PSYCHOPATHOLOGICAL CONSEQUENCES OF TERRORISM: THE PREVALENCE OF POST-TRAUMATIC STRESS DISORDER IN VICTIMS OF TERRORIST ATTACKS[1, 2]

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Abstract

This chapter is aimed at reviewing post-traumatic stress disorder (PTSD) after terrorist attacks. The data and results of a meta-analysis by DiMaggio and Galea (2006) were reviewed and its conclusions were qualified, upgraded and extended with the results from new studies and new analyses. After terrorist attacks, 18-40% of direct victims will develop PTSD, whereas the percentage of indirect victims with PTSD will be lower, but nonetheless above its habitual prevalence in the general population. At one year of terrorist attacks, 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 and in the friends and relatives of the injured and mortal victims. The implications of these results for the psychological treatment of terrorism victims are discussed.

Keywords: mental health, narrative literature review, post-traumatic stress disorder, terrorism, victims.

Introduction

In the period between 2005 and 2013, a mean of 11,233 terrorist attacks occurred worldwide per year, which involved a mean of 16,013 deaths, 31,646 injured victims, and 9,661 kidnappings each year (García-Vera *et al*., 2014). 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 need to be further developed.

Despite the fact that, for some time, the psychopathological consequences of terrorist attacks have been pointed out in the psychiatric and psychological literature (Curran, 1988), until almost 15 years ago, no systematic investigation programs of this issue was developed. In fact, the September 11th, 2001, attacks in New York and Washington DC marked an inflection point in research on the psychopathological repercussions of terrorist attacks, with a dramatic increase in the number of scientific publications on the topic. Thus, a search in PsycINFO bibliographic database with the combination of terms of “terrorist attack” and (“posttraumatic stress” or “depression” or “anxiety” or “panic”) for the period from 1990 to 2001 identified only 18 publications (with a range between 0 and 5 publications per year), whereas a similar search for the period from 2002 to 2012 identified 593 publications (with a range between 26 and 97 publications per year). Furthermore, those searches found only 1 and 5 publications on 2000 and 2001, respectively, but they revealed 50 publications both on 2002 and 2003.

Although all these publications do not deal with the September 11th, 2001, attacks, most of them do. Moreover, the most solid information we have about the mental health problems derived from terrorist attacks is practically limited to that obtained after investigating a very small number of attacks. Specifically, the attacks carried out in developed countries and, particularly, those that occurred in the past 20

years in the USA, Israel, and Western Europe (Spain, France, Ireland, and the United Kingdom) and which caused a large number of deaths and injuries, such as, for example, the attack of April 19th, 1995, in Oklahoma, the attack of August 15th, 1998, in Omagh (Northern Ireland), the attacks of March 11th, 2004, in Madrid, the attacks of July 7th, 2005, in London, and, of course, the attacks of September 11th, 2001, in New York and Washington DC.

The studies of these attacks constitute the most solid compendium of empirical knowledge currently available on mental health problems provoked by terrorism. However, the above-mentioned terrorist attacks only represent a small portion of the dramatic problem of terrorism, even if only attacks with a large number of mortal victims are considered. From 2005 to 2013 alone there were 2,201 worldwide terrorist attacks that caused 10 or more deaths, of which only 26 occurred in Europe (one in the UK, one in Norway, 14 in Russia, and another 10 in Turkey) and only one in North America (García-Vera *et al.*, 2014). Therefore, research of the psychopathological consequences of terrorism is biased towards 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 extremely severe problem.

Bearing this limitation in mind, in recent years, such research has grown rapidly and fruitfully. Thus, although at the beginning of this century, a large part of our knowledge about the mental disorders caused by terrorism came from more extensive scientific literature on traumatic events (i.e., rape, physical or sexual abuse, car accidents, robbery with violence), including that dedicated to all kinds of disasters (i.e., wars, severe train, plane, or boat accidents, flash floods, fires, earthquakes), currently the body of empirical knowledge about mental health problems specifically derived

from terrorism has allowed some meta-analytic and narrative reviews, for example, that of DiMaggio and Galea (2006) on post-traumatic stress disorder (PTSD), that of DiMaggio, Galea, and Li (2009) on substance dependence and consumption disorders, that of García-Vera and Sanz (2010) on depressive and anxiety disorders, or that of Salguero, Fernández-Berrocal, Iruarrizaga, Cano-Vindel, and Galea (2011) on major depressive disorder.

