Running head: Posttraumatic stress disorder in victims of terrorist attacks

A SYSTEMATIC REVIEW OF THE LITERATURE ON POSTTRAUMATIC STRESS DISORDER IN VICTIMS OF TERRORIST ATTACKS[1,2]

MARÍA PAZ GARCÍA-VERA, JESÚS SANZ AND SARA GUTIÉRREZ

Universidad Complutense de Madrid

---

[1] Address correspondence to María Paz García-Vera, Department of Personality, Assessment and Clinical Psychology, Complutense University of Madrid, Campus de Somosaguas, 28223 Madrid, Spain, or e-mail (mpgvera@psi.ucm.es).

Summary.—This article was aimed at systematically reviewing the literature on posttraumatic stress disorder (PTSD) among victims of terrorist attacks. Electronical and hand searches identified 35 studies addressing PTSD prevalence based on validated diagnostic interviews. In the year after terrorist attacks, 33-39% of direct victims will develop PTSD, whereas the percentage of indirect victims with PTSD will be lower (4% in the affected community, 5-6% among emergency, rescue, and recovery workers, and 17-29% among relatives and friends of the injured/killed victims), but nonetheless above its habitual prevalence in the general population. With the passing of time, a significant reduction of PTSD can be expected in the affected community and in the emergency and rescue personnel, but not in the injured victims, in the relatives and friends of the injured/killed victims, and in non-traditional, more vulnerable disaster workers. The implications of these results for the psychological treatment of terrorism victims are discussed.

Introduction

According to the data of the National Consortium for the Study of Terrorism and Responses to Terrorism (START) of the United States, during 2014, 13,463 terrorist attacks occurred worldwide, which provoked 32,727 deaths, 34,791 injured victims, and 9,428 kidnappings, and of these attacks, 561 caused 10 or more mortal victims (START, 2015). These data alone justify the fact that, in recent years, terrorism has become one of the most severe and concerning problems worldwide, and that systematic research programs about its psychopathological consequences have been established and developed. In fact, the 11 September 2001 attacks in New York and Washington, DC marked an inflection point in research on the psychopathological repercussions of terrorist attacks, with a spectacular increase in the scientific publications on the topic. Thus, a search in PsycINFO bibliographic database with the combination of terms of "terrorist attack" or "terrorism" and "posttraumatic stress" or "post-traumatic stress" or "acute stress" or "depression" or "depressive" or "anxiety" or "panic" or "alcohol" or "drug" in the abstract and title fields for the 12-year period from 1990 to 2001 identified only 32 publications (with a range between 1 and 5 publications per year), whereas a similar search for the 12-year period from 2002 to 2013 identified 513 publications (with a range between 26 and 71 publications per year). Furthermore, those searches found only 2, 3, and 5 publications on 1999, 2000, and 2001, respectively, but they revealed 26, 27, and 54 publications on 2002, 2003, and 2004, respectively. Although all these publications do not deal with the 11 September 2001 attacks, at least 39% of them do. The studies of these attacks, along with the studies on the attacks in other developed countries, especially those that occurred in the last 15 years in Israel, Europe (France, Ireland, Spain, and United Kingdom), and in the United States and, in particular, those that caused a large number of deaths and injuries (e.g., the 19 April

1995 attack in Oklahoma City or the 11 March 2004 attacks in Madrid) constitute the most solid compendium of empirical knowledge currently available on mental health problems provoked by terrorism (for exceptions, see, for example, the studies on 1998 US Embassy bombing in Nairobi, Kenya: North et al., 2005; Zhang et al., 2013, 2016).

However, the above-mentioned terrorist attacks only represent a small part of the dramatic problem of terrorism, even if only attacks with a large number of mortal victims are taken into account. As a matter of fact, considering as such the attacks that caused 10 or more deaths, in 2014 these attacks occurred most frequently (72.7% of these attacks) in four countries of Africa, Asia, and Middle East (Nigeria: 155 attacks, 27.6%; Iraq: 141 attacks, 25.1%; Afghanistan: 66 attacks, 11.8%, and Syria: 46 attacks, 8.2%), whereas only two occurred in Europe (one in Russia and one in Turkey) and none in North America (United States Department of State, 2015). Therefore, research on the psychopathological consequences of terrorism is biased toward the massive terrorist attacks that have occurred in developed countries and presents a priori problems for generalization of its findings to terrorist acts that occur in developing countries and that, at a worldwide level, represent the most important percentage of this severe problem.

Bearing this limitation in mind, we must acknowledge that, in the last 15 years, such research has grown rapidly and fruitfully. Thus, the above-mentioned search in PsycINFO identified 599 papers published between 2002 and April 2016, and, therefore, currently the body of empirical knowledge about mental health problems specifically derived from terrorism has allowed some meta-analyses, for example, that of DiMaggio, Galea, and Li (2009) on substance dependence and consumption disorders or that of Salguero, Fernández-Berrocal, Iruarrizaga, Cano-Vindel, and Galea (2011) on major depressive disorder.

The purpose of this article is to systematically review the empirical studies on posttraumatic stress disorder (PTSD) in adults derived from terrorist attacks, with the conviction that any strategy or plan to attend to the mental health of the victims of terrorist attacks must estimate the number of people affected. In this vein, the present review will focus mainly on the presence of diagnosable PTSD, rather than on the mere presence of posttraumatic stress symptoms, because the latter, with no appropriate appraisal of their severity, frequency, duration, covariation, and degree of interference, may only represent intense emotional responses that are a part of people's normal recovery process when faced with a traumatic event (McNally, Bryant, & Ehlers, 2003; Vázquez, Pérez-Sales, & Matt, 2006). Therefore, empirical studies were considered eligible for analysis if they used validated diagnostic interviews with explicit PTSD diagnostic criteria based on the Diagnostic and Statistical Manual of Mental Disorders (DSM) or the International Disease Classification.

DiMaggio and Galea (2006) meta-analytically reviewed studies on the prevalence of PTSD amongst victims of terrorist attacks that had been conducted or published between 1980 and 2004, but in the last 12 years, many new studies have been published. On the other hand, many studies included in that previous review assessed PTSD by self-report screening questionnaires and not diagnostic interviews. In addition, DiMaggio and Galea's (2006) review will be expanded to include empirical literature on the presence of PTSD in other groups of indirect victims not contemplated in it. The psychopathological repercussions of terrorist attacks go beyond the people who have experienced the attack directly and who have survived it without harm or with varying degrees of injuries. To these direct victims, the indirect victims must be added: relatives and close friends of the dead and injured, emergency-rescue professionals (medical and nursing personnel, ambulance drivers, psychologists, firemen, police force, etc.) and

volunteers who intervened to help the victims, the people living near ground zero, and the general population of the affected community, which is the target of the terrorist actions (see, for example, Muñoz, Crespo, Pérez-Santos, & Vázquez, 2005; North, Tivis, McMillen, Pfefferbaum, Spitznagel et al., 2002b; Sprang, 2001; Zimering, Gulliver, Knight, Munroe, & Keane, 2006). The present review will examine PTSD in all these kinds of victims.

Literature Search

Electronical searches on MEDLINE, PsycINFO, and PILOTS (Published International Literature On Traumatic Stress) were carried out by entering the combination of terms of "terrorist" or "terrorism" and "posttraumatic stress" or "post-traumatic stress" and "prevalence" or "incidence" or "proportion" or "epidem*" (* refers to wildcard characters) in the abstract and title fields for the period from 1980 to April 2016.

A total of 170 references were retrieved through the electronic database searches, and a total of 166 remained after removing duplicates. Of these 166 studies, 150 were excluded for the following reasons: textbook chapter or review article (40), PTSD not assessed by a diagnostic interview (32), not PTSD prevalence data (16), nonindependent or previously presented data (14), children or adolescents (13), commentary or essay (11), intervention study (9), mixed traumatic events or not terrorism (6), doctoral dissertation (5), not English, Spanish, French, Portuguese, or Italian (1), instrument study (2), and subjective data (1). Hand searching the references of previous review articles or those of articles eligible for inclusion identified an additional 19 references. A total of 35 reports addressing PTSD prevalence remained (they are marked with asterisks in the reference section).

These studies were classified as (a) studies of survivors or direct victims, (b) studies of the general population of the community affected by a terrorist attack, (c) studies of emergency, rescue or recovery workers or volunteers, (d) studies of relatives or close friends of victims who had been injured or killed in terrorist attacks, or (e) studies of relatives of emergency or rescue workers. The studies corresponding to each of these categories (and the main study characteristics and results) are presented in Tables 1 to 4, respectively, except for the only study found for the last category (Pfefferbaum et al., 2002). The main characteristics and results of this latter study will be described later in the text.

