STRESS AND MALADAPTIVE UNHEALTHY BEHAVIOR: THE POTENTIAL LONG-TERM PSYCHOLOGICAL EFFECTS OF THE LOCKDOWN. AN ITALIAN STUDY

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Abstract

Aiming to reduce the spread of COVID-19, the Italian government declared a total lockdown imposing a forced home confinement which in turn caused significant changes in daily living, including economic, physical and mental health impacts. The goal of this study was to investigate the impact of restrictions on psychological well-being and changes in lifestyle and health habits.

Participants were 419, with a mean age of 41,12 years. The 76,6% reported moderate or high levels of perceived stress. People with highest stress reported significantly lower mental health levels, such as the presence of depression, somatization, anxiety, insomnia and posttraumatic stress symptoms. Significant impact on mental health was given by the discomfort felt for living with other people or living alone. Participants living alone exhibited elevated depressive symptoms. Maladaptive unhealthy behaviour with negative changes in smoking and alcohol intake, eating pattern and physical activity were associated with higher depression, anxiety and posttraumatic symptoms in the course of the pandemic.

As limitations: the sample included a large number of women and people with a high education level and the use of an online survey could have limited the participation of people unfamiliar with technological devices.

People, during the lockdown, were strongly affected by stress and exhibit a presence of maladaptive unhealthy behavior associated with psychological problems which could be potential risk factors for possible long-term mental health effects. Results provide evidence that suggests the implementation of future health-promotion strategies in order to manage mental health outcomes due to lockdown measures.

Key words: COVID-19, depression, anxiety, posttraumatic stress disorder, coping, maladaptive unhealthy behaviour

STRESS E COMPORTAMENTI DI SALUTE MALADATTIVI: I POTENZIALI EFFETTI PSICOLOGICI A LUNGO TERMINE DEL LOCKDOWN. UNO STUDIO ITALIANO

Al fine di ridurre la diffusione del COVID-19, il Governo Italiano ha dichiarato un lockdown che ha costretto la popolazione italiana ad un confinamento in casa con cambiamenti significativi nella vita quotidiana delle persone, con un importante impatto a livello economico e anche sulla salute fisica e mentale.

L'obiettivo di questo studio è stato quello di indagare l'impatto delle restrizioni sul benessere psicologico e sui cambiamenti dello stile di vita e delle abitudini di salute. Hanno partecipato allo studio 419 soggetti, con un'età media di 41,12 anni. Il 76,6% ha riportato un livello di stress percepito moderato e alto e le persone con i più elevati livelli di stress hanno riferito anche la presenza di sintomi psicopatologici come depressione, somatizzazione, ansia, insonnia e stress post-traumatico. I partecipanti hanno riportato che il disagio provato a vivere il periodo del lockdown da soli o con altre persone ha influito sulla loro salute mentale. Le persone che vivevano da sole hanno, infatti, riportato sintomi depressivi significativamente più elevati.

Relativamente ai comportamenti di salute maladattivi, i partecipanti hanno riportato che i cambiamenti negativi delle abitudini relative al fumo, all'assunzione di alcolici, alle abitudini alimentari e all'attività fisica si associano a elevati livelli di depressione, ansia e sintomi post-traumatici durante la pandemia.

Tra le limitazioni del presente studio è necessario annoverare che il campione include un ampio numero di donne e di persone con un livello di istruzione elevato. Inoltre, l'uso di un questionario online ha probabilmente limitato la partecipazione di persone che hanno scarsa familiarità con i dispositivi tecnologici.

In conclusione, durante il lockdown, le persone sono state fortemente influenzate dallo stress e hanno mostrato una serie di comportamenti maladattivi associati a sintomi psicologici che potrebbero essere potenziali fattori di rischio per effetti a lungo termine sulla salute mentale. I risultati di questo studio evidenziano la necessità di implementare future strategie di promozione della salute al fine di gestire gli effetti delle misure di confinamento sulla salute mentale.

Parole chiave: COVID-19, depressione, ansia, disturbo da stress post-traumatico, coping, comportamenti di salute maladattivi

Introduction

The coronavirus pandemic (COVID-19) of the recent months has triggered a global emergency. Italy was the first European nation to be affected by COVID-19 and the pandemic has mainly been located in northern Italy. On 8th of March, the Italian government declared the start of the so-called "phase one" of the lockdown in order to contain the Coronavirus outbreak by imposing a national quarantine and preventing the movements of the population apart from necessity, work, and health circumstances. Italian public health actions consist of stay at home rules, social distancing, closure of nonessential shops and businesses, smart working, learning at home, limits to sports and leisure activities outdoors and restrictions to movements of individuals in the entire national territory. Italy imposed this strict and lengthy lockdown until 4th of May.