The goal of this chapter is to selectively review the empirical studies on the prevalence of PTSD in adults resulting 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. The review will analyze the results of the meta-analytic study of DiMaggio and Galea (2006), and will qualify and complete its conclusions with the results of other studies of PTSD not included in this meta-analysis. Likewise, DiMaggio and Galea's (2006) meta-analysis 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. The indirect victims must be added to these direct victims: friends and relatives of the dead and injured, emergency 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, Cox, *et al.*, 2002; Sprang, 2001; Zimering, Gulliver, Knight, Munroe, & Keane, 2006). The present review will examine PTSD in all these kinds of victims. The focus is mainly on the presence of

diagnosable psychological disorders, rather than on the mere presence of psychological symptoms, because the latter, with no appropriate appraisal of their severity, frequency, 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).

Post-Traumatic Stress Disorder Derived from Terrorist Attacks

In the days following a terrorist attack, many of its direct and indirect victims will experience symptoms of stress that can be grouped into four categories:

(1) Persistent reexperiencing of the attack: the person recurrently experiences unpleasant memories or dreams in which the attack occurs all over again, flashback episodes (states during which the person feels as if the traumatic event were reoccurring and behaves as though experiencing the event at that moment), or intense physical or emotional responses to stimuli that recall or symbolize the attack.

(2) Avoidance of stimuli associated with the attack: the individual makes deliberate and persistent efforts to avoid thoughts, feelings, or conversations about the terrorist attack, and to avoid any activities, situations, or people that could arouse recollection of the attack, in some cases, manifesting total amnesia about a certain aspect of the event.

(3) Numbing of the individual's responsiveness: the person may present depersonalization symptoms (a feeling of detachment from one's own body or mental processes, as if one were an external observer or as if one were dreaming), or derealization (the external world is perceived or experienced as strange and unreal, for example, people may seem like strangers or like mechanical figures), markedly diminished interest or participation in previously enjoyed activities, a feeling of detachment or estrangement from others, marked decrease in the ability to feel emotions

(especially those associated with intimacy, tenderness, and sexuality), or a feeling of future hopelessness.

(4) Increase of arousal or anxiety: sleep disturbances (difficulty falling or remaining asleep) may appear, as well as hypervigilance, exaggerated startle responses, irritability or anger attacks, or difficulties in concentrating or completing tasks.

In most of these people, these symptoms will be of mild or moderate intensity, and the natural psychological mechanisms of recovery will allow the individuals to overcome them with varying difficulty. However, in a significant percentage of the direct and indirect victims of the attacks, the symptoms of stress are of such intensity and persistence that they cause clinically significant distress or impairment in social, occupational, or other important areas of the individual's activities, so that −following the diagnostic criteria of Diagnostic and Statistical Manual of Mental Disorders (DSM), Fourth Edition− in these patients, the diagnosis of an acute stress disorder (if the symptoms last for a minimum of 2 days and a maximum of 4 weeks) or a post-traumatic stress disorder or PTSD (if the symptoms last for more than one month) should be considered.

In 2006, DiMaggio and Galea performed a meta-analytic review in which they analyzed the results of 61 studies published up to 2004 that had estimated the prevalence of PTSD derived from terrorist attacks using either diagnostic criteria based on the DSM or validated screening instruments (DiMaggio & Galea, 2006). A selection of the main results of this meta-analysis are shown in Tables 1 and 2, to which the data of various studies published after 2004 are also presented. These latter data allow us to qualify the conclusions that can be reached from the review of DiMaggio and Galea (2006), revealing the limitations that affect the meta-analytic technique as a research tool. These limitations, which DiMaggio and Galea (2006) acknowledge, have to do

mainly with the possibility of an excessive dependence on meta-analytic summary statistics that can conceal the existence of systematic variations among the studies or can lead to erroneous conclusions because of combining studies that are so heterogeneous that such a combination is at issue.

