Psychological symptoms and quality of life among the population of L'Aquila's "new towns" after the 2009 earthquake

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ABSTRACT

Background: On April 6th, 2009 the city of L'Aquila was hit by an earthquake which caused more than 65,000 people to lose their homes. In order to provide rapid accommodation to those affected, the Italian Government implemented the CASE project (Complex Anti-seismic Sustainable Environmentally-friendly), consisting in the construction of 19 "New Towns" on the outskirts of the city. The new towns were built in rural areas, far from the city center, and lacked many basic services. The purpose of this study was to evaluate the prevalence of mental disorders, psychological symptoms and quality of life in a sample of the population affected by this situation.
Methods: Brief Symptom Inventory (BSI), the Impact of Events Scale-Revised (IES-R), and the Manchester Short Assessment of Quality of Life (MANSA), were applied to the inhabitants of three new towns.
Results: 107 people were interviewed. The mean scores of the GSI of the BSI were 0.70 (SD=0.55). The total score of the IES-R scale was used and the cut-off point, represented by the value equivalent to 33, was exceeded by 59.81% of the sample. The average value was 38.04 (SD=19.22). Fourteen people (21.88%) obtained an average value of ≥ 60. The mean score on the MANSA was 4.5 (SD=0.98), with differences in response among the inhabitants of the three new towns considered.
Conclusion: Data obtained shown some differences between the three new towns studied. These could be a starting point from which to conduct a further analysis, with the aim of finding features in the various new towns which correlate positively and negatively with the quality of life, in order to facilitate future policy-makers, and showing them the best options to improve quality of life for citizens involved in natural disasters.

Key words: Earthquake - Post-traumatic stress disorder - Natural disaster - Survey

INTRODUCTION

Extensive research has been conducted on the impact natural disasters can have on mental health, and some data is available on mental health outcomes in subjects who have experienced an earthquake in first person [5, 13, 19, 22-24, 26, 27, 30, 32, 38, 41, 45, 46, 48, 50, 51, 56, 58-60, 68, 69,73, 79, 85].

Earthquakes often strike unexpectedly, threatening lives and leading to large scale destruction. People involved in natural disasters suffer the loss of family members, material possessions and relationships at individual, group, social and community level.

An earthquake of Mw=6.3 struck the town of L'Aquila (Central Italy) on 6th April 2009, causing 309 deaths. 1,600 people were injured, 200 severely injured and hospitalized, and more than 65,000 displaced. Many buildings collapsed and large parts of the town were destroyed.

First strategy adopted was to place 22,000 survivors in tent camps and another 21,000 in tourist accommodation establishments on the Adriatic coast [2]. Subsequently, between September 2009 and February 2010, the Italian government authorized the construction of temporary housing units to enable the rapid accommodation of those whose homes had been destroyed or declared structurally unsafe [26, 27, 30-32, 38-40, 53, 67, 78, 80].

This initiative was called "C.A.S.E. Project" (earthquake-proof, sustainable, eco-compatible housing complexes) and was different from the alternative settlements (i.e. containers, wood homes, ...) used in similar situations. C.A.S.E. project houses are designed in accordance with the latest sustainability criteria, are made of insulated material, and rest on seismically isolated bases. Built on two or three floors and furnished, the houses come in different sizes depending on household composition. The C.A.S.E. project districts were called "new towns".

The C.A.S.E. Project was distributed over 19 districts. 184 buildings were built for a total number of 5,736 residential flats around the city of L'Aquila [2, 3], and housed about 15,000 people. The new towns were built in rural areas that lacked many basic services and transport and were far from the city center. Several studies on the health situation after the L'Aquila earthquake have been conducted, showing different levels of Posttraumatic Stress Disorder (PTSD) [30, 32, 38, 39, 67]. PTSD is a mental illness that can develop after a person is exposed to one or more traumatic events [4].

Some Authors have examined the prevalence of PTSD in people who had left their damaged homes and were still living in temporary accommodation more than a year after the earthquake [27]. Other researchers have investigated QOL (quality of life) levels among inhabitants of the new towns and found different levels of QOL calculating, for example, changes in QOL that occurred in an adult disease-free population sample, or QOL in the elderly population [40, 80].

Based on the available evidence on the impact of the L'Aquila earthquake on the mental health of affected subjects, the aim of this study was to investigate the prevalence of mental and psychological disorders and perceived quality of life in the inhabitants of the so-called "new towns" during a period of 2.5 years after losing their homes and belongings in the earthquake.

METHODS

We conducted a descriptive study.

Study population and sampling: The study population is composed of residents of the new towns. Three new towns were randomly selected from the 19 districts where the C.A.S.E. study was carried out (Cese di Preturo, Coppito 3 and Paganica 2). The new towns are made up of apartment blocks, each with about 25 apartments. Sampling principles are summarized as follows: households were considered as the basic unit of sampling, and only one member of each household was chosen to participate in the study; participants were at least 18 years of age and had to have experienced the earthquake first hand.