Insert Table 1 about here

Insert Table 2 about here

Insert Table 3 about here

Insert Table 4 about here

PTSD Derived from Terrorist Attacks

The first conclusion that can be reached from Tables 1 to 4 is that, after a terrorist attack, there is a significant percentage of people affected by PTSD among the victims, both direct and indirect, a percentage that ranges between the estimated total mean of 29.8% in samples of people directly exposed to the attack who have survived (Table 1) and the total mean of 2.6 or 4.2% calculated in samples of the general population of the affected community (Table 2). In fact, even the studies in Tables 1 to 4 that reported lower percentages of people affected by PTSD present figures of PTSD

that exceed the habitual 1-year prevalence in the reference population. Thus, for example, 1 to 3 months after the M-11 attacks, Miguel-Tobal, Cano-Vindel, Iruarrizaga, González-Ordi, and Galea (2005a) found only 2.3% of people with PTSD derived from the M-11 attacks in the general population of Madrid and only 1.2% of people with PTSD among the emergency personnel, but these figures exceed the one-year prevalence of PTSD in the Spanish population, which is estimated to be approximately 0.5% from a study carried out before the M-11 attacks, between 2001 and 2002 (Haro et al., 2006). Consistently, both the total mean prevalence of PTSD among the survivors (29.8%), the total mean prevalence of PTSD among emergency, rescue, assistance or recovery personnel or volunteers (6.9%; Table 3), and the total mean prevalence of PTSD among relatives and close friends of the victims injured or killed (23%; Table 4), exceed the 1-year prevalence of PTSD in the United States and European populations, which are estimated to be 3.5% and 0.9%, respectively (Kessler, Chiu, Demler, & Walters, 2005; the ESEMeD∕MHEDEA 2000 Investigators, 2004).

Nevertheless, the increase in the prevalence of PTSD caused by the experience of a terrorist attack should not conceal a second conclusion that can be reached from the empirical literature summarized in Tables 1 to 4 if, for example, the complementary percentages of the prevalence of PTSD that appear in those tables are calculated. This second conclusion is that the great majority of the direct and indirect victims of terrorist attacks do not develop PTSD and manage to recover normally without significant psychopathological sequelae, even when such attacks are characterized by a high number of dead and injured, and very important material destruction, such as in the 9/11 attacks of New York, or by their continuous repetition over time, as in Israel between September 2000 and December 2004, an interval during which about 13,000 attacks were counted leaving over 1,000 dead and nearly 6,000 injured, comprising roughly

0.1% of the population (Hoffman, Diamond, & Lipsitz, 2011). Thus, for example, in spite of the high number of terrorist attacks occurred in Israel in that period, the studies shown in Table 1 indicate that the PTSD prevalence among survivors 3 to 9 months after the attacks oscillated between 15.5% (Dolberg et al., 2010) or 25.8% (Ankri, Bachar, & Shalev, 2010) and 35.9% (Shalev & Freedman, 2005) or 61.3% (Gil & Caspi, 2006), with a weighted mean of 26.5%. In other terms, in spite of the high number of terrorist attacks occurred in Israel between 2000 and 2004, the great majority of survivors (73.5%) did not develop PTSD 3 to 9 months after the attacks.

This conclusion has important implications because, on the one hand, it justifies the need to study the victims' factors and normal psychological recovery processes and, on the other, and with regard to this, it may lead to improvement of current psychological treatments for the victims of terrorist attacks promoting factors and processes observed in those who do no develop PTSD, to enhance people's resilience and capacity to adapt.

PTSD and Degree of Exposure to Terrorist Attacks

As can be expected, the empirical literature summarized in Tables 1 to 4 confirms that the psychopathological consequences of terrorist attacks are directly related to people's degree of exposure to them, although some aspects of that relation could be qualified. From the mean percentages shown in Tables 1 to 3, it could be concluded that the presence of PTSD derived from terrorist attacks is more frequent in survivors than in emergency personnel and rescuers, and much lower in the general population of the affected community, both between 1 month and 6 months after the terrorist attacks (38.9, 5.1, and 4.1%, respectively) and between 6 months and 1 year after the terrorist attacks (32.9, 6, and 4.4%, respectively) or more than 1 year after the terrorist attacks (22.5, 7.2, and 1.4-3.8%, respectively). This conclusion is consistent

with the results of DiMaggio and Galea's (2006) meta-analysis that also obtained PTSD
prevalence rates higher in survivors than in emergency and rescue workers, and higher
in this last group of victims than in the general population of the affected community
(18, 16.8, and 10.9%, respectively). However, the results of the present review also raise
some issues and qualify that conclusion and DiMaggio and Galea's (2006) results.

First, after analyzing the results of eight studies, DiMaggio and Galea (2006)
suggested that there was an 18% of prevalence of PTSD among the survivors. However,
when calculating the mean (weighted by sample size) of the 17 PTSD prevalence rates
reported by the 12 studies of survivors in the current review (Table 1), the prevalence of
PTSD among survivors was 29.8%. In contrast with DiMaggio and Galea's (2006)
review, all studies included in the present review used validated diagnostic interviews to
assess the presence of PTSD. Therefore, the most prudent conclusion with the current
data is that, among survivors, the frequency of PTSD could be estimated around 30%,
ranging between 39% 1 to 6 months after the terrorist attacks and 22% more than one
year after the attacks.

Second, the studies carried out with professionals, workers, and volunteers from
the emergency, assistance, recovery, and rescue systems, and examined in the current
review (Table 3), challenge and qualify the conclusion that these groups present more
PTSD than the general population of the community affected by the attacks. Reality
may be just the opposite because, although it is true that because of the characteristics of
their task, emergency, assistance, recovery, and rescue personnel are overexposed to the
more brutal and horrible effects of the attacks in comparison to people from the general
population, these professional groups, or at least some of them, may also be less
vulnerable to PTSD, among other factors, due to the selection and self-selection
processes for work in traumatic settings. In addition, their preparation and experience in

routine tasks of aiding the injured and recovering the dead, and their having learned skills to maintain mental health in traumatic situations as part of their regular and unregulated training processes, should be protective (Liu, Tarigan, Bromet, & Kim, 2014; North, Tivis, McMillen, Pfefferbaum, Cox et al., 2002a; Perrin, DiGrande, Wheeler, Thorpe, Farfel, & Brackbill, 2007; Zhang et al., 2016).

With regard to emergency, assistance, recovery, and rescue personnel, the results of DiMaggio and Galea are based on only two studies, one of the 9/11 attacks (Centers for Disease Control and Prevention, 2004) and the other of the Oklahoma City bombing (North, Tivis, McMillen, Pfefferbaum, Spitznagel et al., 2002). Therefore, the results of the present review, based on 12 PTSD prevalence rates reported by 11 studies using validated PTSD diagnostic interviews (Table 3), should be considered a better estimation of the PTSD prevalence among that group of indirect victims. These results suggest that approximately 6.9% of the professionals and volunteers of the emergency, assistance, rescue, and recovery services will suffer from PTSD following a terrorist attack. Although this mean prevalence of 6.9% of PTSD is lower than the one calculated by DiMaggio and Galea for the general population of the affected community (10.9%), that figure is still higher than the one calculated in the present review for that general population (2.6-4.2%; Table 2). However, a detailed analysis of the percentages in Table 3 by types of collectives (police force, firefighters, emergency health personnel, utility workers) suggests that the prevalence of PTSD after terrorist attacks is not homogeneous in all these groups and some of them (e.g., emergency or rescue personnel, i.e., police force, firefighters, mental health personnel; Evans, Giosan, Patt, Spielman, & Difede, 2006; Evans, Patt, Giosan, Spielman, & Difede, 2009; Miguel-Tobal Cano-Vindel, Iruarrizaga, González-Ordi, & Galea, 2005; Miguel-Tobal, Cano-Vindel, Iruarrizaga, González-Ordi, Muñoz et al., 2005; Zimering et al., 2006) could

present specifically lower prevalences of PTSD than others (e.g., recovery utility workers, i.e., clearing, cleaning, and construction workers; Cukor, Wyka, Jayasinghe et al., 2011).

In this vein, one study carried out with professionals and volunteers of the emergency and assistance services (police force, firefighters, doctors, nurses, psychologists) who attended to the M-11 victims found that only 1.2% of these people displayed PTSD 1 to 3 months after the attacks (Miguel-Tobal, Cano-Vindel, Iruarrizaga, González-Ordi, & Galea, 2005; see Table 3), a figure that is not only lower than that provided by DiMaggio and Galea (2006) for the general population (10.9%), but also slightly lower than that found in the general population of Madrid 1 to 3 months after M-11 in that same Miguel-Tobal, Cano-Vindel, Iruarrizaga, González-Ordi, and Galea (2005) study (2.3%; see Table 1), despite the fact that it is higher than the habitual 1-year prevalence of PTSD in the general Spanish population before the M-11 attacks (0.5%; Haro *et al*., 2006).