The first conclusion that can be reached from DiMaggio and Galea's (2006) review 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 mean of 18% in samples of people directly exposed to the attack who have survived, and the mean of 10.9%, calculated in samples of the general population of the affected community (see Table 1). In fact, even the studies in Table 1 that reported lower percentages of people affected by PTSD present figures of PTSD that exceed the habitual one-year prevalence in the reference population. Thus, for example, both the studies of Miguel-Tobal, Cano Vindel, Iruarrizaga, González Ordi and Galea (2004) and Vázquez *et al*. (2006), which found approximately 2% of people with PTSD derived from the M-11 attacks in the general population of Madrid, and the studies of Miguel-Tobal *et al*. (2004) and Gabriel, Ferrando, Sainz Cortón, Mingote, García-Camba, Fernández Liria *et al*. (2007), which, after the same attacks, found little more than 1% of people with PTSD among the emergency personnel, present figures that 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, Palacín, Vilagut, Martínez, Bernal, Luque, *et al*., 2006).

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 if, for example, the complementary percentages of the prevalence of PTSD that appear in Table 1 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. The conclusion is offered 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 May 2004, an interval during which about 13,000 attacks were counted (Gelkopf, Solomon, Berger, & Bleich, 2008). The 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, it clears new pathways to improve current psychological treatments for the victims of terrorist attacks and to design new treatments to promote such factors and processes, and to enhance people's resilience and capacity to adapt.

Insert Table 1 about here

Post-Traumatic Stress Disorder and Degree of Exposure to Terrorist Attacks

As can be expected, the empirical literature also 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 DiMaggio and Galea's (2006) meta-analysis, 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 (18, 16.8, and 10.9%, respectively). However, the results of more recent studies not included in DiMaggio and Galea’s meta-analysis raise some issues and qualify those conclusions.

First, after analyzing the results of eight studies, DiMaggio and Galea suggested that there was an 18% of prevalence of PTSD among the survivors (see Table 1).

However, when calculating the mean percentage (weighted by sample size) of five studies of survivors published after this meta-analysis (see Table 1), the prevalence of PTSD among survivors is 39.9%. Consequently, the most prudent conclusion with the current data is that, in this latter collective, the frequency of PTSD could be estimated as being between 18-40%.

Second, more recent studies carried out with professionals, workers, and volunteers from the emergency, assistance, recovery and rescue systems, challenge and qualify the conclusion that all these collectives present more PTSD than the general population of the community affected by the attacks. The 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 in order to work in traumatic settings, 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.

Given that, 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 (CDC, 2004) and the other of the Oklahoma City bombing (North *et al*., 2002), the specific results of these two studies, together with other more recent studies, were included in Table 1. After calculating the mean percentage of people with PTSD, weighted by sample size of the corresponding study, the results of the 8 studies shown in Table 1 suggest that approximately 12% of the professionals and volunteers of the

emergency, assistance, rescue and recovery services will suffer from PTSD following a terrorist attack (12.2% considering the highest percentages that appear in Table 1 when reporting various percentages in the same study for the same collective). This mean prevalence of 12% of PTSD is still higher than the one calculated by DiMaggio and Galea for the general population of the affected community (10.9%), but the difference is only approximately one percentage point. In fact, a detailed analysis of the percentages in Table 1 by types of collectives (police force, firemen, emergency health personnel, clearing, cleaning, and construction workers) suggests that the prevalence of PTSD after terrorist attacks is not homogeneous in all these collectives and some of them (i.e., emergency personnel: police force, firemen, health personnel) could present specifically lower prevalences of PTSD than others (i.e., recovery workers: clearing, cleaning, and construction workers).

In this vein, two studies carried out with professionals and volunteers of the emergency and assistance services (police force, firemen, doctors, nurses, psychologists) who attended to the M-11 victims coincide in that only about 1.2-1.3% of these people displayed PTSD (Gabriel *et al*., 2007; Miguel-Tobal *et al*., 2004; see Table 1), figures that are not only lower than those provided by DiMaggio and Galea (2006) for the general population (10.9%), but also slightly lower than those found in the general population of Madrid after M-11 (1.9-2.3%; see Table 1), despite the fact that they are higher than the habitual one-year prevalence of PTSD in the general Spanish population before the M-11 attacks (0.5%; Haro *et al*., 2006).

Therefore, in addition to considering the heterogeneity of the collectives 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 1, such as 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 a higher level of 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 were also a very high number of deaths among the emergency and rescue personnel. Another factor to be taken into account is the different level of exposure to the traumatic situation in the same collective. 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 *et al.* (2002) indicate a positive relation between the number of days working in rescue tasks and the presence of PTSD.