Investigators chose the apartments included in the sample by starting from the main street of the new town, entering the first apartment block on the right side of the street. After surveying the apartments on the right side of the street, they started on the apartments on the left. One bell every five was rung to reach the expected number of participants (with an average of about 300 apartments for each new town we have chosen a sample of 20%, this number and a tolerance of 5% was applied for a total of 63 apartments for each urban unit visited, for a total of 189 potential respondents), and asked to interview the person who opened the door (if he/she was at least 18 years old). If this person was unable to take part in the survey, the investigators asked to interview the head of the household, and if he/she refused or was not at home, his/her partner or another family member. If this person was not at home either or refused to be interviewed, the investigators moved on to another apartment. In case nobody answered the door bell, the investigators made up to six attempts to contact the apartment selected. After this, if nobody answered, the apartment was considered empty.

Data collection: The interviews were conducted by a team of qualified psychiatrists, psychologists and sociologists, properly trained by expert psychiatrists. The investigators briefly explained the aim of the survey and obtained written consent before each interview. The investigation was anonymous. The study was conducted according to the Helsinki Declaration.

The research was promoted by GUS (Gruppo Umana Solidarietà, non-governmental organization, Central Italy) volunteers informing people face-to-face and distributing

pamphlets. The GUS has had previous experience in other natural and human made disasters. Generally, the strategy adopted by GUS volunteers is to build "listening centers" and encourage disaster victims to share their stories in order to rebuild social identities as modeled on the concept of operational groups and institutions [11, 12, 15, 16, 65, 66]. Together with the GUS team, a project called "Centra l'ascolto" was developed and financed by the Italian Ministry of Labor and Social Affairs.

Survey tools: A structured questionnaire was used to record socio-demographic characteristics (gender, age, marital status, educational level, living situation, employment status, economic difficulties, options for compensation and applications for economic support), experience of stressful events, symptoms of mental distress, PTSD, quality of life.

In addition, the last part of the questionnaire investigated the consumption of drugs before and after the event, and the reasons for their use. The experience of stressful events before, during and after the earthquake was assessed using a list of 28 potentially stressful events. The list is based on and is similar to other methods used to assess exposure to traumatic events [68, 70, 71, 84]. It assesses whether or not a participant has experienced any of the 28 potentially traumatic events included in the questionnaire (see Box 1). For each of the events, participants were asked to rate their level of distress at the time. A five-point Likert-type rating scale ranging from 0 (not distressed at all) to 4 (extremely distressed) was used.

A BSI (Brief Symptom Inventory) developed from SCL-90-R (Symptom Checklist-90-R) was used to analyze general symptoms of mental distress [33]. This is a symptom scale consisting of 53 items, covering nine symptoms: somatisation (SOM), obsessive-compulsive disorder (O-C), interpersonal sensitivity (I-S), depression (DEP), anxiety (ANX), hostility (HOS), phobic anxiety (PHOB), paranoid ideation (PAR) and psychoticism (PSY). Each item is ranked on a 5-point Likert scale ranging from 0 (not at all) to 4 (extremely). In this study, the GSI (Global Severity Index) of the BSI, which measures the overall psychological distress level, was used. It corresponds to the sum of 53 items divided by the number of items included in the scale.

IES-R is a scale developed to assess symptoms of PTSD [82]. It's a 22-item scale measuring three core phenomena of PTSD, i.e., re-experiencing traumatic events, defensive avoidance and denial of trauma-related memories and emotions and hyperarousal. Respondents are asked to rate each item in the IES-R on a scale of 0 (not at all), 1 (a little bit), 2 (moderately), 3 (quite a bit) and 4 (extremely), relating to the past 7 days. In this study, the total score of the scale was used and a cut-off point of 1.5 (equivalent to a total score of 33) was employed [29, 57].

MANSA (Manchester Short Assessment of Quality of Life) was used to assess subjective quality of life (SQOL), defined as the mean score of 12 satisfaction ratings with relating to different life domains and life in general [72].

BOX 1. List of potentially stressful events

Serious accident, fire or explosion
Natural disaster
Assault (not sexual, by a family member)
Assault (not sexual, by a stranger)
Sexual violence (by a family member)
Sexual violence (by a stranger)
Imprisonment
Serious disease
Sudden death of a loved one, not due to violence
Shortage of food or water
Health problems without access to medical care
Lack of shelter
Driven from their homes following threats of violence
Battle situation
Situation of gunfire and / or bombing
Situation in which a mine exploded
Siege situation
Severe injury
Have witnessed an assault, killing or death of another person
Having learned of the killing or violent death of a loved one
Having learned of the disappearance or kidnapping of a loved one
Torture
Being lost
Being kidnapped
Witnessed damage to homes in relation to the earthquake
Had to leave the house because of the earthquake
Any other situation that has resulted in fear or was felt as life-threatening
Frightened and felt life threatening because it has witnessed one of the events mentioned above

Each item is rated on a Likert-type scale ranging from 1 (lowest satisfaction) to 7 (highest satisfaction) with 4 as a neutral middle point. Therefore, dissatisfaction was shown by scores below 4, and satisfaction was shown by values above 4, which was considered a neutral middle point.

