Post-traumatic stress spectrum in young versus middle-aged L'Aquila 2009 earthquake survivors

Spettro post-traumatico da stress nei sopravvissuti al terremoto dell'Aquila 2009: confronto tra giovani e adulti

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Summary

Objective

The aim of this study was to investigate full blown and partial post-traumatic-stress disorder (PTSD), besides post-traumatic stress symptoms, in a selected group of young and middle-age subjects who survived to the 2009 L'Aquila (Italy) earthquake, with a particular focus on the impact of age, gender and of their possible interaction.

Method

Nine-hundred and thirty-nine subjects (468 women and 471 men, recruited amongst high-school students and their parents/relatives who volunteered for the study, were included. All subjects were assessed by the Trauma and Loss spectrum-self report (TALS-SR) and the Impact of Event Scale (IES).

Results

Three hundred and seventy-two (41.3%) subjects reported full PTSD, and 294 (32.5%) partial PTSD. Women reported significantly higher PTSD rates and partial symptoms than men who, in turn, showed significantly higher maladaptive copying behaviours, such as higher suicidal intention and attempts. Interestingly, younger men were more prone than women towards alcohol, drug or substance abuse and risk-taking activities. More mature subjects of both sexes reported significantly higher re-experiencing and arousal symptoms than younger ones.

Conclusions

High rates of full and partial PTSD and post-traumatic stress symptoms were detected in a group of Italian earthquake survivors, especially among women. On the contrary, men reacted to trauma with more maladaptive copying behaviours, particularly evident in the younger ones. Our results would indicate the need to carefully take into consideration age and gender impact on post-traumatic stress symptoms in subjects exposed to earthquakes, in order to identify rapidly high-risk subjects and possibly prevent maladaptive behaviours.

Key words

PTSD • Partial PTSD • Earthquake • Age • Gender • Post-traumatic spectrum symptoms

Introduction

Extensive research has been carried out on psychological and/or psychiatric sequelae of natural disasters, such as earthquakes, as the distress associated with these experiences often poses relevant challenges to health services [1-10]. A significant increase in the use of psychotropic medications and seek for psychological treatment has, in fact, been described in different earthquake survivors [11-15].

Post-traumatic stress disorder (PTSD) is a severe, often chronic and invalidating disorder, associated with specific neurobiological alterations and a high risk for suicide, that has been reported as one of the most frequent psychiatric disorders after earthquake exposure [4 16-34]. Prevalence rates of PTSD ranging between 10.3% and 60% have been reported amongst earthquakes survivors even one year after the traumatic event [4 17 20-25 27-29 32-33 35]. Further, increasing data suggest that another 30% of these survivors endorses criteria for partial or subthreshold PTSD [19 20 30 31].

The role of individual factors, such as gender, age, education or work activity, in the development of PTSD symptoms following a natural disaster is still unclear: such data would be important in order to identify promptly high risk subjects. The majority of the literature is congruent in reporting a higher vulnerability to develop PTSD symptoms in adult women of every age than men [27-31 33 35-40], although scant negative findings have been also published more than a decade ago [41 42].

The impact of age in the development of PTSD symptoms is similarly controversial. Despite most studies seem to report higher rates of PTSD symptoms after an earth-

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quake exposure amongst middle-aged or elderly with respect to younger subjects [33 43-45], others found a significant decrease in PTSD symptoms in subjects older than 60 years [46]. More recently, in a sample of 2.148 subjects exposed to an earthquake in a rural region of Italy in 2002, female gender, a lower school education and being over 55 years of age predicted higher PTSD rates [39].

The inconsistencies reported across studies might be ascribed to differences in sampling selection, the assessment instruments adopted to measure PTSD symptoms, time frames between the assessment and the actual earthquake, and intensity of the earthquake besides its devastating impact [17 40 47].