The pandemic gave rise to a serious crisis with health, social, economic implications and emotional distress.

Prolonged home confinement during the disease outbreak, necessary to reduce the spread of COVID-19, may affect people's physical and mental health (Wang et al., 2020; World Health Organization, 2020), making people feel isolated and lonely and increasing stress, fear and anxiety, sleep problems, depressive and posttraumatic stress disorder (PTSD) symptoms (Holmes et al., 2020; Pfefferbaum and North, 2020; Torales et al., 2020), increased use of tobacco, alcohol

and other substances (Ahmed et al., 2020; García-álvarez et al., 2020) and dysfunctional eating behaviours (Rodgers et al., 2020).

A review of the existing literature on COVID-19 and mental health (Rajkumar, 2020) evidences the factors contributing to stress and mental morbidity on the general population like misinformation and social isolation (Zandifar and Badrfam, 2020), the economic impact and its effects on well-being, the high levels of fear and panic behaviours as well as the hoarding and stockpiling of resources. Moreover, populations at higher risk of adverse mental health outcomes include patients with COVID-19 and their families, individuals with existing physical or psychiatric morbidity and healthcare workers (Shigemura et al., 2020).

During the exposure to SARS and Middle East Respiratory Syndrome Coronavirus (MERS-CoV), posttraumatic stress disorder and depressive disorders have been shown to be the most prevalent mental disorders during long-term follow-up (Mak et al., 2009) in addition an increased risk of PTSD symptoms, depression, anxiety and anger was observed in health workers who treated infected patients (Lee et al., 2018). These symptoms may persist after the confinement period for a long time (Jeong et al., 2016).

Lockdown also leads, clearly, to radical lifestyle changes such as alcohol and smoke habits, dietary habits, sleep quality and physical activity caused by staying at home and social distancing. It is well known that the experience of negative emotions can lead to dysfunctional psychological and emotional responses and unhealthy behaviour including excessive drinking, smoking and eating. These dysfunctional behaviours were used either as a maladaptive coping strategy, a form of distraction or a behavioural avoidance strategy, or as a result of the stress and psychological symptoms experienced.

The current study aims to explore the impact of COVID-19 on psychological well-being during the mandatory and long lasting phase one, as well as the presence of psychopathological symptomatology, PTSD symptoms and perceived stress in the Italian general population. Moreover, we are interested in evaluating the changes in the lifestyle and health habits (eating habits, physical activity, smoking and alcohol consumption) between the period before and during the lockdown, and the presence of maladaptive unhealthy behaviours like potential risk factors for possible long-term mental health effects.

2. Methods

2.1. Participants and procedure

Participants filled out an anonymous online survey that has been developed using google forms, after reading the written consent form and explicitly agreeing to participate. The link of the questionnaire has been sent through emails, chat and other social media to the contacts of the investigators in a limited time window (from April 22 to May 4, 2020) with a snowball recruiting technique. Participants were encouraged to forward the survey to their contacts. All Italian citizens more than 18 years were eligible. No monetary or credit compensation were received by participants.

A total of 419 people living in the Italian territory have participated in the present study.

2.2. Measure

Data on demographic characteristics: gender, age, marital status, educational level, employment, region of domicile and residence were collected from each participant. Moreover, the modification in working and economic situations and the health condition were asked. Participants also filled out

questions about the family and housing situation, such as the number of people they live with, the number of children they have and their age, and the distress experienced for living alone or with others, evaluated on a likert scale from 0 to 4. Furthermore, a list of stress factors related to the lockdown have been presented.

2.2.1. BSI-18

The Brief Symptom Inventory–18 (BSI-18) (Derogatis, 2001) is a self-report symptom checklist measure to measure psychological distress in community populations. Each BSI-18 item describes a symptom to be rated by respondents along a five-point rating scale according to how much they have been bothered by the symptom in the prior week. The BSI-18 also includes three symptom scales: Somatization, Depression, and Anxiety, each comprising six items.

2.2.2. PSS-10

The 10-Item Perceived Stress Scale (PSS-10) is a self-report instrument that assesses global stress or the degree to which life situations are appraised as unpredictable, uncontrollable and overloading. Each of the items on the PSS-10 are rated on a 5-point Likert scale, ranging from 0 (never) to 4 (very often). Scale scores range from 0-40, with higher scores indicating higher levels of perceived stress The total score is interpreted as follows: Normal or low stress (0-14); Moderate stress (15-18) High stress (19+) (Cohen et al., 1983; Cohen and Williamson, 1988).