The survey, designed in 2010, was only conducted after obtaining authorization from the relevant authorities (between March 2011 and August 2011), about two years after the earthquake.

Analysis: Answers to the questionnaire were collected and transferred onto Microsoft Excel sheets. This program was used for data storage and processing. Statistical analysis was performed by X-LSTAT software and Origin 9.1 [1, 61]. Descriptive statistics were used to analyze the distribution of variables. Qualitative data were described using frequences and percentages. The Chi-square analysis was performed to assess differences between gender (male/female), age (≤40, 41-60, >60 age groups), level of education (primary, middle, high school, university), marital status (married, single, divorced, widowed), and new towns. The level of statistical significance was set at $p<0.05$.

For a comparison of stress scales between groups, analysis of variance (ANOVA) was performed with a significance level of $p<0.05$.

Pearson test was used to evaluate the correlation between the tests administered.

Logistic regression models were applied to evaluate the possible influence of factors such as gender, age, marital status, level of education and different new towns of residence in the perception of QOL and specifically in the quality of housing-related activities. Each of these characteristics has been considered as an independent variable, while subjective QOL (estimated from MANSA tests) was considered a dependent variable.

RESULTS

A total of 110 people were contacted, with a presence rate of 58.20%. It was not possible to contact 79 people (among the 79 people not contacted, the interviewers reported that their apartments were empty because, according to reports from neighbors, the tenants had returned to their homes or found other accommodation which was more suited to their needs). Moreover, the survey was conducted in a period in which the highest number of people were not living in the new towns.

Among the 110 participants, only 107 completed the interview totalling a response rate of 97.27% (Cese di Preturo n.28, Coppito 3 n.45, Paganica 2 n.34). In the case of three people who initially gave their consent and started the interview, but later opted out of the interview, interviewers reported that in one case the respondent was mistrustful of this type of activity, considered unnecessary; in the second case, some questions were deemed too personal (eg: monthly income), and in the third case the interview was too long. All participants experienced the earthquake first hand; the sample consisted of 64 women and 43 men whose ages ranged from 19 to 88 years (50.12 ± 18.19). Detailed demographic data are summarized in Table 1.

After the earthquake, all interviewees had had to leave their homes and were temporarily housed elsewhere, i.e. in hotels, residences, tented camps. After the earthquake, 17.76% participants were experiencing economic hardship; 73.68% said that economic difficulties were still pertinent. Only 6.54% had qualified for economic help and, among people who hadn't had yet received compensation, 14.58% were claiming the right to receive it.

Of those who answered the list of stressful events linked to the experience of the earthquake, distress levels were described as: not distressed at all by 1 (1.09%), low by 1 (1.09%), moderate by 6 (6.52%), severe by 20 (21.74%) and extreme by 64 (69.57%) participants. A small number of those interviewed had already been involved in other

TABLE 1. Characteristics of the sample

VARIABLE	N.	%
Age		
Total (mean 50.12 ± 18.19)		
≤ 40	39	36.45
41-60	37	34.58
>60	31	29.97
Gender		
Female	64	59.81
Male	43	40.19
Marital status		
Single	33	30.84
Married	61	57.01
Divorced	7	6.54
Widowed	6	5.61
Living situation		
Alone	11	10.28
Partner	48	44.86
Parents	28	26.17
Other	3	2.80
Children under 18	15	14.02
Children over 18	22	20.56
Education		
Primary school	15	14.02
Middle school	25	23.36
High school	33	30.84
University	34	31.78
Employment status		
Employed	49	45.79
Student	9	8.41
Retired	30	28.04
Unemployed	10	9.35
Housewife	9	8.41
Nationality		
Italian	102	95.33
Eritrean	3	2.80
Greek	1	0.93
Romanian	1	0.93
Monthly income (euro)		
< 1000	34	31.78
1000-1500	27	25.23
>1500-2000	11	10.28
> 2000	2	1.87
n.a.	33	30.84

accidents before the earthquake; they indicated the same levels of distress declared for the earthquake.

The mean GSI score of the BSI was 0.70 (SD=0.55). Between the subscales of the BSI scale, Anxiety, Depression, Obsessive-Compulsive, Paranoid Ideation and Hostility showed as the main values (0.86, 0.85, 0.84, 0.79 and 0.79 respectively). The mean score of BSI was 0.82±0.57 for those aged over 60 years, 0.61±0.51 for age ≤ 40 years, and 0.71±0.56 for 41-60 age group (NS). A significant difference ($p<0.05$) was observed between males and females (the mean GSI score was 0.59 ±0.49, and 0.79 ± 0.57, respectively). Taking into consideration marital status, the mean score was higher for the widowed and single categories (1.01±0.49, and 0.83±0.62 respectively) in comparison to divorced and married people (0.79±0.49, and 0.63±0.49 respectively), without there being a significant difference among the groups. With regard to educational level, the highest mean score was observed in people with a primary school diploma (1.13±0.57), *vs* all the other subgroups considered (0.73±0.49, middle school; 0.55±0.44, high school; 0.71±0.57 university) ($p<0.05$). Finally, Coppito 3 was the new town with the highest mean score (0.78±0.56), in comparison to Cese di Preturo (0.69±0.47), and Paganica 2 (0.68±0.58) (NS).