Italy is one of the most seismically active countries in Europe and, despite minor tremors are common, it is unusual for the country to experience deadly earthquakes. On April 6th 2009, at 3:32 a.m., an earthquake (Richter Magnitude 6.3) struck L'Aquila, Italy, a town with a population of 72.000 residents and a health district of 105.000 residents. In the town of L'Aquila many buildings collapsed and large parts of the town were destroyed, 309 people died and more than 1.600 were injured, of whom 200 severely injured and hospitalized and 66.000 individuals were displaced.

The aim of the present study was to investigate full and partial PTSD and post-traumatic stress symptoms, in a sample of high-school students and their parents/relatives, exposed to the L'Aquila 2009 earthquake. In addition, the impact of age, gender and of their interaction, on clinical symptoms was explored as well.

Methods

Study Participants

The target population was constituted by students of the last two years of high schools and by their parents/relatives, who volunteered for the study, and who were residents of the town of L'Aquila and had experienced the April 6th 2009 earthquake 10 months earlier. All were directly exposed to the disaster and received assistance in the emergency conditions. Some individuals were displaced in locations within a 150 km area from the town, and some in tents located in the urban area: at the time of this study only 25% of the inhabitants could return to their homes.

The Ethics Committee of the University of L'Aquila approved all recruitment and assessment procedures.

Symptoms of post-traumatic stress related to the earthquake were self-rated on the Impact of Event Scale-Revised (IES) [48] and the Trauma and Loss Spectrum-Self Report (TALS-SR) for assessing post-traumatic spectrum symptoms [49].

Instruments and assessments

The IES is a 15-item scale measuring two core phenomena of PTSD, re-experiencing of traumatic events and defensive avoidance of trauma related memories, situations and emotions. In this study, the total and the intrusion and avoidance domain scores were used.

The TALS-SR was developed by the Italian-American team of researcher belonging to the *spectrum-project*. The questionnaire was originally developed in English and was then translated into Italian, back translated, and revised for inconsistencies between the two languages. In the present study we used the final Italian version. The TALS-SR includes 116 items exploring the lifetime experience of a range of loss and/or traumatic events and lifetime symptoms, behaviours and personal characteristics that might represent manifestations and/or risk factors for the development of a stress response syndrome. Items responses are coded in a dichotomous way (yes/no). The instrument is organized into 9 domains and domain scores are obtained by counting the number of positive answers. According to the aims of the present study subjects were asked to fulfil domains IV and over, referring symptoms occurred after the earthquake exposure. Domain IV ("*Reactions to losses or upsetting events*") includes a range of emotional, physical and cognitive symptoms occurring as acute response to the event. Domain V ("*Re-experiencing*"), domain VI ("*Avoidance and numbing*") and domain VIII ("*Arousal*") include re-experiencing, avoidance and numbing, and arousal symptoms respectively. Domain VII ("*Maladaptive copying*") targets maladaptive coping and behaviours. Each items explores whether these occurred since the loss or the trauma exposure.

The presence of either full or partial PTSD was assessed by means of the items of the TALS-SR corresponding to DSM-IV-TR [51] criteria for PTSD diagnosis. A diagnosis of partial PTSD was assessed when criteria B and or C or D for DSM-IV were satisfied [52]. Scores on domains IV, V, VI, VIII and prevalence rates of endorsement of each of the item on domain VII were analysed.

Statistical Analyses

On the basis of the assumption that younger and older subjects might report different levels of symptomatology, the age was coded into two categories: ≤ 40 and > 40 years.

The effects of age and gender on full and partial PTSD rates, and on the positive answers of domain IX items was measured by the X^2 tests, while those of age and gender, and of their possible interactions, on post-traumatic symptoms, as assessed by IES and TALS-SR, were analyzed by two-way ANOVA analyses.

All statistical analyses were carried out using the Statistical Package for Social Science, version 15.0 (SPSS Inc., Chicago 2006).