Nevertheless, in addition to considering the heterogeneity of the groups that work in assistance, recovery, and rescue tasks following a terrorist attack, other factors should be taken into account to understand their psychopathological repercussions in these professional and volunteer groups, factors that, in fact, could explain the discrepancy between the results of some of the studies presented in Table 3, such as, for example, the lower numbers of PTSD in the studies of M-11 versus the studies of 9/11 or the Oklahoma City bombing. Thus, the discrepancy could be due to the characteristics of the attacks because, for example, there was more material destruction, injured victims, and loss of human lives in the 9/11 attacks than in the M-11 attacks; in fact, in the 9/11 attacks, there was also a very high number of deaths and injured persons among the emergency and rescue personnel. Another factor to be taken into

account is the different level of exposure to the traumatic situation within the same group. For example, the rescue work went on for a longer interval in the 9/11 and Oklahoma City attacks than in the M-11 attacks, and the results of North, Tivis, McMillen, Pfefferbaum, Spitznagel et al. (2002) indicate a positive relation between the number of days working in rescue tasks and the presence of PTSD. Finally, another factor to be considered is the professionalization among emergency and rescue workers. Zhang et al. (2016) found that Nairobi rescue workers responding to the 1998 U.S. Embassy bombing, mostly volunteers assembled by the Red Cross, showed higher PTSD prevalence rates than professional firefighters responding to the 1995 Oklahoma City bombing (22% vs 10%). This difference suggests the importance of professional status of rescue workers in conferring protection from adverse mental health outcomes.

Third, in the review of DiMaggio and Galea (2006), data from another important group of indirect victims of terrorism are missing: the relatives and friends of the dead and injured in the attacks. In fact, the scientific literature on the psychopathological consequences of terrorist attacks has, in general, paid little attention to the people who lose their loved ones in such attacks. In Table 4 are presented six studies carried out with this population, three after the 9/11 attacks, two after the M-11 attacks and one after an attack in Haifa (Israel). After calculating the mean percentage of people with PTSD, weighting for sample size of the corresponding study, it can be estimated that PTSD could affect approximately 23% of the relatives and close friends of the injured or dead in the attacks (Table 4), which places this group of indirect victims, with regard to the prevalence of PTSD derived from attacks, much higher than the general population of the affected community (2.6-4.2%) or than the emergency and rescue personnel (7.1%), and at similar levels as the survivors or direct victims (29.8%).

In fact, the group of people who suffered the traumatic loss of a loved one in a terrorist attack deserves special consideration because other psychopathological problems, such as major depression disorder or complicated bereavement and the comorbidity of the latter with PTSD, are frequently present in this group. For example, in a sample of 70 people who had received individual psychological counselling through the free program *Project Liberty* after the 9/11 attacks and who reported knowing someone who had died in the attacks, it was found that, approximately a year and a half after the attacks, 18.5% simultaneously presented PTSD, major depressive disorder, and complicated bereavement, another 8.6% displayed PTSD and major depressive disorder, 5.7% had PTSD and complicated bereavement, and lastly, another 5.7% presented only PTSD (Shear, Jackson, Essock, Donahue, & Felton, 2006).

Finally, another group of people who deserve to be studied are the friends and relatives of emergency, rescue, and recovery workers in terrorist attacks. Only one study was found on that population. Pfefferbaum et al. (2002) analyzed the effects of the 1995 Oklahoma City bombing on a sample of 27 female partners of the Oklahoma City firefighters who participated in the bombing rescue effort. These women were assessed, using the Diagnostic Interview Schedule for the DSM, revised third edition, 42 to 44 months after the bombing, and only one woman (4% of partners) showed bombing-related PTSD. Therefore, it seems that the prevalence of postdisaster PTSD in that group of indirect victims is similar to that found in samples of the general population and lower than that found in samples of emergency, rescue, and recovery personnel, although, given the paucity of data, this conclusion needs further study.

PTSD and the Passing of Time after Terrorist Attacks

A last conclusion about the prevalence of PTSD that could be reached from the empirical literature summarized in Tables 1 to 4 is that, with the passing of time, there

is a significant decrease in the number of people affected by PTSD, although that decrease seems to be only evident in some type of victims. Thus, 1 to 6 months after the terrorist attacks, an average PTSD prevalence rate of 38.9% is observed among the survivors and of 29.4% among the relatives or close friends of the victims injured or killed, prevalence rates that have notably decreased to 32.9 and 16.9%, respectively, at 6 to 12 months, and, in the case of survivors, to 22.5% at more than 1 year (Tables 1 and 4). These results are consistent with the meta-analytical data of DiMaggio and Galea (2006) indicating that, 2 months after the attacks, an average PTSD prevalence of approximately 16% is observed among the direct and indirect victims, a prevalence that has significantly decreased to 14% at 6 months, and to approximately 12% at one year. However, in the present review, this decrease in PTSD prevalence was not evident in emergency, rescue, assistance or recovery personnel or volunteers (5.1% at 1 to 6 months after the terrorist attacks, but 6% at 6 to 12 months and 7.5% at more than 1 year; Table 3), and it was less evident in the general population of the affected community (4.1% at 1 to 6 months after the terrorist attacks, but 4.4% at 6 to 12 months, although 1.4 or 3.8% at more than 1 year; Table 2).

The results and conclusions reported by DiMaggio and Galea (2006) and in the present review are mainly based on comparisons made between cross-sectional studies conducted at different times. Furthermore, an excessive dependence on meta-analytic or simple summary statistics can conceal the existence of systematic variations among the studies or can lead to erroneous conclusions because of combining studies that are so heterogeneous. Therefore, we must confirm or qualify the above-mentioned conclusions using longitudinal studies that allow better appraisal of the course of PTSD, and, of course, taking into account the victims' characteristics and degree of exposure to the

attacks. In Table 5 are presented the longitudinal studies found in the present review and their main characteristics and results.

Insert Table 5 about here

In the same vein as the results of DiMaggio and Galea (2006), at 6 to 9 months of 9/11 or M-11 attacks, both in the general population and in emergency and assistance personnel, an important reduction in the frequency of PTSD was found (from 7.5% or 2.3% to 0.6% or 0.4%, and from 1.2% or 11% to 0%, respectively; Table 5), so that 6 to 9 months after the attacks, the percentage of people affected by PTSD in these two groups of indirect victims was similar to or lower than the annual prevalence of this disorder in the Spanish population (0.5%; Haro et al., 2006) or in the U.S. population (3.5%; Kessler et al., 2005). However, it seems than among some groups of non-traditional disaster workers as, for example, the recovery utility workers deployed to work in the World Trade Center site in New York City following the 9/11 attacks, especially the more vulnerable (those with psychiatric history, trauma history, and greater exposure to the attacks and their consequences), there are still high PTSD prevalence rates (8-15%) even 1 to 5 years after the 9/11 attacks (Cukor, Wyka, Mello et al., 2011; see Table 5).

On the other hand, among survivors of terrorist attacks, the results are contradictory concerning the existence of medium-term reductions in the frequency of PTSD (see Table 5). In one study, a reduction in the frequency of PTSD was confirmed 6 to 9 months after the attacks (from 78.2% to 25.8%), whereas in another study, no significant reduction in the frequency of PTSD was observed 6 to 9 months after the attacks (from 35.7% to 34.1%; a variation of barely 1.6 percentage points). Likewise, the results are contradictory concerning the existence of long-term reductions (Table 5).

In three studies, a reduction in the frequency of PTSD was confirmed 12 months after the attacks (from 35.7% to 28.6%) or 1 to 5 years after the attacks (from 31.4% or 41% to 19% or 28%), whereas in another study, no significant reduction was observed 1 to 5 years after the attacks (from 32% to 31%; a variation of barely 1 percentage point). In contrast, the results are consistent concerning the existence of very long-term reductions in survivors. The two studies shown in Table 5 consistently found a significant reduction in the frequency of PTSD 6 or 7 years after the attacks (from 41% or 31.4% to 26% or 15%; Table 5). Nevertheless, despite such medium-term, long-term, or very long-term reductions, the PTSD prevalence rates in survivors at 6 to 9 months, 1 year, 1 to 5 years, or more than 5 years after the attacks are still much higher than the habitual numbers in the Spanish population (0.5%) or the U.S. population (3.5%), or even in the Israeli population in the context of ongoing trauma (0.5%; Levinson, Zilber, Lerner, Grinshpoon, & Levav, 2007).