Third, in the review of DiMaggio and Galea (2006), data from another important group of indirect victims of terrorism are missing: the friends and relatives 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 1 are presented three studies carried out with this population, 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 between 1 and 6 months after an attack, PTSD could affect approximately 27.6% of the friends and relatives of the injured or dead in the attack, 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 (10.9%) or than the emergency and rescue personnel (12%), and at similar levels as the survivors or direct victims (18-40%).

In fact, the group of people who suffer 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 counseling 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).

Post-Traumatic Stress Disorder and the Passing of Time after Terrorist Attacks

A last conclusion about the prevalence of PTSD that could be reached from the empirical literature is that, with the passing of time there is a significant decrease in the number of people affected by PTSD. Thus, according to the meta-analytical data of DiMaggio and Galea (2006) based on 18 studies, most of them cross-sectional, two months after the attacks, an average prevalence of approximately 16% is observed among the direct and indirect victims, a prevalence that significantly decreased to 14% at 6 months, and to approximately 12% at one year (see Table 2). This means that, in the course of one year, the prevalence of PTSD among the victims reduced by about 25%.

Again, we could confirm or qualify this conclusion taking into account the type of victims, that is, their degree of exposure to the attacks, and analyzing the results of longitudinal studies that allow us to better appraise the course of PTSD. In Table 2 are presented some of these studies on victims of the M-11 attacks.

In the same vein as the results of DiMaggio and Galea (2006), at 6-9 months of M-11, both in the general population and in emergency and assistance personnel, an important reduction in the frequency of PTSD was found (from 2.3 to 0.4%, and of 1.2 to 0%, respectively), 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 the annual prevalence of this disorder in the Spanish population before the M-11 attacks (0.5%; Haro *et al*., 2006). However, among the friends and relatives of the mortal victims or the injured in the M-11 attacks, the results are contradictory (see Table 2). In one study, a reduction in the frequency of PTSD was confirmed (from 28.2 to 15.4%), whereas in another study, no significant reduction in the frequency of PTSD was observed 6 to 9 months after the attacks (from 34 to 31.3%). With regard to the direct victims of the M-11 attacks, specifically the injured victims, the only longitudinal study published to date did not find any important short-term reduction of PTSD with the passing of time; in fact, the percentage of injured people who suffered from this disorder 6 months after the M-11 attacks (34.1%) was practically the same as the percentage who suffered it 1 month after the attacks (35.7%). Only at 1 year was a significant reduction observed in the prevalence of PTSD, which was around 29% (a 20% reduction). Nevertheless, despite such reductions, both in the direct victims and in the friends and relatives of the direct victims who were injured or killed, the prevalence of PTSD at 6 to 9 months or 1 year after the attacks is still much higher than the habitual numbers 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 PTSD, that is, cases in which at least 6 months have gone by between the attacks and the onset of PTSD symptoms, according to criteria of the DSM-IV. Although, to our knowledge there is no study of this kind of PTSD in victims of terrorist attacks, a 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 PTSD in the absence of prior post-traumatic symptoms was a very rare condition, but that the delayed onset that represents an exacerbation or reactivation 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). Therefore, one could speculate that delayed PTSD, understood as an exacerbation or reactivation of prior symptoms, can also be presented by a significant percentage of victims of terrorism following the attacks, especially in the injured. For example, this is shown in the results of the study of Grieger, Cozza, Ursano, Hoge, Martinez, Engel *et al*. (2007) with soldiers hospitalized for combat injuries in Iraq and Afghanistan, which suggests that the more severely injured showed more delay in the development of PTSD. This could explain some cases of delayed PTSD.

Insert Table 2 about here

Conclusions

In the last few decades, terrorism has become one of the most serious and alarming problems worldwide. In response, over the past 10-15 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.

As with other traumatic situations, after a terrorist attack, a great variety of psychopathological symptoms and diagnosable mental disorders may emerge (Bills, Levy, Sharma, Charney, Herbert, Moline *et al*., 2008; DiMaggio & Galea, 2006; DiMaggio *et al*., 2009). However, there is no doubt that PTSD is the most frequent mental disorder among the direct or indirect victims of terrorist attacks and, therefore, it has received the most attention from scientific community.