TABLE I.
Full and partial PTSD in subjects exposed to the L'Aquila 2009 earthquake. *PTSD totale e parziale in soggetti esposti al terremoto de L'Aquila 2009.*

		Age ≤ 40	Age > 40	Tot	χ^2, p	
PTSD	Men	99/370 (26.8%)	23/76 (30.3%)	122/446 (27.4%)	Gender: $\chi^2 = 70.11$, $p < .001$	Age within gender: N.S.
	Women	211/381 (55.4%)	39/73 (53.4%)	250/454 (55.1%)		Age within gender: N.S.
	Total	310/751 (41.3%)	62/149 (41.6%)	372/900 (41.3%)	Age cat.: N.S.	
	χ^2, p	Gender within age: $\chi^2 = 62.27$, $p < .001$	Gender within age: $\chi^2 = 7.30$, $p = .007$			
Partial PTSD	Men	120/373 (32.2%)	25/76 (32.9%)	145/449 (32.3%)	Gender: N.S.	Age within gender: N.S.
	Women	122/382 (31.9%)	27/73 (37.0%)	149/455 (32.7%)		Age within gender: N.S.
	Total	242/755 (32.1%)	52/149 (34.9%)	294/904 (32.5%)	Age cat.: N.S.	
	χ^2, p	Gender within age: N.S.	Gender within age: N.S.			

Results

The TALS-SR was administered to 946 subjects, but only 939 (468 women and 471 men) returned the completed questionnaire. The age (mean ± SD) of the total sample was 24.4 ± 12.1 years, with no difference between women and men.

Details on full and partial PTSD in each age category and divided by gender are reported in Table I. In particular, 372 (41.3%) subjects fulfilled the DSM-IV-TR criteria for PTSD. This diagnosis was significantly more prevalent in women than in men (250 women versus 122 men, $X^2 = 70.11$, $p < .001$). In addition, other 294 (32.5%) subjects (145 men and 149 women) fulfilled the criteria for partial PTSD, with no sex or age preponderance.

When the total sample was analysed according to gender, women showed significantly higher scores than men in each of the IES and TALS-SR domains (Table II). In addition, as depicted in Table III, women reported significantly higher rates than men ($\chi^2 = 32.90$, $p < .001$) at the item "… stop taking care of yourself, for example, not getting enough rest or not eating right?", while men at the items "… engage in risk-taking behaviours, such as driving fast, promiscuous sex, hanging out in dangerous neighbourhoods?" ($\chi^2 = 28.65$, $p < .001$) and "… attempt suicide?" ($\chi^2 = 10.98$, $p = .004$).

As far as the age was concerned, more mature subjects reported significantly higher symptoms than the younger ones in the "Re-experiencing" and "Arousal" TALS-SR domains [$F(1,910) = 7.44$, $p = .006$ and $F(1,915) = 6.11$, $p = .014$] (Table II). Further (Table III), younger subjects showed higher scores than subjects older than 40 years at the item "use alcohol or drugs or over the counter medications to calm yourself or to relieve emotional or physical pain?" ($\chi^2 = 3.76$, $p = .053$) and "engage in risk-taking behaviors, such as driving fast, promiscuous sex, hanging out in dangerous neighborhoods?" ($\chi^2 = 11.46$, $p = .001$). These findings were confirmed only amongst men, while mature women had higher scores than the young ones at the item "stop taking prescribed medications or fail to follow-up with medical recommendations, such as appointments, diagnostic tests, or a diet".

The two-way ANOVA analyses on each of the four TALS-SR domain scores revealed no significant age X gender interaction.

Discussion

This study represents the first investigation of full, partial and subthreshold PTSD and post-traumatic spectrum symptoms, in a selected population of L'Aquila (Italy) sur-

TABLE II.
TALS-SR and IES domains scores by GENDER and AGE categories, in subjects exposed to the L'Aquila earthquake. *Punteggi dei domini TALS e IES per genere e fascia d'età in soggetti esposti al terremoto de L'Aquila.*