The mean score on the IES-R was 1.73 (SD=0.87). The total score of the IES-R scale was used and the average value was 38.04 (SD=19.22), of which 14 people (21.88%) obtained an average value ≥ 60. The cut-off of 33 was passed by 48.84% of the males and 67.19% females (this difference is not significant), and by 58.97% of those aged under 41, 62.16% in the 41-60 age group, and 58.06% by people aged over 60 (NS). Taking the inhabitants of the three new towns into consideration the cut-off point of 33 was passed by 53.57% in Cese di Preturo, 68,88% in Coppito 3, and 52.94% in Paganica 2 (NS). Taking marital status into consideration, 66.67% of widowed people passed the cut-off, followed by singles (60.61%), married people (59.02%), and divorced people (42.86%) ($p<0.05$). An analysis of educational level showed the cut-off point of 33 was passed by 61.76% of those with a university degree, followed by a primary school diploma (60%), high school diploma(48.48%), and middle school diploma (40.01%) ($p<0.05$).

The mean score on the MANSA was 4.5 (SD=0.98). A slightly lower score was observed among those aged over 60 (4.12±0.94) vs ≤40 age group (4.79±0.86) and 41-60 age group (4.63±1.03). This difference was significant ($p<0.05$). Female scores were slightly lower than male scores (4.44±1.01, and 4.69±0.92 respectively) (NS).

As regards marital status, married people appear more satisfied (4.82±0.83) than divorced (4.77±0.84), single (4.12±1.08), and widowed respondents (3.72±0.81) ($p<0.05$). People with a primary school education showed the lowest score (3.66±1.12), while the highest score was observed among those with a high school qualification (4.91±0.62), followed by university and middle school (4.58±0.82, and 4.54±1.17 respectively) ($p<0.05$).

Considering the three new towns mentioned above, a lower score was observed among inhabitants of Cese di Preturo (4.40±0.75) in comparison to Coppito 3 (4.51±1.12) ; the highest score belonged to Paganica 2 (4.69±0.94) (NS).

The answers to item no.1 on the MANSA scale: "How satisfied are you with your life as a whole today?" showed that 52.34% of participants were satisfied, while 24.30% were dissatisfied.

Furthermore, 37.38% were dissatisfied with their job and 38.64% with their financial situation. A further

TABLE 2. Results of MANSA Scale

MANSA ITEMS	DISSATISFIED (LOWER THAN 4) %	NEUTRAL MIDDLE POINT (4) %	SATISFIED (HIGHER THAN 4) %
How satisfied are you with your life as a whole today?	24.30	23.36	52.34
How satisfied are you with your job (or sheltered employment, or training/education as your main occupation)?	37.38	11.21	51.41
How satisfied are you with your financial situation?	38.64	21.11	40.25
How satisfied are you with the number and quality of your friendships?	12.15	14.02	73.83
How satisfied are you with your leisure activities?	26.17	28.04	45.79
How satisfied are you with your accommodation?	40.19	17.76	42.06
How satisfied are you with your personal safety?	15.89	19.63	65.09
How satisfied are you with the people that you live with?	11.21	6.54	82.24
How satisfied are you with your relationship with your family?	11.21	12.15	76.64
How satisfied are you with your health?	23.36	16.82	59.81

TABLE 3. Correlation coefficients among rating scales

		BSI	IES-R	MANSA
BSI	Pearson Corr.	1		
	Sig.	-		
IES-R	Pearson Corr.	0.06941	1	
	Sig.	0.47748	-	
MANSA	Pearson Corr.	-0.60373 *	-0.00984	1
	Sig.	$5.84177*10^{-12}$	0.91989	-

*Two-tailed test of significance was used; *: Correlation significant at the level of 0.05*

26.17% were dissatisfied with leisure time activities and 23.36% with their health status.

Responses to item no.8, "How satisfied are you with your accommodation?" showed the highest levels of dissatisfaction (40.19%) (Table 2).

However, answers to other items showed a certain degree of satisfaction, such as for friendships (73.83%), the people they live with (82.24%), relations with family members (76.64%) and their safety (65.09%) (Table 2). There were no significant differences in responses between the three age groups and gender until question no.8.

Answers to question no.8 of the MANSA scale, showing the main degree of dissatisfaction (as shown in Table 2), were also analyzed according to new town. It was found that the highest percentage of dissatisfiction was experienced by people living in Cese di Preturo (60.71%) in comparison to Coppito 3 and Paganica 2 (40.0% and 20.59% respectively).