Likewise, although a reduction in the frequency of PTSD was observed among the friends and relatives of the victims who died or were injured 6 to 9 months after the 11-M attacks (from 28.2% to 15.4%; Table 4), the prevalence of PTSD among those indirect victims at 6 to 9 months after the attacks is still much higher than in the general Spanish population.

Summing up, after a terrorist attack, with the passing of time, a significant reduction can be expected in the number of people affected by PTSD; however, this reduction is not the same in all types of victims nor does it follow the same course. The reduction is more obvious in people from the general population of the affected community and in the emergency and rescue personnel, and it is relatively less or slower in the case of the injured and in their friends and relatives or in those of the mortal victims. In this sense, it is important to take into account the possible existence

of cases of delayed-onset PTSD, that is, cases in which at least 6 months have passed between the attacks and the onset of PTSD symptoms, according to criteria of the DSM-IV-TR. A recent review of studies of a different sort of people affected by traumatic events, mainly military combat personnel and victims of traffic accidents, concluded that delayed-onset PTSD in the absence of prior posttraumatic symptoms was a very rare condition, but that the delayed PTSD that represents an exacerbation of prior symptoms was found on average in 38.2% of military combat personnel with PTSD, and in 15.3% of the civil population with PTSD (Andrews, Brewin, Philpott, & Stewart, 2007). Consistently, North et al. (2004) did not found cases of delayed-onset PTSD in survivors of the Oklahoma City bombing at a 17-month follow-up, but they found that 8.7% of the survivors were diagnosed with PTSD for the first time at follow-up. Furthermore, all PTSD cases first identified at follow-up had showed subthreshold levels of PTSD symptoms before, and these symptoms had begun within the first month after the Oklahoma City bombing.

Therefore, one could speculate that delayed PTSD, understood as an exacerbation of prior symptoms that can reach at some point the threshold for a diagnosis of PTSD, can also be presented by a significant percentage of victims of terrorism following the attacks, especially in the injured, as, for example, the results of the study of Grieger et al. (2006) with soldiers hospitalized for combat injuries in Iraq and Afghanistan suggest that the more severely injured show more delay in the development of a diagnosis of PTSD. In fact, that definition of delayed PTSD is compatible with the so-called *PTSD with delayed expression* in the DSM-5. This DSM-5 label recognizes that posttraumatic stress symptoms typically appear within the first 3 months after the trauma, and that the delay is in meeting full criteria for the diagnosis of PTSD.

Conclusions

In the last few decades, terrorism has become a serious and alarming problem worldwide. In response, over the past 15 to 20 years, systematic research programs about the psychopathological repercussions of terrorist attacks have been developed, although they have been limited practically to the massive terrorist attacks that have occurred in developed countries. Thus, of the 35 studies identified in this review, 28 studies (78.8%) addressed massive terrorist attacks in the United States, Europe, Israel, or Japan, mainly the 9/11 attacks (48.6%), the Oklahoma City bombing (14.3%), and the M-11 attacks (8.6%), four studies addressed nonmassive attacks in Israel and Europe, and only three studies addressed attacks in Africa (all these three studies focused on the 1998 U.S. Embassy bombing in Nairobi).

As with other traumatic situations, after a terrorist attack, a great variety of psychological symptoms and diagnosable mental disorders may emerge, including PTSD (DiMaggio & Galea, 2006; DiMaggio et al., 2009; Salguero et al., 2011). However, from the results presented in this literature review, it follows that most of the people affected by terrorism will not develop PTSD and will manage to recover normally, with no significant psychopathological sequelae. But these results also underline that, in the year after a terrorist attack, a large percentage of the direct victims (about 33 to 39%) will develop PTSD, whereas the number of indirect victims who will develop this disorder will be lower (about 4% in the general population of the affected community, 5-6% among emergency, rescue, assistance, or recovery workers, and 17-29% among relatives and friends of the victims injured or killed), but even so, it will be higher than the habitual prevalence of PTSD in the general population before the attacks.

The abundant scientific literature on the capacity of adaptation of human beings, which has increased notably in the last 15 years following the concept of resilience (Hoge, Austin & Pollack, 2007; Southwick, Douglas-Palumberi, & Pietrzak, 2014), has caused many professionals, scientists, and managers and politicians from the area of mental health to focus their attention on the expectations of natural recovery of that majority of people. However, although pertinent, especially in certain contexts and moments of a terrorist attack or threat (Foa et al., 2005), it can also lead to a serious danger: that adequate psychological treatments are not administered to the people who need them or that too much time goes by before administering them so that the problems have become chronic.

Consequently, after a terrorist attack, both the direct and indirect victims need psychological attention at short, medium, long, and very long-term (see García-Vera et al., 2015; García-Vera & Sanz, 2011, for reviews on the psychological treatment of the psychopathological repercussions of terrorist attacks). However, a core principal derived from the empirical data collected in this review is that such psychological attention should take into account the particular situation of each victim or group of victims and propose diverse goals, among them (but not only): to facilitate the normal recovery processes, promote people's resilience and capacity to adapt, alleviate or reduce their psychological symptoms, and improve their functioning.

In fact, the results of the studies reviewed also indicate that, 6 to 9 months after the terrorist attacks, and especially, 1 to 5 years later, their psychopathological repercussions will have decreased considerably in the affected general population as well as in the emergency and rescue personnel, although not in those injured in the attacks, in the friends and relatives of the dead of injured, or in some groups of nontraditional disaster workers (e.g., utility workers), at least, they will not have

decreased to the point where one could refer to recovery. In fact, the results of the present review reveal that even 6 or 7 years after the terrorist attacks, 15% to 26% of direct victims will show PTSD. This shows that the evolution of the psychopathological repercussions of the attacks differs from one person to the next and therefore suggests another core principle to take into account with regard to psychological assistance in terrorist attacks: the need for follow-up and to continue with longer term psychological assistance. Such follow-ups should be carried out with all the high-risk groups, among which are included: (a) people who present an acute stress disorder or other clinically significant symptoms as a consequence of the attacks; (b) relatives of people who died in the attacks; (c) people who already had a prior psychological disorder; (d) the victims who needed medical or surgical attention, and (e) people whose exposure to the attacks was particularly intense or long (National Institute of Mental Health, 2002).

Summing up, psychological assistance to the direct and indirect victims of terrorist attacks should take into account the diverse needs and characteristics of the affected individuals, and the fact that such needs have different priorities and can vary at different moments or phases after the attacks.

References

Andrews, B., Brewin, C. R., Philpott, R., & Stewart, L. (2007) Delayed-onset

posttraumatic stress disorder: a systematic review of the evidence. *American

Journal of Psychiatry*, 164, 1319-1326.

*Ankri, Y. L. E., Bachar, E., & Shalev, A. Y. (2010) Reactions to terror attacks in ultra-

orthodox Jews: the cost of maintaining strict identity. *Psychiatry: Interpersonal

and Biological Processes*, 73, 190-197.

*Boscarino, J. A., Adams, R. E., & Figley, C. R. (2004) Mental health service use 1-

year after the World Trade Center disaster: implications for mental health care.

General Hospital Psychiatry, 26, 346-358.

*Boscarino, J. A., & Adams, R. E. (2009) Peritraumatic panic attacks and health

outcomes two years after psychological trauma: Implications for intervention

and research. *Psychiatry Research*, 167, 139-150.

Centers for Disease Control and Prevention (CDC) (2004) Mental health status of

World Trade Center rescue and recovery workers and volunteers - New York

City, July 2002-August 2004. *MMWR Morbidity and Mortality Weekly Report*,

53, 812-815.

*Chiu, S., Webber, M. P., Zeig-Owens, R, Gustave, J., Lee, R., Kelly, K. J., Rizzotto,

L., Schorr, J. K., North, C. S., & Prezant, D. J. (2011) Performance

characteristics of the PTSD Checklist in retired firefighters exposed to the World

Trade Center disaster. *Annals of Clinical Psychiatry*, 23, 95-104.

*Conejo-Galindo, J., Medina, O., Fraguas, D., Terán, S., Sainz-Cortón, E., & Arango,

C. (2008) Psychopathological sequelae of the 11 March terrorist attacks in

Madrid: an epidemiological study of victims treated in a hospital. *European

Archives of Psychiatry and Clinical Neuroscience*, 258, 28-34.

*Cukor, J., Wyka, K., Jayasinghe, N., Weathers, F., Giosan, C., Leck, P., Roberts, J., Spielman, L., Crane, M., & Difede, J. (2011a) Prevalence and predictors of posttraumatic stress symptoms in utility workers deployed to the World Trade Center following the attacks of September 11, 2001. *Depression and Anxiety*, 28, 210-217.