	Domains	Age ≤ 40 (n; mean ± SD)	Age > 40 (n; mean ± SD)	Scores within gender (n; mean ± SD)	Two-Way ANOVA* F, p
TALS	Reaction to the earthquake				
	Men	(378; 6.68 ± 3.08)	(77; 7.18 ± 3.53)	(455; 6.76 ± 3.16)	Gender effect: F(1,905) = 67.85, p < .001
	Women	(381; 9.27 ± 2.92)	(73; 9.12 ± 3.36)	(454; 9.24 ± 2.99)	
	within Age-categories	(759; 7.98 ± 3.27)	(150; 8.13 ± 3.57)		Age effect: N.S.
	Re-experiencing				
	Men	(378; 3.26 ± 2.19)	(77; 3.97 ± 2.67)	(455; 3.38 ± 2.29)	Gender effect: F(1,910) = 83.02, p < .001
	Women	(386; 5.21 ± 2.07)	(73; 5.56 ± 2.03)	(459; 5.27 ± 2.07)	
	within Age-categories	(764; 2.25 ± 2.34)	(150; 4.75 ± 2.50)		Age effect: F(1,910) = 7.44, p = .006
	Avoidance				
	Men	(369; 3.13 ± 2.30)	(76; 3.14 ± 2.94)	(445; 3.13 ± 2.42)	Gender effect: F(1,890) = 39.74, p < .001
	Women	(376; 4.78 ± 2.57)	(73; 4.37 ± 3.05)	(449; 4.71 ± 2.65)	
	within Age-categories	(745; 3.96 ± 2.57)	(149; 3.75 ± 3.05)		Age effect: N.S.
	Arousal				
	Men	(381; 1.92 ± 1.51)	(77; 2.42 ± 1.84)	(458; 2.01 ± 1.58)	Gender effect: F(1,915) = 75.14, p < .001
	Women	(386; 3.26 ± 1.48)	(75; 3.44 ± 1.60)	(461; 3.29 ± 1.50)	
	within Age-categories	(767; 2.60 ± 1.63)	(152; 2.92 ± 1.80)		Age effect: F(1,915) = 6.11, p = .014
IES	Intrusion				
	Men	(361; 7.51 ± 8.31)	(77; 8.06 ± 10.31)	(438; 7.61 ± 8.67)	Gender effect F(1,869) = 39.86, p < .001
	Women	(361; 14.22 ± 10.86)	(74; 12.62 ± 12.31)	(435; 13.95 ± 11.12)	
	within Age-categories	(722; 10.87 ± 10.23)	(151; 10.30 ± 11.53)		Age effect N.S.
	Avoidance				
	Men	(366; 8.70 ± 8.55)	(76; 8.43 ± 10.00)	(442; 8.65 ± 8.81)	Gender effect F(1,866) = 14.77, p < .001
	Women	(355; 12.58 ± 9.32)	(73; 10.96 ± 11.02)	(428; 12.29 ± 9.64)	
	within Age-categories	(721; 10.60 ± 9.14)	(149; 9.67 ± 10.55)		Age effect N.S.

vived to a major devastating earthquake 10 months earlier, in particular high-school students and their parents and relatives. At the time of assessment, several subjects were out of their original houses, still displaced and living with relatives or in temporary accommodations.

The results revealed a full PTSD diagnosis in 41.3% of the total sample with a further 32.5% of subjects suffering from partial PTSD, in agreement with data gathered in other populations. Three months after the Wenchuan (China) earthquake, PTSD was diagnosed in 37.8% of the subjecst [27], up to 45.5% in heavily damaged counties following the same event [4]. Similar rates were measured in adult earthquake survivors in Armenia 1.5 years after the exposure (49.7%) [53], in Turkey (41.9%) [54], and in Kashmir (46.6%) 18 months after an earthquake [40]. However, lower rates have been also noted [21 23 33].