2.2.3. IES-R

The Impact of Event Scale – Revised (IES-R) is a 22-item self-report measure (Weiss and Marmar, 1996) that assesses subjective distress caused by traumatic events. Respondents are asked to identify a specific stressful life event and then indicate how much they were distressed or bothered during the past seven days by each "difficulty" listed. Items are rated on a 5-point scale ranging from 0 ("not at all") to 4 ("extremely"). The IES-R yields a total score (ranging from 0 to 88) and subscale scores can also be calculated for the Intrusion, Avoidance, and Hyperarousal subscales.

2.2.4. ISI

The Insomnia Severity Index (ISI) is a 7-item self-report questionnaire assessing the nature, severity, and impact of insomnia (Bastien et al., 2001; Morin, 1993). A 5-point Likert scale is used to rate each item (e.g., 0 = no problem; 4 = very severe problem), yielding a total score ranging from 0 to 28. The total score is interpreted as follows: absence of insomnia (0–7); sub-threshold insomnia (8–14); moderate insomnia (15–21); and severe insomnia (22–28).

2.2.5. AUDIT-C

The Alcohol Use Disorders Identification Test-Concise (AUDIT-C) is a brief alcohol screening instrument that reliably identifies persons, in the general population, who are hazardous drinkers or have active alcohol use disorders. The AUDIT-C is a modified version of the 10 question AUDIT instrument. The AUDIT-C has 3 questions and is scored on a scale of 0-12 (scores of 0 reflect no alcohol use). In men, a score of 4 or more and in women, a score of 3 or more is considered positive, optimal for identifying hazardous drinking or active alcohol use disorders (Bradley et al., 2003; Bush et al., 1998).

2.2.6. DMQ-R SF

The Drinking Motives Questionnaire Revised Short Form (DMQ-R SF) (Kuntsche and Kuntsche, 2009; Mazzardis et al., 2010) were used. Each of the 12 items is a statement concerning the frequency of drinking for four distinct dimensions: enhancement, social, conformity, and coping motives. Each dimension consists of 3 items and is rated on a frequency scale ranging from "Never" to "Almost always".

2.2.7. FTND

The Fagerström Test for Nicotine Dependence (FTND) (Heatherton et al., 1991) is a standard instrument for assessing the intensity of physical addiction to nicotine. It contains six items that evaluate the quantity of cigarette consumption, the compulsion to use, and dependence. The higher the total Fagerström score, the more intense is the patient's physical dependence on nicotine.

2.2.8. VAS

The Visual Analog Scales (VAS) (Hayes and Patterson, 1921; Zealley and Aitken, 1969) is a measure of internal state and subjective or behavioural experience (e.g., craving, alcohol and tobacco consumption). They are typically presented as a 10 cm line with descriptive anchors at each end, such as "not at all alcohol/tobacco craving" to "extremely alcohol/tobacco craving" (e.g., "very strong"; "very much"). Respondents place a vertical line through the point on the scale that best fits their experience with that construct at that moment.

2.2.9. Questions about dietary and physical activity during COVID-19

A pool of questions has been proposed to investigate the changes in lifestyle and health habits (eating behaviour, physical activity) in the period before and during the lockdown.

Lifestyle habits information investigated was: number of meals per day and place where meals or food were consumed, dysfunctional habits, namely to consume food in front of the pc or other technological devices, grazing comfort food or junk food, the amount of hours of physical activity and the types (sedentary, moderate and vigorous training).

2.3. Statistical Methods

All statistical analyses were performed using SPSS 25.0 (IBM Corp), with p<0,05 as the level of statistical significance. Descriptive statistics of the participants' baseline characteristics are provided as mean and standard deviation (SD) for continuous variables and frequency and percentages for categorical variables.

One-way ANOVA and LSD post hoc comparisons were used to assess the differences between sociodemographic characteristics, work, economic, family and housing situation, stressful factors and mental health variables, evaluated with BSI-18, IES-R, ISI and PSS-10. Pearson correlations were used to evaluate the associations between continuous variables.

One-way ANOVA and Chi square tests were used to analyze differences between the expected frequencies and the observed frequencies with respect to the change in health and lifestyle habits such as alcohol, smoke, diet and physical activity.

3. Results

3.1. Sample description

A total of 419 participants completed the survey. The 26% were men (n=109) and the 74% women (n=310). The youngest was 20 and the oldest was 80 years old with a mean age of 41,12±13,08.

Most of the participants were married or living together with the partner (63,3%) and the 28,9% were single, the 66,6% had a master degree or a higher level title. The 78,3% of the participants lived in the central regions of Italy, the remaining lived in the North (12,4%) and South (9,3%) of Italy. **Table 1** shows the characteristics of the sample.

