated out-groups, a separate pool of respondents ($n = 245740$) were analyzed who completed the Race IAT before and after the attacks. Mirroring the findings from Study 1, there was no significant increase in bias toward Black people (see Table 3C of the online supplement).

The large sample size allows us also to look at participants who completed *both* the Race IAT and the Arab-IAT during the same session. We can thereby compare participants who completed both IATs before the attacks with participants who completed both IATs after the attacks. This procedure has two important benefits.

Firstly, any unrelated time-trend or event affecting overall bias should affect performance on both tests (Muñoz et al. 2019). By comparing participants who completed both IATs, we can largely rule out the influence of unrelated time-trends or events. Secondly, prejudiced attitudes are typically correlated and share many important predictors. If the original findings are driven by unobserved imbalances between the two groups due to, for example, self-selection, these imbalances would likely affect performance on both tests. 3374 participants completed both IATs 1-30 days before or after the attacks. There was (as expected) a significant increase in implicit bias towards Arab Muslims but no significant increase in implicit bias towards Black people (see Table 7C for full details), further validating the initial findings.

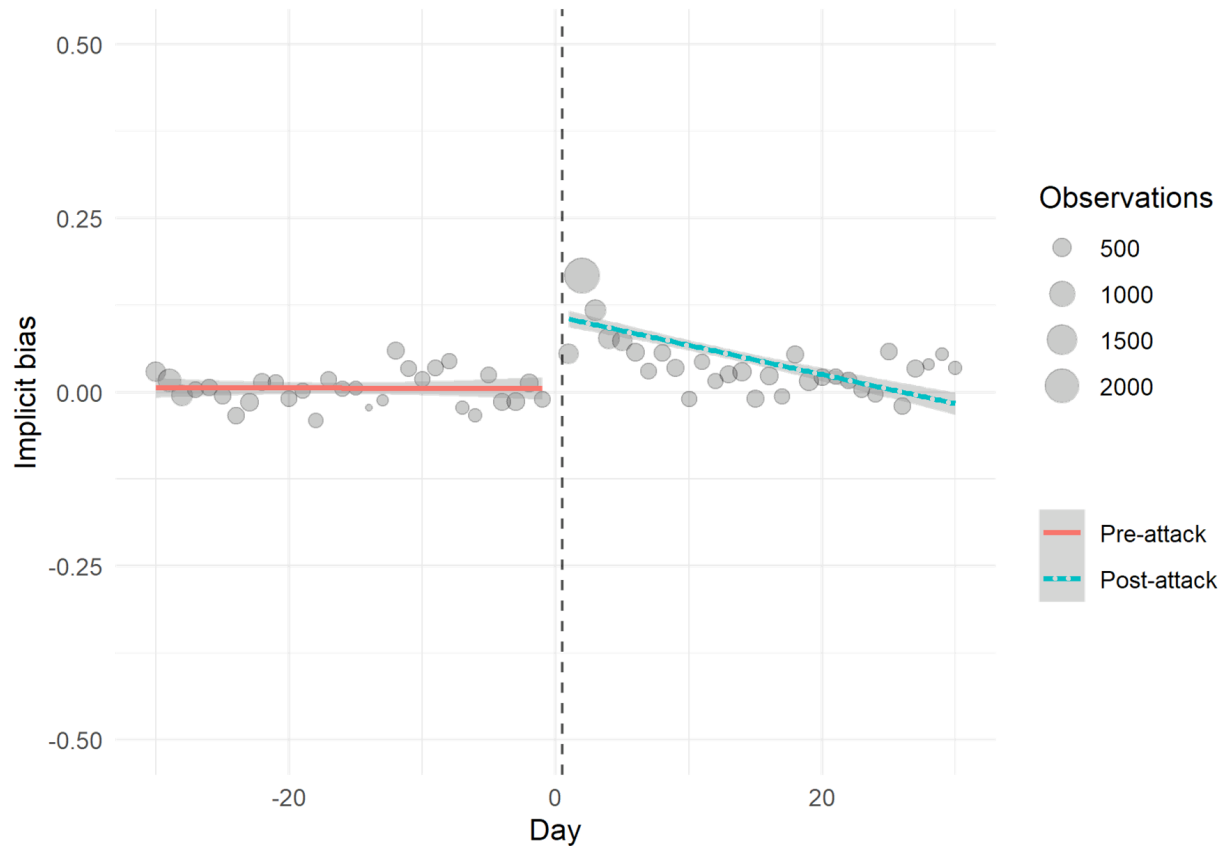


Figure 4: The effect of the attacks on implicit bias over time in the World.