TABLE III.
Positive answers to the TALS-SR domain VII items in subjects exposed to the L'Aquila earthquake. *Risposte positive agli item del dominio VII del TALS-SR nei sopravvissuti al terremoto de L'Aquila.*

		Age ≤ 40	Age > 40		Sign. differences χ^2, p	
… stop taking care of yourself …?	Men	66/384 (17.2%)	11/77 (14.3%)	77/461 (16.7%)	Gender: $\chi^2 = 32.90$, $p < .001$	Age within gender: N.S.
	Women	129/388 (33.2%)	25/75 (33.3%)	154/463 (33,3%)		Age within gender: N.S.
	Total	195/772 (25.3%)	36/152 (23.7%)	231/924 (25.0%)	Age cat.: N.S.	
	χ^2, p	Gender within age: $\chi^2 = 25.52$, $p < .001$	Gender within age: $\chi^2 = 6.61$, $p = .010$			
… stop taking prescribed medications or fail to follow-up with medical recommendations …?	Men	26/382 (6.8%)	4/77 (5.2%)	30/459 (6.5%)	Gender: N.S.	Age within gender: N.S.
	Women	20/388 (5.2%)	9/75 (12.0%)	29/463 (6.3%)		Age within gender: $\chi^2 = 3.92$, $p = .048$
	Total	46/770 (6.0%)	13/152 (8.6%)	59/922 (6.4%)	Age cat.: N.S.	
	χ^2, p	Gender within age: N.S.	Gender within age: N.S.			
… use alcohol or drugs or over-the-counter medications to calm yourself or to relieve emotional or phisical pain?	Men	80/383 (20.9%)	5/77 (6.5%)	85/460 (18.5%)	Gender: N.S.	Age within gender: $\chi^2 = 7.89$, $p = .005$
	Women	53/388 (13.7%)	11/75 (14.7%)	64/463 (13.8%)		Age within gender: N.S.
	Total	133/771 (17.3%)	16/152 (10.5%)	149/923 (16.1%)	Age cat.: $\chi^2 = 3.76$, $p = .053$	
	χ^2, p	Gender within age: $\chi^2 = 6.56$, $p = .010$	Gender within age: N.S.			
… engage in risk-taking behaviours …?	Men	74/383 (19.3%)	1/77 (1.3%)	75/460 (16.3%)	Gender: $\chi^2 = 28.65$, $p < .001$	Age within gender: $\chi^2 = 13.97$, $p < .001$
	Women	21/388 (5.4%)	3/75 (4.0%)	24/463 (5.2%)		Age within gender: N.S.
	Total	95/771 (12.3%)	4/152 (2.6%)	99/923 (10.7%)	Age cat.: $\chi^2 = 11.46$, $p = .001$	
	χ^2, p	Gender within age: $\chi^2 = 33.24$, $p < .001$	Gender within age: N.S.			
… wish you hadn't survived?	Men	40/383 (10.4%)	7/76 (9.2%)	47/459 (10.2%)	Gender: N.S.	Age within gender: N.S.
	Women	49/388 (12.6%)	6/75 (8.0%)	55/463 (11.9%)		Age within gender: N.S.
	Total	89/771 (11.5%)	13/151 (8.6%)	102/922 (11.1%)	Age cat.: N.S.	
	χ^2, p	Gender within age: N.S.	Gender within age: N.S.			

(continues)

TABLE III - *continued*.

		Age ≤ 40	Age > 40		Sign. differences χ^2, p	
… think about ending tour life?	Men	21/383 (5.5%)	2/77 (2.6%)	23/460 (5.0%)	Gender: N.S.	Age within gender: N.S.
	Women	22/387 (5.7%)	4/75 (5.3%)	26/462 (5.6%)		Age within gender: N.S.
	Total	43/770 (5.6%)	6/152 (3.9%)	49/922 (5.3%)	Age cat.: N.S.	
	χ^2, p	Gender within age: N.S.	Gender within age: N.S.			
… intentionally scratch, cut, burn or hurt yourself?	Men	30/383 (7.8%)	2/77 (2.6%)	32/460 (7.0%)	Gender: $\chi^2 = 3.66$, p = .056	Age within gender: N.S.
	Women	15/388 (3.9%)	3/75 (4.0%)	18/463 (3.9%)		Age within gender: N.S.
	Total	45/771 (5.8%)	5/152 (3.3%)	50/923 (5.4%)	Age cat.: N.S.	
	χ^2, p	Gender within age: $\chi^2 = 4.82$, p = .028	Gender within age: N.S.			
attempt suicide?	Men	24/382 (6.3%)	1/77 (1.3%)	25/459 (5.4%)	Gender: $\chi^2 = 10.98$, p = .004	Age within gender: N.S.
	Women	4/388 (1.0%)	2/75 (2.7%)	6/463 (1.3%)		Age within gender: N.S.
	Total	28/770 (3.6%)	3/152 (2.0%)	31/922 (3.4%)	Age cat.: N.S.	
	χ^2, p	Gender within age: $\chi^2 = 13.69$, p < .001	Gender within age: N.S.			