*Cukor, J., Wyka, K., Mello, B., Olden, M., Jayasinghe, N., Roberts, J., Giosan, C., Crane, M., & Difede, J. (2011b) The longitudinal course of PTSD among disaster workers deployed to the World Trade Center following the attacks of September 11th. *Journal of Traumatic Stress*, 24, 506-514.

*De Clercq, M., de Framan, B. H., & Hoyois, P. (1999) Impact à trois ans d'un attentat sur les intervenants du plan catastrophe [Impact at three years of a terrorist attack on the members of a disaster team]. *Médecine de Catastrophe et Urgence Collectives*, 2, 153-158.

DiMaggio, C., & Galea, S. (2006) The behavioral consequences of terrorism: a meta-analysis. *Academic Emergency Medicine*, 13, 559-566.

DiMaggio, C., Galea, S., & Li, G. (2009) Substance use and misuse in the aftermath of terrorism. A Bayesian meta-analysis. *Addiction*, 104, 894-904.

*Dolberg, O. T., Barkai, G., Leor, A., Rapoport, H., Bloch, M., & Schreiber, S. (2010) Injured civilian survivors of suicide bomb attacks: from partial PTSD to recovery or to traumatisation. Where is the turning point? *The World Journal of Biological Psychiatry*, 11, 344-351.

*Evans, S., Giosan, C., Patt, I., Spielman, L., & Difede, J. (2006) Anger and its association to distress and social/occupational functioning in symptomatic disaster relief workers responding to the September 11, 2001, World Trade Center disaster. *Journal of Traumatic Stress*, 19, 147-152.

*Evans, S., Patt, I., Giosan, C., Spielman, L., & Difede, J. (2009) Disability and posttraumatic stress disorder in disaster relief workers responding to the September 11, 2001 World Trade Center disaster. *Journal of Clinical Psychology*, 65, 684-694.

Foa, E. B., Cahill, S. P., Boscarino, J. A., Hobfoll, S. E., Lahad, M., McNally, R. J., & Solomon, Z. (2005) Social, psychological, and psychiatric interventions following terrorist attacks: recommendations for practice and research. *Neuropsychopharmacology*, 30, 1806-1817.

*Galea, S., Vlahov, D., Resnick, H., Ahern, J., Susser, E., Gold, J., Bucuvalas, M., & Kilpatrick, D. (2003) Trends of probable post-traumatic stress disorder in New York City after the September 11 terrorist attacks. *American Journal of Epidemiology*, 158, 514-524.

*Galea, S., Vlahov, D., Tracy, M., Hoover, D. R., Resnick, H., & Kilpatrick, D. (2004) Hispanic ethnicity and post-traumatic stress disorder after a disaster: evidence from a general population survey after September 11, 2001. *Annals of Epidemiology*, 14, 520-531.

García-Vera, M. P., & Sanz, J. (2011) Psychology applied to terrorism. Psychological treatment for victims of terrorist attacks. In P. R. Martin, F. M. Cheung, M. C. Knowles, M. Kyrios, J. B. Overmier & J. M. Prieto (Eds.), *IAAP Handbook of Applied Psychology*. Oxford, UK: Wiley-Blackwell. Pp. 663-683.

García-Vera, M. P., Moreno, N., Sanz, J., Gutiérrez, S., Gesteira, C., Zapardiel, A., & Marotta-Walters, S. (2015) Eficacia y utilidad clínica de los tratamientos para las víctimas adultas de atentados terroristas: una revisión sistemática [Efficacy and clinical utility (effectiveness) of treatments for adult victims of terrorist attacks:

a systematic review]. *Behavioral Psychology/Psicología Conductual*, 23, 215-244.

*Gil, S., & Caspi, Y. (2006) Personality traits, coping style, and perceived threat as predictors of posttraumatic stress disorder after exposure to a terrorist attack: A prospective study. *Psychosomatic Medicine*, 68, 904-909.

Grieger, T. A., Cozza, S. J., Ursano, R. J., Hoge, C., Martinez, P. E., Engel, C. C., & Wain, H. J. (2006) Posttraumatic stress disorder and depression in battle-injured soldiers. *American Journal of Psychiatry*, 163, 1777-1783.

Haro, J. M., Palacín, C., Vilagut, G., Martínez, M., Bernal, M., Luque, I., Codony, M., Dolz, M., Alonso, J., & el Grupo ESEMeD-España. (2006) Prevalencia de los trastornos mentales y factores asociados: resultados del estudio ESEMeD-España [Prevalence of mental disorders and associated factors: results of ESEMeD-Spain study]. *Medicina Clínica*, 126, 445-451.

*Henriksen, C. A., Bolton, J. M., & Sareen, J. (2010) The psychological impact of terrorist attacks: examining a dose-response relationship between exposure to 9/11 and axis I mental disorders. *Depression and Anxiety*, 27, 993-1000.

*Hobfoll, S. E., Canetti, D., Hall, B. J., Brom, D., Palmieri, P. A., Johnson, R. J., Pat-Horenczyk, R., & Galea, S. (2011) Are community studies of psychological trauma's impact accurate? A study among Jews and Palestinians. *Psychological Assessment*, 23, 599-605.

Hoffman, Y. S. G., Diamond, G. M., & Lipsitz, J. D. (2011) The challenge of estimating PTSD prevalence in the context of ongoing trauma: the example of Israel during the Second Intifada. *Journal of Anxiety Disorders*, 25, 788-793.

Hoge, E. A., Austin, E. D., & Pollack, M. H. (2007) Resilience: research evidence and conceptual considerations for posttraumatic stress disorder. *Depression and Anxiety*, 24, 139-152.

*Jayansinghe, N., Giosan, C., Evans, S., Spielman, L., & Difede, J. (2008) Anger and posttraumatic stress disorders in disaster relief workers exposed to the September 11, 2001 World Trade Center disaster: one year follow-up study. *Journal of Nervous & Mental Disease*, 196, 844-846.

Kessler, R. C., Chiu, W. T., Demler, O., & Walters, E. E. (2005) Prevalence, severity, and comorbidity of twelve-month DSM-IV disorders in the National Comorbidity Survey Replication (NCS-R). *Archives of General Psychiatry*, 62, 617-627.

*Lawyer, S. R., Resnick, H. S., Galea, S., Ahern, J., Kilpatrick, D. G., & Vlahov, D. (2006) Predictors of peritraumatic reactions and PTSD following the September 11th terrorist attacks. *Psychiatry*, 69, 130-141.

Liu, B., Tarigan, L. H., Bromet, E. J., & Kim, H. (2014) World Trade Center disaster exposure-related probable posttraumatic stress disorder among responders and civilians: a meta-analysis. *PLoS One*, 9. doi:10.1371/journal.pone.0101491.

Levinson, D., Zilber, N., Lerner, Y., Grinshpoon, A., & Levav, I. (2007) Prevalence of mood and anxiety disorders in the community: results from the Israel National Health Survey. *The Israel Journal of Psychiatry and Related Sciences*, 44, 94-103.

McNally, R. J., Bryant, R., & Ehlers, A. (2003) Does early psychological intervention promote recovery from traumatic stress? *Psychological Science in the Public Interest*, 4, 45-79.

*Miguel-Tobal, J. J., Cano-Vindel, A., Iruarrizaga, I., González-Ordi, H., & Galea, S. (2005a) Psychopathological repercussions of the March 11 terrorist attacks in Madrid. *Psychology in Spain*, 9, 75-80.

*Miguel-Tobal, J. J., Cano-Vindel, A., Iruarrizaga, I., González-Ordi, H., Muñoz, M., & Casado, M. I. (2005b) *Evolución de las consecuencias psicológicas por los atentados del 11-M* [Course of the psychological consequences derived from 11-M terrorist attacks]. Retrieved February 19, 2008, from http://www.ucm.es/info/seas/tep/Resumen_Rueda_de_prensa_(4-marzo-2004).pdf

Muñoz, M., Crespo, M., Pérez-Santos, E., & Vázquez, J. J. (2005) Early psychological consequences of the March 11, 2004, terrorist attacks in Madrid, Spain. *Psychological Reports*, 97, 907-920.

*Nandi, A., Galea, S., Ahern, J., & Vlahov, D. (2005) Probable cigarette dependence, PTSD, and depression after an urban disaster: results from a population survey of New York City residents 4 months after September 11, 2001. *Psychiatry*, 68, 299-310.

National Consortium for the Study of Terrorism and Responses to Terrorism (START) (2015) *Annex of statistical information. Country reports on terrorism 2014*. Retrieved May 10, 2016, from http://www.state.gov/documents/organization/239628.pdf

National Institute of Mental Health (2002) *Mental health and mass violence: evidence-based early psychological intervention for victims/survivors of mass violence. A workshop to reach consensus on best practices*. NIH Publication No. 02-5138, Washington, DC: U.S. Government Printing Office.