Finally, I analyze whether distance moderates the effect of terror attacks on implicit bias. There is a significant interaction effect between distance and terror attacks: every additional kilometer decreases the effect of the attacks on implicit bias by 0.000005 (see Table 4C). This means that respondents in Europe had, on average, a 0.06²⁹ larger increase in implicit bias than respondents in for example, the U.S.³⁰ or India.³¹ The effect remains significant when using a log transformation on distance (see model 2 in 4C).

General discussion

I began the article by arguing that certain expressions of implicit culture are likely more malleable and context-dependent than previously thought, and conducted two studies to evaluate how large-scale contextual changes might affect certain types of implicit culture. I specifically tested how terror attacks affect the direction, specificity, and longevity of implicit bias, but also how the effect on implicit bias differ from explicit bias. In the following section, I first discuss the findings and how they relate to previous research. I then discuss the theoretical, empirical, and methodological implications of the two studies.

Differences and similarities between France and the World

Study 1 showed that terror attacks had a substantial effect on implicit bias towards Arab Muslims in France, and Study 2 found a corresponding effect using an international sample consisting of 181 countries.

The effect was substantially larger in the French sample than in the international sample, indicating that proximity (among other factors) to the attacks matter. As Study 1 and Study 2 used different IATs, it is, however, difficult to compare the absolute value of these two coefficients. The importance of proximity was then directly tested in Study 2, showing that the effect of terror attacks diminished with physical distance. Distance likely matters for at least two reasons. Respondents close to the attacks will experience more coverage of the attacks (Sui et al., 2017), and the increased coverage will likely result in stronger association between “Arab Muslim” and negative attributes. Respondents close to the attack will also likely experience higher levels of threat and fear (Braithwaite 2013). Proximity can thus increase both negative media coverage and negative emotions, and both these factors can lead to increases in implicit bias.

The attacks did not affect implicit bias toward Black people in either study. There was thus no “spill-over” effect on an unrelated out-group. Although terror attacks can create general mistrust and antipathy toward out-groups (Legewie 2013), they do not seem to result in a general increase in implicit bias. There are few studies on implicit spill-over effects, but these findings indicate considerable domain-specificity in the activation of implicit bias. The finding could potentially be reconciled with recent studies on implicit bias reduction. This research shows that anti-bias interventions targeting specific stereotypes are often more effective than interventions focusing on more indirect attitudes, such as egalitarian values (Röhner and Lai 2020).

The effect of the terror attacks decayed over time internationally but increased over time in France. This difference is likely related to variations in how the attacks affected the physical, symbolic, and social context. The attacks resulted in a prolonged state of emergency, an increase in security measures, and an ongoing political debate in France. These durable contextual changes seem to have resulted in more durable changes in implicit bias. The lack of immediate effect in Study 1 could partially be attributed to the low sample size, making any threshold effect difficult to detect. The increases over time are, however, in line with other studies on terror attacks, showing that the effect on public opinion and negative emotions can lag behind by several weeks (Epifanio et al., 2023; Bove et al., 2023). These studies attribute the lagged effect to changes in media coverage. Although coverage is most intense (in terms of quantity) right after an attack, the sustained coverage might shift from purely descriptive to more politicized and emotional. This change could help explain the sustained and increasing effect over time.