In our sample, the full PTSD diagnosis was more frequent in women than in men. This is not a novel finding, as the association of PTSD with the female gender has been widely reported, while suggesting an intrinsic vulnerability of women that appears to be independent from different factors, such as the degree of exposure, the impact of the trauma and post-trauma socio-economical resources or interventions [25 27 29-31 33 37 39 40 55 56]. On the contrary, we could not confirm the gender difference in partial PTSD rates observed by others [18].

The analyses of the post-traumatic subthreshold symptoms showed that women showed higher scores than men in all IES and TALS-SR domains. A similar finding was reported in a retrospective study 50 years after a catastrophic earthquake, with women suffering more often from recurrent dreams of the earthquake and distress than did men [37]. More recently, higher levels of post traumatic symptoms were reported in women six and a half years after the Spitak earthquake [38] In our study women had higher scores than men of the TALS-SR domain IV scores that explores the emotional, physical and cognitive symptoms occurring as acute response to the traumatic event [28 33]. A similar finding has been also reported in different populations and related to the evidence that women are generally more prone to severe acute reactions [19 27 35 54 56].

When the sample was analysed by gender, interesting data emerged also from the TALS-SR domain on maladaptive behaviours reported after the earthquake exposure. In fact, women reported more often than men to have stopped taking care of themselves after the event, while men reported higher self-injuring behaviours and suicide attempts. Previously, increased alcohol assumption [24 57] and suicidal behaviours [58-60] have been described in earthquake-exposed populations. In our sample this was particularly evident in younger men who showed high rates of alcohol, drugs or medications use and risk taking behaviours.

Most of the literature on earthquake survivors reports higher levels of PTSD symptoms amongst middle-aged or elderly than younger people, but inconsistencies are also present [33 43-45]. This is consistent with our finding of high rate of re-experiencing and arousal symptoms in the most mature subjects [23 61].

Some major limitations of our study should be acknowledged. First, the sample cannot be considered representative of the general population of L'Aquila, as it includes subjects within a small age range due to the fact that we recruited high-school students and their parents and relatives who volunteered for the study, however it turned out to be quite homogenous. Second, there was a lack of information on the impact of the earthquake on each individual in terms of self -injury, loss of relatives and/or significant others, economical status, household damage. Third, the use of self-report instruments, instead of the rating of the clinician, in order to detect PTSD symptoms and even diagnosis may be considered less accurate. Fourth, the lack of information on the presence of Axis I psychiatric comorbidities may account for the answers on TALS-SR domain VII regarding alcohol or drug abuse.

Conclusions

The results of the present study confirm the pervasive effects of a disaster, such as an earthquake, on the mental health of the general population exposed, with the presence of relevant rates of full and partial PTSD and post-traumatic symptoms. Young and mature women appeared particularly vulnerable to PTSD, while younger men seemed to be more prone to develop maladaptive copying behaviours in the aftermath of exposure, such as alcohol, drug or substance abuse and risk taking behaviours. Independently from the age, men also showed higher suicidal behaviours than women. Further studies, in more representative and larger samples, are needed to corroborate these results, in order to promptly identify high-risk subjects for post-traumatic symptoms and high risk behaviours in the aftermath of earthquake exposure.

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