From the results presented in this narrative 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, after a terrorist attack a large percentage of the direct victims (about 18-40%) will develop PTSD, whereas the number of indirect victims who will develop this disorder will be lower, 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 recent years following the concept of *resilience* (adaptability, resistance, or the capacity of recovery) (Almedom & Glandon, 2007; Hoge, Austin & Pollack, 2007), 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 the majority of people. However, although pertinent, especially in certain contexts and moments of a terrorist attack or threat (Foa, Cahill, Boscarino, Hobfoll, Lahad, McNally *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, and long term (see García-Vera & Sanz, 2011, and García-Vera *et al.*, 2014, 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 psychopathological 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 one year later, the 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 or in the friends and relatives of the dead or injured. At least, they will not have decreased to the point where one could refer to recovery. This shows that the evolution of the psychopathological repercussions of the attacks differ 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 [NIMH], 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.

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Table 1. Prevalence of post-traumatic stress disorder (PTSD) derived from terrorist attacks as a function of degree of exposure to the attacks (general population; survivors; emergency, rescue, assistance or recovery personnel; friends and relatives of the victims injured or killed)

Reference	Terrorist attack / Sample	Moment of assessment after the attack	Measures	Prevalence of PTSD
		General population		
DiMaggio & Galea (2006)	Meta-analysis of 10 studies of various terrorist attacks	Variable	Explicit diagnostic criteria based on the Diagnostic and Statistical Manual of Mental Disorders (DSM) and/or other validated screening instruments of PTSD	10.9%
DiGrande *et al.* (2008)	New York, 9-11/ 11.037 adults from the affected area of New York	2-3 years	DSM-IV diagnostic criteria based on the PCL-C + cut-off point of the PCL-C	12.6%
Gabriel *et al.* (2007)	Madrid, M-11 /485 adults from Alcalá de Henares (Madrid)	5-12 weeks	DTS	12.3%
Gelkopf *et al.* (2008)	Israel, 2000-2002 / 512 adults from Israel (28.1% direct victims/witnesses)	19 months after the first attack	DSM-IV symptomatic criteria based on the SASRQ	9.6%
Gelkopf *et al.* (2008)	Israel, 2000-2004 / 501 adults from Israel (20.1% direct victims/witnesses)	44 months after the first attack	DSM-IV symptomatic criteria based on the SASRQ	8.8%
Miguel-Tobal *et al.* (2005)	Madrid, M-11 / 1,589 adults from Madrid	1-3 months	Interview based on the NWS	2.3%
Nandi *et al.* (2005)	New York, 9-11 / 2,001 adults from New York	4 months	Interview based on the NWS	7.4%

Reference	Terrorist attack / Sample	Moment of assessment after the attack	Measures	Prevalence of PTSD
Shalev *et al.* (2006)	Israel, 2000-2001 /167 adults from a directly affected suburb of Jerusalem and 89 from an indirectly affected suburb	8-10 months after the first attack	DSM-IV criteria based on the PSS + dysfunctional distress assessed by the BSI + functional impairment assessed by four 5-point-items	- 9.6% (directly affected suburb) - 6.7% (indirectly affected suburb)
Somer *et al.* (2005)	Israel, March 2002 / 295 adults from the affected areas	1 month	IES-R-B	5.1%
Vázquez *et al.* (2006)	Madrid M-11 / 309 adults and 194 university students from Madrid	18-25 days	DSM-IV criteria based on the PCL-C + four 10-point rating items that assess the A2 and F diagnostic criteria of the DSM-IV	1.9%
		Survivors		
DiMaggio & Galea (2006)	Meta-analysis of 8 studies of various terrorist attacks	Variable	Explicit diagnostic criteria based on the DSM and/or other validated screening instruments of PTSD	18.0%
Fraguas *et al.* (2006); Conejo-Galindo *et al.* (2008)	Madrid, M-11 / 56 injured survivors	1 month	- DTS - MINI	- 41.1% - 35.7%
Gabriel *et al.* (2007)	Madrid, M-11 / 127 injured survivors	5-12 weeks	DTS	44.1%
Gil & Caspi (2006)	Haifa (Israel), bomb on a bus in Spring of 2003 / 31 direct victims	6 months	SCID	61.3%
Kutz & Dekel (2006)	Israel, 2003 / 50 uninjured or slightly wounded survivors	4 months	Solomon's PTSD Inventory	24%
Shalev & Freedman (2005)	Israel, 2000-2002 / 39 injured survivors	4 months	CAPS	35.9%
		Emergency, rescue, assistance, or recovery professionals or volunteers		