The changes were, in contrast, much more limited internationally. Although for example, the Hebdo attack made international headlines, interest in attacks was less intense and durable than in France (Smyrniotis and Ratinaud 2017). Other policies, discourses, and narratives might then more rapidly “exert a pressure on average implicit bias scores” (Payne et al. 2017:244), making the effect of terror attacks more temporary. It is, however, noteworthy that the effect on implicit bias in Study 2

only reverted to pre-attack levels after several weeks. This finding suggests that the initial response to an attack can have a (relatively) lasting effect on implicit bias even in the absence of long-term contextual changes. The finding is particularly interesting in light of recent studies failing to find long-term changes in implicit bias (Forscher et al. 2017). In the most comprehensive study to date, Lai et al. (2016) compared the effect of nine popular anti-bias interventions. Although most interventions decreased implicit bias, no effect lasted more than a few hours or days. These types of studies have, however, all been lab-based. By using real-world data and a substantially “stronger” intervention, I show the possibility of considerable changes in implicit bias over time.³²

The attacks had a substantially smaller effect on explicit bias in both studies, and none of the effects on explicit bias were robust to entropy balancing. The finding is in line with previous studies that fail to find an effect of terror attacks on explicit attitudes (e.g., Brouard et al. 2018; Savelkoul et al. 2022). The divergence between explicit and implicit bias could be explained in two different ways. Firstly, the results could reflect a social desirability or framing effect. People might have been unwilling to disclose socially sensitive attitudes, especially if they run counter to a larger narrative (as was the case after the Hebdo attack in France). Implicit bias is, in comparison, significantly less sensitive to social desirability bias (Greenwald et al. 1998). The lack of effect in both studies might, then, not accurately reflect the stability or malleability of explicit attitudes.

Secondly, the results could mirror real differences between explicit and implicit bias. Terror attacks might primarily—at least initially—trigger emotions such as fear and anger, and only over time turn into more elaborate attitudes and beliefs. The attacks could also have strengthened the association between “Arab Muslims” and negative attributes irrespective of what we explicitly believe or want to believe (cf. Matthes and Schmuck 2017).

Methodological, empirical, and theoretical implications

Implications for research on terrorism. There has been a recent surge in research on terror attacks within both sociology and political science. Numerous studies are using natural experiments to assess whether terror attacks affect anti-immigrant sentiments, prejudice, and trust. Several studies find no or even a reversed effect on explicit attitudes, leading some authors to argue that terror attacks may not have an effect on anti-immigrant or anti-Muslim attitudes (see e.g., Brouard et al 2018; Turkoglu and Chadeaux 2022). In both Study 1 and Study 2, I show that this conclusion is premature. Terror attacks have a significant effect on bias, but primarily (and sometimes exclusively) on implicit bias.

The newfound interest in natural experiments and terror attacks within social science is a positive one. There are certainly cases where natural experiments can be used to study the effect of terror attacks on explicit attitudes, and some studies *have* found a significant effect (e.g., Legewie 2013). Explicit measures might be appropriate when looking at long-term changes, or when studying socially acceptable attitudes. Most studies do, however, study socially sensitive attitudes and rely on a relatively narrow bandwidth. These results indicate that explicit measures might

be unsuitable for some of these study designs, and that this mismatch has led to a misrepresentation of how terror attacks affect attitudes.

The results similarly underscore the importance of correspondence between measures and events. Many studies analyze the effect of terror attacks on attitudes towards immigrants in general. The results indicate that an attack might primarily affect attitudes towards a specific group, particularly when it comes to implicit attitudes. A lack of correspondence could thus also help explain some of the null effects in previous studies.

These implications should be situated in a larger context. The attacks resulted in increased discrimination against Arab Muslims in France and other countries (Giani and Merlino 2020). The increase in discrimination was not necessarily mirrored by an increase in explicit bias. If we only analyze explicit bias, we will—as some authors have—fail to explain the connection between terror attacks and, for example, discrimination and hate speech. Both Study 1 and Study 2 demonstrate that terror attacks can be “successful” in affecting a population without affecting explicit attitudes. Terror attacks instill fear and anger, and these emotions can fuel prejudice, fear, and anger toward Arab Muslims.