In a gender analysis, the percentage of dissatisfaction was comparable in Cese di Preturo and Coppito 3, while in Paganica 2 women generally reported higher levels of satisfaction (only 6% of women were dissatisfied vs 33% of men).

An analysis by age group seemed to show higher levels of dissatisfaction in people over 60 (48.38% vs 46.15% in age group ≤40, and 24.3% of people aged 41-60), but the difference was not significant.

Age groups were analyzed in each new town and showed that levels of dissatisfaction in people over 60 was almost unvarying (42.85% for Cese di Preturo, 52.94% for Coppito 3, and 42.85% for Paganica 2). Instead, higher levels of dissatisfaction were noticed in the other age groups for Cese di Preturo (≤40 years, 69.23%; 41-60 years, 62.5%), in comparison to Coppito 3 (≤40 years, 38.46%; 41-60 years, 26.67%), and Paganica 2 ((≤40 years, 30.77%; 41-60 years, 0%).

Among the most satisfied participants (41-60 age group), the highest levels of satisfaction were observed in Paganica 2 (the highest level of dissatisfaction was observed in Cese di Preturo); the same observation was made for the ≤40 age group.

Correlations between the different scales used were evaluated with the Pearson test, (Table 3), which highlighted the only existing correlation between BSI and MANSA.

Answers to question no. 8 of the MANSA scale were compared to the results of the BSI and IES-R scales in order to investigate possible differences between dissatisfaction, the neutral middle point and satisfaction. The results showed that the mean value of IES-R was higher than 33 in the three categories (dissatisfied, neutral middle point, satisfied), and the percentage that was higher than this value was equivalent (about 60%) in the three groups. This result indicates that dissatisfaction does not correlate with the stress condition highlighted by the IES-R scale. Similarly, the mean score of BSI scale was comparable in the three categories, although the value was slightly higher in the dissatisfied group (NS) (Table 4).

The association between characteristics of respondents (gender, age group, education, job, marital status and new town) and poor quality of life (represented by a MANSA value lower than 4) are described in Table 5. MANSA value <4 was considered a dependent variable, while each socio-demographic characteristic was treated as an independent variable. Data showed low education and being single are directly related to a low quality of life (Table 5).

Analysing data exclusively in relation to people who reported significant levels of dissatisfaction (question no. 8), a direct correlation was shown in marital status (single people) and level of education (both high and low). (Table 6). Another interesting result that confirms what was previously observed is that living in Cese di Preturo is directly related to dissatisfaction with accommodation, compared to those living in Paganica 2 who reported the highest levels of satisfaction (Table 6). Considering the total score of MANSA, which showed no significant differences between the three new towns, the results obtained (question 8) highlights the negative perception of the inhabitants of Cese di Preturo, in relation to housing conditions alone (Table 6).

Finally, 27.10% of participants declared they regularly took medicines before the earthquake. During

TABLE 4. Results of IES-R and BSI compared to MANSA categories for question no. 8: "How satisfied are you with your accommodation?"

	DISSATISFIED (42 PEOPLE)	NEUTRAL MIDDLE POINT (20 PEOPLE)	SATISFIED (45 PEOPLE)
IES-R total (mean value±SD)	37.69 ± 19.37	40.37 ± 20.11	37.53 ± 19.28
IES-R >33 (%)	59.52	60.0	60.0
GSI of BSI mean score	0.77 ± 0.61	0.71 ± 0.61	0.63 ± 0.47

TABLE 5. Association between characteristics of participants and MANSA<4 value

		OR	95% CI	P
GENDER	Male (reference)	1		
	Female	1.0578	0.4116 to 2.7186	0.9072
AGE	≤40 (reference)	1		
	41-60	1.0690	0.3547 to 3.2213	0.9057
	>60	1.1302	0.3594 to 3.5547	0.8342
EDUCATION	Primary school	6.6667*	1.3822 to 32.1546	0.0181
	Middle school	3.1579	0.7044 to 14.1576	0.1330
	High school (reference)	1		
	University	3.0769	0.7385 to 12.8200	0.1227
JOB	Student	1.4643	0.2558 to 8.3807	0.6683
	Worker (reference)	1		
	Housewife	0.6406	0.0701 to 5.8551	0.6932
	Unemployed	3.4167	0.7819 to 14.9290	0.1025
	Retired	1.8636	0.6151 to 5.6463	0.2710
MARITAL STATUS	Married (reference)	1		
	Single	6.7544*	2.2724 to 20.0765	0.0006
	Divorced	1.5278	0.1565 to 14.9156	0.7154
	Widowed	4.5833	0.6889 to 30.4932	0.1154
NEW TOWN	Cese di Preturo	1.2727	0.3603 to 4.4954	0.7080
	Coppito 3	1.5098	0.4959 to 4.5970	0.4683
	Paganica 2 (reference)	1		

**: Correlation significant at the 0.05 level*

the last year, their intake was unchanged (27.10%).