*North, C. S., Nixon, S. J., Shariat, S., Mallonee, S., McMillen, J. C., Spitznagel, E. L., & Smith, E. M. (1999) Psychiatric disorders among survivors of the Oklahoma City bombing. *Journal of American Medical Association*, 282, 755-762.

*North, C. S., Pfefferbaum, B., Kawasaki, A., Lee, S., & Spitznagel, E. L. (2011) Psychosocial adjustment of directly exposed survivors 7 years after the Oklahoma City bombing. *Comprehensive Psychiatry*, 52, 1-8.

*North, C. S., Pfefferbaum, B., Narayanan, P., Thielman, S., McCoy, G., Dumont, C., Kawasaki, A., Ryosho, N., y Spitznagel, E. L. (2005) Comparison of post-disaster psychiatric disorders after terrorist bombings in Nairobi and Oklahoma City. *British Journal of Psychiatry*, 186, 487-493.

*North, C. S., Pfefferbaum, B., Tivis, L., Kawasaki, A., Reddy, C., & Spitznagel, E. L. (2004) The course of posttraumatic stress disorder in a follow-up study of survivors of the Oklahoma City bombing. *Annals of Clinical Psychiatry*, 16, 209-215.

*North, C. S., Pollio, D. E., Smith, R. P., King, R. V., Pandya, A., Surís, A. M., Hong, B. A., Dean, D. J., Wallace, N. E., Herman, D. B., Conover, S., Susser, E., & Pfefferbaum, B. (2011) Trauma exposure and posttraumatic stress disorder among employees of New York City companies affected by the September 11, 2001 attacks on the World Trade Center. *Disaster Medicine and Public Health Preparedness*, 5, 205-213.

North, C. S., Tivis, L., McMillen, J.C., Pfefferbaum, B., Cox, J., Spitznagel, E. L., Bunch, K. P., Schorr, J., & Smith, E. M. (2002a) Coping, functioning, and adjustment of rescue workers after the Oklahoma City bombing. *Journal of Traumatic Stress*, 15, 171-175.

*North, C. S., Tivis, L., McMillen, J.C., Pfefferbaum, B., Spitznagel, E. L., Cox, J., Nixon, S., Bunch, K. P., & Smith, E. M. (2002b) Psychiatric disorders in rescue workers after the Oklahoma City bombing. *American Journal of Psychiatry*, 159, 857-859.

*Ohtani, T., Twanami, A., Kasal, K., Yamasue, H., Kato, T., Sasaki, T., & Kato, N. (2004) Post-traumatic stress disorder symptoms in victims of Tokyo subway attack: a 5-year follow up study. *Psychiatry and Clinical Neurosciences*, 58, 624-629.

Perrin, M. A., DiGrande, L., Wheeler, K., Thorpe, L., Farfel, M., & Brackbill, R. (2007) Differences in PTSD prevalence and associated risk factors among World Trade Center disaster rescue and recovery workers. *American Journal of Psychiatry*, 164, 1385-1394.

*Pfefferbaum, B., North, C. S., Bunch, K., Wilson, T. G., Tucker, P., & Schorr, J. K. (2002) The impact of the 1995 Oklahoma city bombing on the partners of firefighters. *Journal of Urban Health: Bulletin of the New York Academy of Medicine*, 79, 364-372.

Salguero, J. M., Fernández-Berrocal, P., Iruarrizaga, I., Cano-Vindel, A., & Galea, S. (2011) Major depressive disorder following terrorist attacks: a systematic review of prevalence, course and correlates. *BMC Psychiatry*, 11. doi:http://dx.doi.org/10.1186/1471-244X-11-96

*Shalev, A. Y., & Freedman, S. (2005) PTSD following terrorist attacks: A prospective evaluation. *American Journal of Psychiatry*, 162, 1188-1191.

*Shear, K. M., Jackson, C. T., Essock, S. M., Donahue, S. A., & Felton, C. J. (2006) Screening for complicated grief among Project Liberty service recipients 18 months after September 11, 2001. *Psychiatric Services*, 57, 1291-1297.

Southwick, S. M., Douglas-Palumberi, H., & Pietrzak, R. H. (2014). Resilience. In M. J. Friedman, T. M. Keane, & P. A. Resick (Ed.), *Handbook of PTSD: science and practice* (2nd ed.). New York, NY: Guilford Press. Pp. 590-606.

Sprang, G. (2001) Vicarious stress: patterns of disturbance and use of mental health services by those indirectly affected by the Oklahoma City bombing. *Psychological Reports*, 89, 331-338.

*Stuber, J., Resnick, H., & Galea, S. (2006) Gender disparities in posttraumatic stress disorder after mass trauma. *Gender Medicine*, 3, 54-67.

The ESEMeD/MHEDEA 2000 Investigators (2004) Prevalence of mental disorders in Europe: results from the European study of the epidemiology of mental disorders (ESEMeD) project. *Acta Psychiatrica Scandinavica*, 109(Suppl. 420), 21-27.

United States Department of State (2015) *Country reports on terrorism 2014*. Retrieved May 10, 2016, from http://www.state.gov/documents/organization/239631.pdf

Vázquez, C., Pérez-Sales, P., & Matt, G. (2006) Post-traumatic stress reactions following the Madrid March 11, terrorist attacks: A cautionary note about the measurement of psychological trauma. *Spanish Journal of Psychology*, 9, 161-174.

*Zhang, G., North, C. S., Narayanan, P., Kim, Y., Thielman, S., & Pfefferbaum, B. (2013) The course of postdisaster psychiatric disorders in directly exposed civilians after the US Embassy bombing in Nairobi, Kenya: a follow-up study. *Social Psychiatry and Psychiatric Epidemiology*, 48, 195-203.

*Zhang, G., Pfefferbaum, B., Narayanan, P., Lee, S., Thielman, S., & North, C. S. (2016) Psychiatric disorders after terrorist bombings among rescue workers and bombing survivors in Nairobi and rescue workers in Oklahoma City. *Annals of Clinical Psychiatry*, 28, 22-30.

*Zimering, R., Gulliver, S. B., Knight, J., Munroe, J., & Keane, T. M. (2006)

Posttraumatic stress disorder in disaster relief workers following direct and

indirect trauma exposure to Ground Zero. *Journal of Traumatic Stress*, 19, 553-

557.

Table 1. Prevalence of posttraumatic stress disorder (PTSD) derived from terrorist attacks in survivors

Reference	Terrorist attack / Sample	Moment of assessment after the attack	Measures	Prevalence of PTSD
Shalev & Freedman (2005)	Israel, 2000-2002 / 39 injured survivors	4 months	CAPS	35.9%
Conejo-Galindo *et al.* (2008)	Madrid, M-11 2004 / Injured survivors (T1: 56; T2: 44; T3: 42)	T1: 5-8 weeks T2: 6 months T3: 1 year	MINI	T1: 35.7%
Ankri *et al.* (2010)	Jerusalem (Israel), suicide bus-bombings in 2003 and 2004 / 53 survivors (T1: 37; T2: 31)	T1: < 1 month T2: 8 months	CAPS	T1: 78.2%
North, Pollio *et al.* (2011)	New York, 9-11 2001 / 143 New York City employees who were physically endangered ($n1$ = 102) or were exposed through directly witnessing the attacks ($n2$ = 41)	Postdisaster PTSD retrospectively assessed at 27-52 months (median = 35 months)	DIS and DIS Disaster Supplement for DSM-IV-TR	30.8% ($n1$ = 35.3%; $n2$ = 19.5%)
North *et al.* (1999, 2004); North, Pfefferbaum *et al.* (2011)	Oklahoma City, April 19, 1995 bombing / Survivors (87% injured) (T1: 182; T2: 137; T3: 113)	T1: 6 months T2: 17 months T3: 7 years	DIS and DIS Disaster Supplement for DSM-IV	T1: 34.3%
North *et al.* (2005); Zhang *et al.* (2013)	1998 US Embassy bombing in Nairobi, Kenya / Survivors [T1: 227 (88.1 injured); T2: 128 (96% injured)]	T1: 8-10 months T2: Mean of 31.2 months	DIS and DIS Disaster Supplement for DSM-IV	T1: 39.2%
Gil & Caspi (2006)	Haifa (Israel), bomb on a bus in Spring of 2003 / 31 direct victims (19.4% were inside the bus and 80.6% witnessed the explosion in person)	6 months	SCID	61.3%
Conejo-Galindo *et al.* (2008)	Madrid, M-11 2004 / Injured survivors (T1: 56; T2: 44; T3: 42)	T1: 5-8 weeks T2: 6 months T3: 1 year	MINI	T2: 34.1% T3: 28.6%
Ankri *et al.* (2010)	Jerusalem (Israel), suicide bus-bombings in 2003 and 2004 / 53 survivors (T1: 37; T2: 31)	T1: < 1 month T2: 8 months	CAPS	T2: 25.8%