Following the attacks, right-wing populist parties have similarly risen in popularity, and Islamophobic narratives have become increasingly normalized (Stockemer 2017). Events such as terror attacks can potentially increase the “resonance” between right-wing populist frames and a pre-existing attitude (Bonikowski 2017), making the parties more popular. As implicit bias has previously been connected to right-wing populist support (Olsson 2023), an increase in implicit bias could partially help explain the rise of right-wing populist parties following the attacks. If we only study explicit bias, we will likely underestimate (or outright ignore) the importance of terror attacks on changes in political orientations and prejudiced attitudes.

In summary, the current article highlights three important lessons for research on terror attacks. Firstly, it shows that the attacks might primarily affect implicit attitudes, at least short-term. Secondly, it shows that any attack likely needs to directly affect associations between a specific group and negative attributes. Indirect effects—such as spill-over effects—might be non-existent or too weak to detect.³³ Thirdly, it shows that any attack or event needs to be highly salient. There was considerable heterogeneity between the different attacks, and the Nice truck attack had no significant effect on implicit bias. If an event is not highly salient, it will likely disappear in the “noise” of other contexts that affect our implicit associations.

Implications for research on implicit culture. Although an increasing number of sociologists are using implicit measures to test different theoretical assumptions (e.g., Schaap, Waal, and Koster 2021; Miles, Charron-Chénier, and Schleifer 2019), the discussion on implicit culture has primarily been theoretical. In this article, I use real-world data to show when and why a specific expression of implicit culture—implicit bias—changes. The article combined insights from research on terror attacks, implicit bias, and implicit culture to test several predictions. Importantly, the results show that implicit bias is highly malleable and context dependent. This has implications for the study of personal culture in general and implicit culture in particular.

The sociological debate on both contextual and dispositional models of personal culture has mainly focused on explicit attitudes (e.g., Vaisey and Lizardo 2016). This article shows that some explicit attitudes are—at least when it comes to terror attacks—more stable than implicit attitudes. This finding underscores the importance of incorporating implicit measures into research on culture and cognition (cf. Lamont et al. 2017).³⁴ If sociological research exclusively focuses on explicit attitudes, we might falsely assume that expressions of personal culture are relatively stable and dispositional. Contrary to this assumption, this article shows that there are different mechanisms in place for certain expressions of explicit and implicit culture.³⁵

The article does not directly compare a contextual and dispositional approach. We can thereby not be certain whether dispositions or contexts are *overall* more important for the activation of implicit bias.³⁶ In line with both the BotC model and contextual approaches, the article does however show how people's personal culture *can* change “on the fly” (Kiley and Vaisey 2020:477). If a person's context changes, their implicit attitudes seem to change with it. Although it is beyond the scope of this article (and data set) to explore the possible permanence of these changes, there was also a surprising amount of longevity in both studies. A durable change in context seems to result in a durable change of implicit bias.

This study focused on a specific expression of implicit culture: implicit bias. It is possible, and perhaps also likely, that other expressions of implicit culture are more “dispositional”. Some types of implicit cognitions have proven to be more stable than others, such as evaluations of specific brands, products, and the self (Payne et al. 2017). Going forward, the debate should perhaps focus on how different approaches can explain different models of implicit culture (see Lizardo et al. 2016 for a related call). Some implicit attitudes, beliefs, and associations might be more dispositional, whereas others (such as implicit bias) might be more contextual and malleable. Adopting a single approach for studying implicit culture will likely result in the same issues that have plagued research on implicit cognition more generally (Payne et al. 2017).

Limitations and future studies

The two studies showed that terror attacks do not necessarily have the same effect on explicit and implicit bias. The studies also showed that the longevity of the effect differs in different contexts, and that proximity matters. I speculated that the results could be related to factors such as social desirability, framing effects, different media coverage, and emotions such as fear and anger, but none of these mechanisms are directly tested.

Future studies could test framing effects and social desirability by studying the effect of terror attacks in countries with different coverages. If the effect on explicit bias is moderated by framing effects or social desirability, we would expect to see heterogeneous effects in countries with different types of coverage and discourses (see Solheim 2019, for a similar approach). Media coverage could be tested by analyzing, for example, newspapers, Google searches, and social media.