Participants claimed that they hadn't taken drugs for mental health problems before the earthquake, while 11.21% started taking these drugs after this occasion.

The main reasons given for taking drugs were the following: heart problems, kidney disease, diabetes, thyroid, anxiety, depression and insomnia.

DISCUSSION

The study assessed PTSD symptoms in participants (59.81% of the sample). The mean values obtained on IES-R scale were higher than the cut-off point (33 points) and reached mean values of 38.04 (SD=19.22). In addition, the BSI scale showed the main values for Anxiety, Depression, Paranoid Ideation, Obsessive-Compulsive

TABLE 6. Association between characteristics of interviewees and MANSA value <4 for question n°8

		OR	95% CI	P
GENDER	Male (reference)	1		
	Female	0.8547	0.3875 to 1.8851	0.6972
AGE	≤40 (reference)	1		
	41-60	0.5000	0.1834 to 1.3633	0.1756
	>60	1.1667	0.4498 to 3.0263	0.7513
EDUCATION	Primary school	4.1667 *	1.1081 to 15.6681	0.0347
	Middle school	1.4706	0.4621 to 4.6798	0.5138
	High school (reference)	1		
	University	3.5156 *	1.2392 to 9.9741	0.0181
JOB	Student	2.3529	0.5573 to 9.9350	0.2443
	Worker (reference)	1		
	Housewife	1.1298	0.2403 to 5.3081	0.8775
	Unemployed	0.4706	0.0897 to 2.4686	0.3727
	Retired	1.8824	0.7454 to 4.7538	0.1808
MARITAL STATUS	Married (reference)	1		
	Single	3.1538 *	1.3089 to 7.5991	0.0105
	Divorced	0.1350	0.0073 to 2.4805	0.1775
	Widowed	1.3667	0.2112 to 8.8441	0.7430
NEW TOWN	Cese di Preturo	6.5571 *	2.0956 to 20.5172	0.0012
	Coppito 3	2.5714	0.9244 to 7.1534	0.0704
	Paganica 2 (reference)	1		

**: Correlation significant at the 0.05 level*

disorder, Hostility. The findings show that the prevalence of mental disorders and levels of symptoms are high, and the mean value of subjective quality of life (SQOL) is close to the neutral middle point (4.5).

Most studies focused on the prevalence of post-traumatic stress disorder (PTSD) and found various rates of PTSD among earthquake survivors. However, studies used different instruments to measure PTSD symptoms, and the time-lag between the actual earthquake and the assessment of PTSD symptoms varied considerably.

Results were then compared with other studies conducted among survivors of other natural disasters. Research on survivors from the Province of Sichuan (China) three months after the disaster that occurred on May 12th, 2008 showed a mean score of 26.7 (SD=18.0) of IES-R scale [81]. Three years after the same earthquake, another investigation found 8.8% of the participants in hard-affected areas reported symptoms of PTSD, by compared with 0.5% of those in areas that were less badly affected [83]. A survey of 505 survivors of the 2010 earthquake in southwestern China showed a 33.7% prevalence rate of probable PTSD [85].

Research conducted on 187 young people seeking help from the Psychiatric Department of L'Aquila University showed PTSD in 13.8% of the sample [67]. Further research conducted on 512 students attending the last year of high school in L'Aquila about 10 months after the earthquake showed that 37.5% of the sample were experiencing full PTSD [32].

Research conducted on a sample of the diabetic population in L'Aquila showed higher levels of PTSD among patients whose diabetes was diagnosed after the earthquake [26].

A cross-sectional prevalence study carried out on a sample of 281 people aged >18 years living in temporary housing after the L'Aquila earthquake showed PTSD

symptoms in 43% of respondents [27]. The lowest rate of PTSD in the population of L'Aquila (4.1%) was found in adults interviewed via telephone [30, 38].

Furthermore, the mental health of the population of L'Aquila was evaluated after the earthquake by studying the pharmaco-epidemiology of antidepressant and antipsychotic drug prescriptions. Comparison of variations between the semester before and after the earthquake revealed a 37% increase in prescriptions of antidepressants and a 129% increase in the use of antipsychotics, especially in older people and females [78].

The rate of PTSD found in survivors living in temporary residential housing units 1 year after the Chi-chi earthquake in Taiwan was 16.5% [49].

The mean scores on the GSI of the BSI and on the IES-R found in our research were higher than those found in previous research conducted on the Italian population 8 years after the Marche-Umbria earthquake, while the mean score of MANSA was at its lowest. This previous research showed mean scores of GSI corresponding to 0.29 (SD=0.30), of IES-R corresponding to 0.40 (SD=3.33), and MANSA corresponding to 5.26 (SD=0.59) [68].

The SQOL in our research, analyzed by MANSA scale, showed levels of dissatisfaction relating to respondents' financial situation, occupation, leisure time and health status. In particular, high levels of dissatisfaction related to living situations was noted. However, people reported satisfaction when asked whether they felt safe. Therefore, people felt safe at home but did not consider their present accommodation as satisfactory. This finding prompts the following question: "Why are people dissatisfied if they live in houses that are new and safe?"