Reference	Terrorist attack / Sample	Moment of assessment after the attack	Measures	Prevalence of PTSD
North *et al.* (2002)	Oklahoma City, April19, 1995 / 176 firemen	15-41 months (mean = 34 months)	DIS	13.0%
CDC (2004)	New York, 9-11- / 1,138 rescue and recovery workers and volunteers	10-15 months	- PCL-C cut-off point - PCL-C cut-off point + DSM-IV diagnostic criteria	- 19.7% - 15.3%
Gabriel *et al.* (2007)	Madrid, 11-M /153 police force	5-12 weeks	DTS	1.3%
Miguel-Tobal *et al.* (2004)	Madrid, M-11 /165 emergency-rescue professionals-volunteers	1-3 months	Interview based on the NWS	1.2%
Perrin *et al.* (2007)	New York, 9-11 / - 3,925 police force - 3,232 firemen - 1,741 medical personnel - 1,741 clear-up and construction workers - 1,798 clean-up workers - 5,438 volunteers from organizations - 3,797 volunteers without affiliation - 4,263 workers from other government agencies	2-3 years	DSM-IV diagnostic criteria based on the PCL-C + cut-off point of the PCL-C	 - 6.2% - 12.2% - 11.6% - 17.8% - 10.6% - 7.2% - 21.2% - 11.8%

Reference	Terrorist attack / Sample	Moment of assessment after the attack	Measures	Prevalence of PTSD
Stellman *et al.* (2008)	New York, 9-11- / 10,132 rescue, recovery, and clean-up workers or volunteers (5% were also relatives of mortal victims; 36% were also friends of mortal victims)	10-61 months	PCL-C	11.1%
Zimering *et al.* (2006)	New York, 9-11 / 109 mental health workers	6-8 months	CAPS	4.6%-6.4% (at 3 months) 0% (at 6-8 months)
Friends and relatives of mortal victims or injured victims				
Fraguas *et al.* (2006)	Madrid M-11 / 47 friends-relatives of injured victims	1 month	DTS	34.0%
Gil & Caspi (2006)	Haifa (Israel), bomb on bus in Spring of 2003/ 50 friends-relatives of direct victims	6 months	SCID	20.0%
Miguel-Tobal *et al.* (2004)	Madrid, M-11 / 110 friends-relatives of injured /mortal victims + 7 injured survivors	1-3 months	Interview based on the NWS	28.2%

Note. BSI = *Brief Symptom Inventory*. CAPS = *Clinician-Administered PTSD Scale*. DIS = *Diagnostic Interview Schedule* of the National Institute of Mental Health. DTS = *Davidson Trauma Scale*. IES-R-B = *Impact of Event Scale, Revised Version, Brief*. MINI = *Mini International Neuropsychiatric Interview*. NWS = TEPT module of the *National Women Study*. PCL-C = *Post-traumatic Stress Disorder*

Checklist-Civilian version. PSS = *Post-traumatic Symptom Scale*. SASRQ = *Stanford Acute Stress Reaction Questionnaire*. SCID = *Structured Clinical Interview for Axis I DSM-IV Disorders*.

Table 2. Prevalence of post-traumatic stress disorder (PTSD) derived from terrorist attacks as a function of time passed since the attack

Reference	Terrorist attack / Sample	Prevalence of PTSD		
		1-3 months	6-9 months	12 months
DiMaggio & Galea (2006)	Meta-analysis of 18 studies of various terrorist attacks and samples (survivors, emergency-rescue personnel, general population)	15.9%	14.2%	12.3%
	Madrid, M-11			
Miguel-Tobal *et al.* (2005, 2006)	General population of Madrid	2.3%	0.4%	
Miguel-Tobal *et al.* (2004, 2005); Iruarrizaga *et al.* (2004)	Friends-relatives of injured/dead victims	28.2%	15.4%	
Fraguas *et al.* (2006)	Friends-relatives of injured/dead victims	34%	31.3%	
Conejo-Galindo *et al.* (2008)	Injured survivors	35.7%	34.1%	28.6%
Miguel-Tobal *et al.* (2004, 2005)	Emergency-rescue professionals-volunteers	1.2%	0%	