By coupling the approach with a sentiment or content analysis, it would be possible to measure how different types of coverage affect bias.

Future studies should also, when possible, look to include more elaborate measures of explicit attitudes. Explicit bias was measured with a single-item which measured positive and negative feelings towards Muslims, and measures tapping into other types of prejudice and anti-immigrant sentiments might show more malleability. Although studies using more elaborate measures (Brouard et al., 2018; Turkoglu and Chadeaux, 2022) have found a limited (or non-existent) effect of the attacks on explicit attitudes, including more elaborate measures of explicit bias would provide a stronger test of the relative malleability of implicit and explicit bias.

Terror attacks by Arab Muslims had no spill-over effect on other groups, but the reverse might not be true. Some studies (e.g., Schmuck et al. 2018) have shown that terror attacks are sometimes associated with Arab Muslims by default. It is thus possible that studies of other terror attacks—such as the Breivik attack in Norway—might find a spill-over effect on Arab Muslims, at least initially. It would similarly be interesting to explore whether other large-scale events without a clear “perpetrator” (natural disasters, pandemics, or political elections) have more general spill-over effects.

It is also possible that some associations are more malleable than others based on both their depth and the accessibility of counter-representations (Lizardo 2021; Brownstein, Madva, and Gawronski 2020). Terror attacks by white people might have a negligible effect on implicit bias if strong pre-existing dispositions and contextual cues outweigh them. Some social categories are similarly more abstract than others, and this “fuzziness” could make interpretations more dependent on contextual cues. We might thus have more stable sentiments towards a specific brand (e.g., Coca-Cola) or a specific person (e.g., Martin Luther King) than less specific categories (e.g., sodas and Black people).³⁷ Future studies could test whether terror attacks (and similar events) exclusively change implicit bias towards Arab Muslims as a group, or whether it also affects more specific (and perhaps stable) representations of the group.

Finally, it would also be fruitful to look at the effect of more institutional changes in context, such as law changes. These “events” can create slow-moving but durable contextual changes. If implicit bias—and other related attitudes—primarily depend on contextual factors, we would expect these durable changes to have durable effects on implicit bias. Using data from Project Implicit, it would be possible to look at how changes in, for example, LGBTQ- or abortion rights affect implicit bias.

Conclusion

This article analyzed three of the deadliest terror attacks in modern European history to demonstrate the nature and malleability of implicit bias. It showed how the attacks primarily—and in this study exclusively—affected implicit bias. These results can be viewed as support for a more “contextual” approach to the study of implicit bias within both cognitive psychology and cultural sociology. Although dispositional factors can still be important—and particularly the interaction be-

tween dispositions and situations—context has been under-emphasized within implicit bias research. This article will hopefully stimulate further research on the contextuality and situatedness of implicit bias and related implicit cognitions.

Irrespective of the nature of implicit bias, this study underscores the importance of incorporating implicit measures into sociological research. As several other sociologists have pointed out (Vaisey 2009; Shepherd 2011; Lamont et al. 2017; Schaap, van der Waal, and de Koster 2019), implicit measures are essential to understanding the interaction between personal and public culture. If we restrict our analysis to explicit measures, we will fail to detect the many ways personal and public culture interact. The current article is a good example. If the analysis had been limited to explicit measures, we would have (incorrectly) concluded that terror attacks do not affect personal attitudes. To this end, I encourage sociologists to use both new and existing implicit measures in the study of personal culture. I have suggested a few avenues for future research, but there is certainly much more left to be explored.