Ab origine, a large number of people who took part in the study saw the new town as a "non-place", an ambivalent space having none of the familiar attributes of place contributing to increase the sense of loss, isolation and detachment from their usual places of life and socio-cultural relationships. The "non-place" inspires no sense of belonging, increasing oblivion and aberration of memory [6, 34]. The new town was defined by the well-known architect Renzo Piano as a *"place without soul, without logic, without affection: all over the world, people build and argue to conquer the suburbs. L'Aquila is the only case in which the suburbs were made ex novo"* [74]. Previous reports on the inhabitants of L'Aquila's new towns describe them as exhibiting high rates of PTSD [27] with a worse perception of quality of life compared to those who lived in rented or owned accommodation [40].

This condition may be related to feelings of displacement and insecurity about the fate of their homes, no knowledge of how long the situation would continue, disrupted social lives and uncertainty about their future [27].

With regard to the housing situation in the new towns, interviewees expressed dissatisfaction, as already stated (40.19% dissatisfied, compared to 42.06% who reported they were satisfied). Although a large number of satisfied interviewees (42.06%) was registered, the percentage of 40.19% of dissatisfied people is a cause for concern, given that percentages observed were of the same order of magnitude. No considerable differences between those who expressed dissatisfaction for their housing situation and those who did not (both had IES values above the cut-off and exceed the value of 33) were found. Dissatisfaction seems so real as to be almost tangible, and not related to mental health problems that directly or indirectly affect the reliability of the response.

Our data show that more than 40% of people living in these new towns either tried to return to their homes of origin or to find autonomous accommodation more suitable to their needs, showing dissatisfaction and general malaise due to housing arrangements and relationships. Nor are all the new towns the same: people living in Cese di Preturo, for example, were more dissatisfied than those living in Paganica 2.

Analyzing the map of the three new towns, we see that Cese di Preturo is close to a small village of 800 inhabitants, about 7 Km away from the center of L'Aquila and not far from the airport. Coppito 3 is considered a suburban district of L'Aquila. Finally, although Paganica 2, is about 7 Km away from the center of L'Aquila, it is very close to Paganica (a district of L'Aquila numbering about 5000 inhabitants).

In the present study, no significant difference in SQOL was found in elderly people and those aged under 60, similar to what was observed in researches conducted on well-being and perceived quality of life in the elderly which showed that the population living in the new towns have a worse perception of their quality of life than the others [40, 54].

Another inquiry aimed at estimating changes in QOL over an 18-month period in an adult population sample after the L'Aquila earthquake showed that the elderly were less satisfied with their psychological condition on average [80]. Moreover, research conducted before and after the L'Aquila earthquake concluded that the data seemed to suggest no decrease in the inhabitants' health-related quality of life (HRQoL) level after the disaster, which may suggest the role of resilience in supporting survivors' HRQoL [39].

One limitation of our study is that, based on these results, it is not possible to affirm that the living situation in the new town could help to maintain, if not increase, long-term PTSD; to clarify this, it would be useful to compare these results with others obtained from a population not undergoing this particular situation (control group). With a control group, we could have spoken with more confidence. However, without a control group, we haven't been able to measure the change in health variables forthe periods before and after the earthquake, and this is a further limitation.

Differences between the population that has not relocated to the new town but resides in housing units

close to their own community and where the community is preserved should also be taken into consideration. This would effectively check what has been pointed out by other studies suggesting that preserving social cohesion in small communities possibly serves to prevent mental disorders [63].

Compared to the earthquakes suffered by Marche-Umbria and Molise [64, 69], the situation in L'Aquila was tackled efficiently from the beginning, both regarding the initial decision to provide temporary accommodation in tents and the final solutions adopted, even if a lack of involvement in psycho-social/familial needs was noted. For example, access to the camps was not free but strictly controlled (perhaps for security issues), and accommodation was chosen by an impersonal software that assigned accommodation using parameters such as, for example, the number of household members or the presence of disability [28]. As a consequence, people had to live with strangers.

Referring to the Goffman, Foucault, Basaglia and Burton theories about the "institutionalization" of the population [8-10, 17, 36, 37, 42] some researchers affirmed that this situation also occurred in the case of L'Aquila as a result of "soft institutionalization" [77].

Different operational choices were made in the management of the Umbria-Marche earthquake, in which personal and familial needs were considered to be fundamental [43, 52, 64]. Indeed, in the Marche-Umbria earthquake of 1997 the population were able to remain in their place of origin (and were not removed from their areas of residence) and this was considered one of the key factors (together with the presence of structures that provided psychological support) in containing the trauma which was associated with the seismic event [64]. A similar situation, in favor of what is claimed, has been described among the inhabitants of Pescomaggiore (a town hard hit by the earthquake of 2009, near L'Aquila) who refused to be moved to the new town, preferring to build wooden houses in their place of origin [35].