Reference	Terrorist attack / Sample	Moment of assessment after the attack	Measures	Prevalence of PTSD
Dolberg *et al*. (2010)	Israel, seven suicide bombers and two shootings at civilian crowds in the Tel Aviv metropolitan area in 2001 and 2002 / Injured survivors (T1: 129; T2: 54)	T1: 3-9 months T2: 20 months	SCID	T1: 15.5%
North *et al*. (1999, 2004); North, Pfefferbaum *et al.* (2011)	Oklahoma City, April 19, 1995 bombing / Survivors (87% injured) (T1: 182; T2: 137; T3: 113)	T1: 6 months T2: 17 months T3: 7 years	DIS and DIS Disaster Supplement for DSM-IV	T2: 31% T3: 26%
Ohtani *et al.* (2004)	Tokyo, March 20, 1995 sarin attack / 34 injured survivors	5 years	CAPS	32,4%
Dolberg *et al*. (2010)	Israel, seven suicide bombers and two shootings at civilian crowds in the Tel Aviv metropolitan area in 2001 and 2002 / Injured survivors (T1: 129; T2: 54)	T1: 3-9 months T2: 20 months	SCID	T2: 35%
Henriksen *et al*. (2010)	New York, 9-11 2001 / 170 adults residing in the US who directly experienced the attack or were injured	3-4 years	AUDADIS-IV	3.3%
North *et al.* (2005); Zhang *et al.* (2013)	1998 US Embassy bombing in Nairobi, Kenya / Survivors [T1: 227 (88.1 injured); T2: 128 (96% injured)]	T1: 8-10 months T2: Mean of 31.2 months	DIS and DIS Disaster Supplement for DSM-IV	T2: 28%
Mean prevalence (weighted by sample size) between 1 month and 6 months after the terrorist attacks =				38.9%
Mean prevalence (weighted by sample size) between 6 months and 1 year after the terrorist attacks =				32.9%
Mean prevalence (weighted by sample size) more than 1 year after the terrorist attacks =				22.5%
Total mean prevalence (weighted by sample size) =				29.8%

Note. The first part of the table shows PTSD prevalence between 1 month and 6 months after the terrorist attacks, the second part shows PTSD prevalence between 6 months (inclusive) and 1 year (inclusive) after the terrorist attacks, and the third part shows PTSD prevalence more

than 1 year after the terrorist attacks. AUDADIS-IV = *Alcohol Use Disorder and Associated Disabilities Interview Schedule-Diagnostic and Statistical Manual of Mental Disorders-Fourth Edition*. CAPS = *Clinician-Administered PTSD Scale*. DIS = *Diagnostic Interview Schedule* of the National Institute of Mental Health. MINI = *Mini International Neuropsychiatric Interview*. SCID = *Structured Clinical Interview for Axis I DSM-IV Disorders*.

Table 2. Prevalence of posttraumatic stress disorder (PTSD) derived from terrorist attacks in the general population of the affected community

Reference	Terrorist attack / Sample	Moment of assessment after the attack	Measures	Prevalence of PTSD
Galea *et al*. (2003)	New York, 9-11 2001 / 4,559 adults from New York City [T1: 988 (all from Manhattan); T2: 2,001 (506 from Manhattan); T3: 1,570 (854 from Manhattan)]	T1: 1 month T2: 4 months T3: 6 months	Interview based on the NWS-PTSD module	T1: 7.5% T2: 2.3 (1.7%)
Miguel-Tobal *et al*. (2005a, 2005b)	Madrid, M-11 2004 / adults from Madrid [T1: 1,589 (324 from the areas affected by the bombings); T2: 1,192 (268 from the areas affected by the bombings)]	T1: 1-3 months T2: 6-9 months	Interview based on the NWS-PTSD module	T1: 2.3%
Nandi *et al*. (2005)	New York, 9-11 2001/ 2,001 adults from New York City	4 months	Interview based on the NWS-PTSD module	7.4%
Lawyer *et al*. (2006)	New York, 9-11 2001 / 2,001 adults from New York City	4 months	Interview based on the NWS-PTSD module	1.7%
Hobfoll *et al*. (2011)	Israel / 150 Jewish and Palestinian residents of Jerusalem	During a period of marked threat of terrorism	CIDI	15%
Galea *et al*. (2003)	New York, 9-11 2001 / 4,559 adults from New York City [T1: 988 (all from Manhattan); T2: 2,001 (506 from Manhattan); T3: 1,570 (854 from Manhattan)]	T1: 1 month T2: 4 months T3: 6 months	Interview based on the NWS-PTSD module	T3: 1.5% (0.6%)
Galea *et al*. (2004)	New York, 9-11 2001 / 2,616 adults from the New York metropolitan area	6-9 months	Interview based on the NWS-PTSD module	6.1%
Boscarino *et al*. (2004); Boscarino & Adams (2009)	New York, 9-11 2001 / Adults from New York City (T1: 2,386; T2: 1,681)	T1: 1 year T2: 2 years	Interview based on the NWS-PTSD module	T1: 5.25%

Reference	Terrorist attack / Sample	Moment of assessment after the attack	Measures	Prevalence of PTSD
11_1111-Miguel-Tobal *et al.* (2005a, 2005b)	Madrid, M-11 2004 / adults from Madrid [T1: 1,589 (324 from the areas affected by the bombings); T2: 1,192 (268 from the areas affected by the bombings)]	T1: 1-3 months T2: 6-9 months	Interview based on the NWS-PTSD module	T2: 0.4%
Stuber *et al.* (2006)	New York, 9-11 2001 / 2,752 adults from the New York metropolitan area	6-9 months	Interview based on the NWS-PTSD module	5.4%
Shear *et al.* (2006)	New York, 9-11 2001 / 77 adults from the New York metropolitan area who received crisis counseling services ("Project Liberty services") and did not know someone who had died because of the terrorist attacks	1.5 years	Interview based on the NWS-PTSD module	21%
Boscarino *et al.* (2004); Boscarino & Adams (2009)	New York, 9-11 2001 / Adults from New York City (T1: 2,386; T2: 1,681)	T1: 1 year T2: 2 years	Interview based on the NWS-PTSD module	T2: 3.8%
Henriksen *et al.* (2010)	New York, 9-11 2001 / 25,239 adults residing in the US who had indirectly experienced the attacks (e.g., watching them on TV)	3-4 years	AUDADIS-IV	1.2%
Mean prevalence (weighted by sample size) between 1 month and 6 months after the terrorist attacks =				4.1%
Mean prevalence (weighted by sample size) between 6 months and 1 year after the terrorist attacks =				4.4%
Mean prevalence (weighted by sample size) more than 1 year after the terrorist attacks =				1.4% (3.8%)*
Total mean prevalence (weighted by sample size) =				2.6% (4.2%)*

Note. The first part of the table shows PTSD prevalence between 1 month and 6 months after the terrorist attacks, the second part shows PTSD prevalence between 6 months (inclusive) and 1 year (inclusive) after the terrorist attacks, and the third part shows PTSD prevalence more than 1 year after the terrorist attacks. AUDADIS-IV = *Alcohol Use Disorder and Associated Disabilities Interview Schedule-Diagnostic and Statistical Manual of Mental Disorders-Fourth Edition*. CIDI = *Composite International Diagnostic Interview* of the World Health

Organization. NWS-PTSD module = *National Women's Study* PTSD module. *The numbers between parentheses are the mean prevalence calculated without the prevalence figure of Henriksen *et al.*'s (2010) study, since its participants (residents in any place of US) belong to a community not so directly affected as those living in the cities where the terrorist attacks occurred (or in their metropolitan areas), and without the prevalence figure of Shear *et al.*'s (2006) study, since its participant sample was biased towards the inclusion of persons especially affected by the terrorist attacks (all of them were crisis counseling recipients).