Notes

- 1 This mismatch can lead to potentially erroneous conclusions, such as “terrorist events [...] are not necessarily accompanied by a surge of anti-immigrant sentiment” (Brouard et al. 2018:1076).
- 2 Dual-process models often describe explicit and implicit culture as distinct, but the degree of distinctiveness is highly contested (see e.g., Vila-Henninger 2015). Studies show that we often use both types of culture at the same time (Brekhus and Ignatow 2019).
- 3 Some (e.g., Lizardo 2017) even claim that it is *only* learned via slow learning and repeated encodings, although this statement is controversial (Houwer 2014; Van Dessel, Ye, and De Houwer 2018)
- 4 Implicit bias might also consist of more complex propositions, and the content of these propositions could affect the relationship between a concept and a sentiment. Mere co-occurrence might not, as a result, always strengthen implicit bias. Portrayals of Arab Muslims being e.g., the victim of a terror attack could even decrease implicit bias (Bursell and Olsson 2021).
- 5 DiMaggio uses the broader term “schemas”. Schemas and implicit associations are tightly connected, where implicit associations can be seen as “the representations and computations underlying schematic processes” (Leschziner and Brett 2021:1221).
- 6 The discussion taps into the larger debate between the “cultural fragmentation” model and the “acquired dispositions” model (Lizardo and Vaisey 2016; Kiley and Vaisey 2020), although this debate has mainly centered around explicit culture.
- 7 Reviewing a decade of research on the malleability of implicit bias, Dasgupta similarly concludes that implicit bias “are mirror-like reflections of local environments and communities within which individuals are immersed” (2013:240).
- 8 A specific context cannot explain all variations in implicit bias. We exist in several different contexts at the same time. We exist in e.g., a nation, a workplace, and a household, and these environments all shape concept accessibility. Specific contextual changes might thus also affect people differently depending on pre-existing contextual factors.

- 9 Gawronski et al. (2022:1) argue that more traditional dual-process models have underemphasized the role of situations and contexts, and that a “modal” view of implicit cognition is “theoretically, empirically, and methodologically unsubstantiated”. They do, however, believe that individual differences can be important in explaining variations *within* a certain context (see also Gawronski 2019).
- 10 The Bias of the Crowds model primarily relates to implicit bias. As the authors point out, it is possible (and perhaps likely) that other expressions of implicit culture are more stable.
- 11 Physical context, negative emotions, and implicit bias are oftentimes interconnected. Studies show how certain contexts can prime associations between minorities and perceived threats (e.g., Schaller, Park, and Mueller 2003). We might, for example, feel more threatened and prejudiced when we encounter an Arab Muslim man in an airplane than in the streets.
- 12 Dispositional models also assume that attitudes can be affected by current events and “revert back to a relatively stable baseline in short time” (Kiley and Vaisey 2020:481). These non-persistent changes are, however, often viewed as measurement errors (Payne and Hannay 2021; Kiley and Vaisey 2020).
- 13 There were, of course, also competing frames. The state-run TV station *France 24* explicitly linked the attacks to Islam (Polońska-Kimunguyi and Gillespie 2016), and far-right movements repeatedly criticized how President Hollande handled the attacks.
- 14 Muslim participants were included in both Study 1 and Study 2, but these participants do not affect the findings of either study. As can be seen in Table 5C, the coefficient remains largely the same when these participants are excluded.
- 15 Due to the larger and more varied sample size in Study 2, we are able to partially evaluate this assumption by testing a number of interaction effects. These interaction effects are presented in Table 6C. There are no interaction effects for age, political ideology, or college education. Although the respondents may deviate in other unobservable ways, younger, more left-leaning, and better-educated respondents are not more vulnerable to the intervention than other participants.
- 16 The sample size is based on a preliminary power analysis. To find a change that equates to 1/3 SD of the total sample mean ($d = 0.399$), we would need a sample of 444 respondents. Using a 15-day bandwidth would result in a sample size of only 190.
- 17 When we use a larger bandwidth of ± 60 days, there is a significant and substantial difference in gender distribution (see supplemental material).
- 18 Simultaneous events could cause additional violations of the excludability assumption (Muñoz et al. 2019). There was, to the best of my knowledge, no simultaneous event with comparable salience and magnitude during the attacks. Although the Nice attack coincided with the Bastille Day, any Bastille Day effect should be picked up by the placebo test in Table 2B of the online supplement.
- 19 Details about the Arab-IAT, including the data sets and the stimuli used, can be found at <https://osf.io/3xuum/> and <https://osf.io/t8u7p/>.
- 20 These effect sizes are calculated based on the entire data set ($n = 15903$).
- 21 A lack of a significant threshold effect might not be surprising given the sample size, but there is no threshold effect whatsoever.
- 22 Although not presented in this article, additional analysis found no significant effect of the attacks on implicit prejudice towards Gay people (Sexuality IAT), the elderly (Age IAT), or the overweight (Weight IAT).