From this point of view one might also speculate that the choice of different approaches in L'Aquila, compared to the organizational management during the Marche-Umbria earthquake, could have increased levels of discomfort in people whose sense of security had already been undermined by the trauma caused by the earthquake.

This hypothesis is supported by other researches that affirm the following: "The long-lasting alterations of day-to-day life and the disruption of social networks can well be associated with mental health problems including depression and hopelessness. Stores, bars, clubhouses, churches, squares and other aggregation places where people can find social support, have been lost. Following many disasters, the loss of important bonds is a severe consequence, with social and community resources deteriorating just when victims need them the most" [78]. Further support for this hypothesis is provided by research carried out among the elderly three years after the L'Aquila earthquake. This survey highlighted the isolation of these people, linked to the lack or absence of basic necessities. In addition, the paper also stated that these services, beyond fulfilling basic needs, represent an opportunity for socialization and for mutual support, the lack of which can generate psychological distress [54].

This perception may also be influenced by housing conditions, as revealed by a study on the elderly population relocated after the earthquake of 1997 [47, 55, 62].

Italian culture is based on a strong familial solidarity. It is difficult, in our opinion, to think that the destruction of these relationships does not damage the psyche of this community.

Other authors have even argued that social network disruption was responsible for increased psychological problems in relocated survivors [14,47]. In effect, research conducted in L'Aquila showed that social network use among adults aged 25-54 had a positive impact on mental health and quality of life (QOL) outcomes in the years following a disaster. The paper concludes that the use of social networks may be an important tool for coping with the mental health outcomes of disruptive natural disasters, helping to maintain, if not improve, QOL in terms of social relationships and psychological distress [53].

This statement is also confirmed by further research underlining the value of increased virtual relationships of residents through Facebook, to cope with the loss of previous social relationships, get information about recreational opportunities, or to get organized for public events, despite their relocation [20].

Some authors hypothesized that relocation reinforces a culture of avoidance and fear but seems to reduce flashbacks and suggest that "the elevated rates of mental health problems could constitute a cause rather than an effect of relocation" [76].

Although our results do not allow us to affirm that the construction of the new towns - which was carried out following seismic regulations - seems to be responsible for a loss of social and community identity in the residents, new towns are generally isolated from the urban context, deprived of social services and shops, and poorly connected with areas in which people would meet prior to the earthquake.

As affirmed by other Authors, the new towns are devoid of any emotional and symbolic points of reference. Material and organizational services - in most cases - are absent or otherwise deficient, creating further organizational difficulties in the most common activities among people (shopping, going to work, etc.). The lack of the essential components of daily life weakens the social and relational system [21].

However, our results suggest that new towns are not perceived in the same way by all participants. The results of BSI and IES-R tests for the new towns gave similar results,

except when it came to quality of life (MANSA scale results), and especially for how they perceived housing. This confirms that accommodation is not comparable.

This is further confirmed by a study carried out among the inhabitants of other new towns, in which it is explained that it is one thing to live in a house in which you have chosen to stay, as part of its social fabric; another is to live in a house where you did not choose to stay, away from the main memories, residential and planning references, and detached from social bonds [18].

As stated by some authors, the CASE project was a catastrophic choice in which the population was relocated to rural areas characterized by urban sprawl (the disorderly dissemination of urban settlements in rural areas), leading to a loss of control of urbanization, resulting in the proliferation of settlements with the almost total absence of services) [25, 44, 75]. Such a distortion is shown in the transition from the square to the roundabout: from "place to " non-place" [7].

CONCLUSIONS

The population of L'Aquila have always been strongly attached to their land of origin. Consequently, having to abandon their homes as a result of the earthquake may in our opinion, be seen as an additional trauma. Results may stimulate further studies based on a numerically superior sample, to obtain results from fewer questions, and it would also be interesting to evaluate, as has been done in other studies, the situation in the future. As previously mentioned, differences among the population living in housing units near the main house in the vicinity of their own community (where the community is preserved), might be considered. This could serve to examine what has been pointed out by other studies suggesting that maintaining the social cohesion in small communities is a way of preventing mental disorders.

Given the obvious differences observed in the perception of quality of life experienced by the population who was relocated to the new towns, it would be interesting to conduct a study to highlight what features of the various new towns correlate positively and negatively with the QOL of those who live there. This could be useful to facilitate decision-making processes in the future, orienting policy-makers towards the best options to improve the quality of life of citizens affected by natural disasters.

To date, as a result of the earthquake that hit central Italy on August 24th, 2016, the strategies adopted for operational management have subverted the organizing protocol adopted for L'Aquila.

Relocation in wooden houses – a solution adopted in 1997 for the Umbria-Marche earthquake – has been decided, in accordance with the needs expressed by those affected. The choice of wooden houses results from the consideration that, in the Amatrice earthquake, the individual was considered as being at the center of every strategic decision, in full respect for the identity of the place and the dignity of the people.

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