Table 3. Prevalence of posttraumatic stress disorder (PTSD) derived from terrorist attacks in emergency, rescue, assistance or recovery personnel or volunteers

Reference	Terrorist attack / Sample	Moment of assessment after the attack	Measures	Prevalence of PTSD
Miguel-Tobal *et al.* (2005a, 2005b)	Madrid, M-11 2004 / Emergency-rescue professionals or volunteers (T1: 165; T2: 155)	T1: 1-3 months T2: 6-9 months	Interview based on the NWS-PTSD module	T1: 1.2%
Zimering *et al.* (2006)	New York, 9-11 2001 / 109 mental health relief workers	T1: 1-3 month postdisaster PTSD retrospectively assessed at 6-8 months T2: 6-8 months	CAPS	T1: 11%
Miguel-Tobal *et al.* (2005a, 2005b)	Madrid, M-11 2004 / Emergency-rescue professionals or volunteers (T1: 165; T2: 155)	T1: 1-3 months T2: 6-9 months	Interview based on the NWS-PTSD module	T2: 0%
Zimering *et al.* (2006)	New York, 9-11 2001 / 109 mental health relief workers	T1: 1-3 month postdisaster PTSD retrospectively assessed at 6-8 months T2: 6-8 months	CAPS	T2: 0%
Jayansinghe *et al.* (2008)	New York, 9-11 2001 / 1,040 rescue workers in the World Trade Center	1 year	CAPS	6.8%
Zhang *et al.* (2016)	1998 US Embassy bombing in Nairobi, Kenya / 52 rescue and recovery male volunteers (40% injured)	8-10 months	DIS and DIS Disaster Supplement for DSM-IV	22%
De Clercq *et al.* (1999)	Lovaina (Belgium), 1990 terrorist attack at the University / 15 doctors and nurses who attend wounded people	3 years	SCID	13%
North *et al.* (2002b)	Oklahoma City, April 19, 1995 / 181 professional firefighters (11% injured)	15-41 months (mean = 34 months)	DIS and DIS Disaster Supplement for DSM-IV	13%

Reference	Terrorist attack / Sample	Moment of assessment after the attack	Measures	Prevalence of PTSD
Evans *et al.* (2006)	New York, 9-11 2001 / 626 disaster relief workers	21-25 months	CAPS	5.8%
Evans *et al.* (2009)	New York, 9-11 2001 / 842 disaster relief workers	17-27 months	CAPS and SCID	5.9%
Chiu *et al.* (2011)	New York, 9-11 2001 / 1,915 retired firefighters who worked at Ground Zero	3-6 years	DIS	6.5%
Cukor *et al.* (2011a)	New York, 9-11 2001 / 2,960 utility workers for the World Trade Center	10-34 months	CAPS	8%
Mean prevalence (weighted by sample size) between 1 month and 6 months after the terrorist attacks =				5.1%
Mean prevalence (weighted by sample size) between 6 months and 1 year after the terrorist attacks =				6%
Mean prevalence (weighted by sample size) more than 1 year after the terrorist attacks =				7.2%
Total mean prevalence (weighted by sample size) =				6.9%

Note. The first part of the table shows PTSD prevalence between 1 month and 6 months after the terrorist attacks, the second part shows PTSD prevalence between 6 months (inclusive) and 1 year (inclusive) after the terrorist attacks, and the third part shows PTSD prevalence more than 1 year after the terrorist attacks. CAPS = *Clinician-Administered PTSD Scale*. DIS = *Diagnostic Interview Schedule* of the National Institute of Mental Health. NWS-PTSD module = *National Women Study* PTSD module. SCID = *Structured Clinical Interview for Axis I DSM-IV Disorders*.

Table 4. Prevalence of posttraumatic stress disorder (PTSD) derived from terrorist attacks in relatives and friends of the victims injured or killed

Reference	Terrorist attack / Sample	Moment of assessment after the attack	Measures	Prevalence of PTSD
Miguel-Tobal *et al*. (2005a, 2005b)	Madrid, M-11 2004 / 117 friends-relatives of injured/mortal victims [T1: 117 (7 injured survivors); T2: 98]	T1: 1-3 months T2: 6-9 months	Interview based on the NWS-PTSD module	T1: 28.2%
North, Pollio *et al*. (2011)	New York, 9-11 2001 / 26 New York City employees who were close relatives/friends of mortal or direct victims	Postdisaster PTSD retrospectively assessed at 27-52 months (median = 35 months)	DIS and DIS Disaster Supplement for DSM-IV-TR	34.6%
Miguel-Tobal *et al*. (2005a, 2005b)	Madrid, M-11 2004 / 117 friends-relatives of injured/mortal victims [T1: 117 (7 injured survivors); T2: 98]	T1: 1-3 months T2: 6-9 months	Interview based on the NWS-PTSD module	T2: 15.4%
Gil & Caspi (2006)	Haifa (Israel), bomb on bus in Spring of 2003 / 50 undergraduate students who had a relative or friend who had witnessed the attack (72%) or had been injured (26%) or had been killed (2%)	6 months	SCID	20.0%
Shear *et al*. (2006)	New York, 9-11 2001 / 72 adults from the New York metropolitan area who received crisis counseling services ("Project Liberty services") and knew someone who had died because of the terrorist attacks	1.5 years	Interview based on the NWS-PTSD module	40%
Henriksen *et al*. (2010)	New York, 9-11 2001 / 1,241 adults residing in the US who had a close relative/friend who had directly experienced the attack (*n* = 1,190) or had been injured (*n* = 173) or had been killed (*n* = 184)	3-4 years	AUDADIS-IV	1.9%
Mean prevalence (weighted by sample size) between 1 month and 6 months after the terrorist attacks =				29.4%

Reference	Terrorist attack / Sample	Moment of assessment after the attack	Measures	Prevalence of PTSD
	Mean prevalence (weighted by sample size) between 6 months and 1 year after the terrorist attacks =			16.9%
	Mean prevalence (weighted by sample size) more than 1 year after the terrorist attacks =			No data*
	Total mean prevalence (weighted by sample size) =			23%*

Note. The first part of the table shows PTSD prevalence between 1 month and 6 months after the terrorist attacks, the second part shows PTSD prevalence between 6 months (inclusive) and 1 year (inclusive) after the terrorist attacks, and the third part shows PTSD prevalence more than 1 year after the terrorist attacks. AUDADIS-IV = *Alcohol Use Disorder and Associated Disabilities Interview Schedule-Diagnostic and Statistical Manual of Mental Disorders-Fourth Edition*. DIS = *Diagnostic Interview Schedule* of the National Institute of Mental Health. NWS-PTSD module = *National Women Study* PTSD module. SCID = *Structured Clinical Interview for Axis I DSM-IV Disorders*. *Excluding the prevalence figure of Henriksen *et al*.'s (2010) study, since almost all of its participants (95.9%) had a close relative/friend who had directly experienced the attack, but not a close relative/friend who had been injured or killed, and excluding the prevalence figure of Shear *et al*.'s (2006) study, since its participant sample was biased towards the inclusion of persons especially affected by the terrorist attacks (all of them were crisis counseling recipients).

Table 5. Prevalence of posttraumatic stress disorder (PTSD) derived from terrorist attacks as a function of time passed since the attack

(longitudinal studies)

Reference	Terrorist attack / Sample	Prevalence of PTSD				
		1-3 months	6-9 months	12 months	1-5 years	> 5 years
Galea *et al.* (2003)	New York, 9-11, 2001 / General population of New York City (Manhattan)	7.5%	0.6%			
Miguel-Tobal *et al.* (2005a, 2005b)	Madrid, M-11, 2004 / General population of Madrid	2.3%	0.4%			
North *et al.* (2004)	Oklahoma City, April 19, 1995 bombing / Survivors (88% injured)		32%		31% (17 months)	
Conejo-Galindo *et al.* (2008)	Madrid, M-11, 2004 / Injured survivors	35.7%	34.1%	28.6%		
Ankri *et al.* (2010)	Jerusalem (Israel), suicide bus-bombings in 2003 and 2004 / Survivors	78.2%	25.8%			
North, Pfefferbaum *et al.* (2011)	Oklahoma City, April 19, 1995 bombing / Survivors (87% injured)		41%			26% (7 years)
North, Pollio *et al.* (2011)	New York, 9-11, 2001 / New York City surviving employees directly exposed to danger (60%) or exposed through witnessed experiences (24%) or through a close relative-friend's direct exposure	31.4% (retrospectively)			19% (3 years)	15% (6 years)
Zhang *et al.* (2013)	1998 US Embassy bombing in Nairobi, Kenya / Survivors (96% injured)	41%			28% (31 months)	
Miguel-Tobal *et al.* (2005a, 2005b)	Madrid, M-11, 2004 / Emergency-rescue professionals or volunteers	1.2%	0%			
Zimering *et al.* (2006)	New York, 9-11, 2001 / Mental health relief workers	11%	0%			

Reference	Terrorist attack / Sample	Prevalence of PTSD				
		1-3 months	6-9 months	12 months	1-5 years	> 5 years
Cukor *et al*. (2011b)	New York, 9-11 2001 / Utility workers for the World Trade Center				14.9% (19 months) 8.4% (40 months)	5.8% (77 months)
Miguel-Tobal *et al*. (2005a, 2005b)	Madrid, M-11, 2004 / Relatives or friends of injured or dead victims	28.2%	15.4%			