- 23 The Race IAT also serves as an additional placebo test. If the results are driven by an unrelated time-trend or event, we would expect to find an effect on the Race IAT as well.
- 24 The physical context will, for example, remain relatively unchanged for respondents in distant countries.
- 25 There are exceptions: some countries feel animosity toward neighboring countries, and some countries far apart might have strong cultural and historical links. In these cases, physical and personal proximity might not overlap.
- 26 In Study 1, respondents were coded as having “foreign background” if they had a non-French citizenship. This variable was not meaningful for Study 2 and thus excluded.
- 27 The difference is likely related to the amount of exposure each attack received. Charlie Hebdo was the first large-scale Islamic terror after a decade of relative calm, and the 2015 November Paris attack was the deadliest since the 2004 Madrid bombings. These two attacks (likely) attracted more international attention than the Nice attack. Exposure to repeated attacks can also lead to a type of new normality where respondents experience less distress in unsafe situations (Spilerman and Stecklov, 2009).
- 28 The international data set contains 187 participants who live in France. The effect of terror attacks increased over time for these respondents, although the effect was not significant ($d = 0.007$, $p = 0.3$). If we use specifications less sensitive to sample size (i.e., constant slope models), the effect becomes significant ($d = 0.007$, $p = 0.028$). These results indicate that the differences in magnitude between Study 1 and Study 2 are not due to differences in design.
- 29 There is also a significant effect ($d = 0.058$) if we dummy-code neighboring countries versus non-neighboring countries.
- 30 68 percent of the sample consisted of people living in the U.S. To ensure that the results are not driven by differences between the U.S. and the rest of the world, I also re-ran the regressions in Table 4C without any U.S. participants, but the results remain largely unchanged.
- 31 There was, however, considerable heterogeneity between different countries. Certain distant countries were more affected than some countries in Europe. Explaining this heterogeneity is beyond the scope of this study, but future research could test whether other country-specific characteristics – such as cultural ties to France, or the percentage of Muslims in the population – moderate the effect of the attacks on implicit bias.
- 32 We cannot, however, know whether the effects are mainly due to the initial intervention (the attack), or due to repeated interventions over time (coverage of the attacks). The results from Study 1 and Study 2 indicate that it might be a mix of both.
- 33 The results also indirectly show that terror attacks do not affect overall ingroup bias. If the attacks had a significant effect on ingroup bias, we would expect to see an increase in all types of implicit bias.
- 34 But see Bursell and Olsson (2020) on potential issues related to creating and using implicit measures in sociology.
- 35 Some previous studies (e.g., Savelkoul et al. 2022) found a decrease in anti-Muslim attitudes following the Hebdo attack. In contrast, the effect on implicit bias was largest in both Study 1 and Study 2 following the Hebdo attack. Although public calls of tolerance, openness, and solidarity may have moderated the effect on explicit bias, the effect on implicit bias seem less dependent on the public discourse. This could, as discussed throughout the article, reflect a very real divergence between people’s explicit and implicit attitudes beyond simply social desirability bias. People may genuinely have

become explicitly more positive towards Arab Muslims following the Hebdo attack, but implicitly more negative.

36 The IAT is a relatively noisy measure (Dentale et al., 2019), and many unobserved variables explain part of the variation in implicit bias. Some of these variations might depend on pre-existing contextual factors, and some might depend on more chronically accessible associations.

37 We might similarly have relatively stable implicit evaluations of specific cultural “tastes” (such as music genres), but relatively context-dependent evaluations regarding what counts as “good taste”.

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Filip Olsson: Department of Sociology, Stockholm University.
E-mail: filip.olsson@sociology.su.se.