3.1.1. Work and economic situation

The 78,5% of the sample were workers and the 11,7% of these are healthcare workers. Only the 5% of the sample were unemployed and the 11% were students, the 1% were housewives and the 4,5% were retired (see **table 1**). The 75,4% of the workers have contact with other people as clients or patients in their job. Only the 22,9% of the workers had no modifications of the work situation. Indeed, the 1,7% lost their work, the 17,2% had viewed their activity to be completely closed in the lockdown period, the 28,9% modified the usual business and the 29,4% were in a smart working regime.

Regarding the economic situation, the 54,9% had no modifications, the 17,9% had a small reduction in earnings and the 18,1% had a strong reduction in the economic income itself. The 7,9% of the sample had completely lost their livelihood, and the 1,2% viewed their economic situation to be improved.

Table 1. *The table 1 shows the characteristics of the sample. Data are expressed as percentage or mean±SD*

	Study sample *n* = 419	Men: 26% (n=109)	Women: 74% (n=310)
Age (years: M±SD)	41.12±13.08	45.73 (±14.085)	39.5 (±12.325)
Marital status (%)			
Single	28.9	22.9	31
Cohabiting	27	22.9	28.4
Married	36.3	45	33.2
Separated/Divorced	6.9	9.2	6.1
Widower	1	0	1.3
Educational Level (%)			
High school and below	33.4	41.3	30.7
University Degree and Postgraduate	66.6	58.7	69.3
Employment Status (%)			
Employed	78.5	78.8	78.4
Economically inactive or Unemployed	17	13.8	18.1
Retired	4.5	7.4	3.5

Table 1. *Continued*

Perceived Stress Scale (%)			
Normal or low stress	24.6	32.1	20.6
Moderate stress	29.4	31.2	28.8
High stress	47	36.7	50.6
Alcohol behaviour (%)			
Harmful or hazardous drinkers	27.4	29.4	26.8
Low-risk drinkers	44.6	48.6	43.2
Non-drinkers	28	22	30
Smoking behaviour (%)			
Smokers	33.4	32.1	33.9
Quitted smoking	16.2	16.5	16.1
Never smokers	50.4	51.4	50
Eating behaviour (%)			
Stable weight	69.7	68.6	70.1
Weight gain	22.6	22.9	22.5
Weight reduction	7.7	8.5	7.4

3.1.2. Family and housing situation

The 95,5% of the participants passed the lockdown in their usual residence. Only the 11,7% lived alone, the 40,6% shared living space with a partner or another person, whilst the 23,2% lived with two people, the 19,3% with three, the 3,1% with four and the 2,1% with five or more.

The 58,1% of people living with another one did not experience discomfort for sharing the space, while the remaining 41,9% responding from 1 (21,4%) to 4 (3%) experienced distress for living with others. On the contrary, only the 24,5% of people living alone did not experience discomfort, while the 48,9% referred to little or moderately distress and finally the 26,5% felt highly uncomfortable.

The 42,2% of the sample have sons. Among these, the 39% have children in the age of preschool, the 42% have sons attending from primary to high school, the 18% have sons aged from 18 to 25 and the 29% have sons that are more than 25 years old.

3.1.3. Stressful factors impact of COVID-19 on the general population

Only the 1% (4 participants) referred to none stressors, the remaining 99% ranged from one (46,8%) to five (3,3%) stress factors.

Participants referred as the major stressors to the difficulty in carrying out daily activities (67,5%) and the social isolation from family and other significant people (51,80%). Other stress factors regarded the loss or reduction of work (22,9%), the constraint to live in a place where they do not want to be (17,9%), the impossibility to take care of the loved ones due to the

containment (12,6%), the difficulty to deal with the smart working (1,20%) and the issues related to the learning at home of their sons (6,20%). Regarding the COVID-19, the 4,10% were stressed because someone close to them contracted the disease and the 1,2% had someone death for coronavirus. In our sample only 3 people had contracted the COVID-19 and other 3 were in isolation because of contact with someone affected by COVID-19.

3.1.4. Mental health impact of COVID-19 on the general population

The Perceived Stress Scale revealed that the 76,4% of participants have reported moderate or high levels of stress (see **table 1**). One way Analysis of Variance has shown that people with moderate and severe stress have manifested higher symptoms of Anxiety ($F_{(3,418)}$= 41,040; $p<0.001$), Depression ($F_{(3,418)}$=17,631; $p<0.001$) and Somatization ($F_{(3,418)}$=33,175; $p< 0.001$), higher symptoms of PTSD such as Avoidance ($F_{(3,418)}$=30,813; $p< 0.001$), Intrusion ($F_{(3,418)}$=29,327; $p< 0.001$) and Hyperarousal ($F_{(3,418)}$=44,718; $p<0.001$). People with high levels of stress also had a bad quality of sleep ($F_{(3,418)}$=12,503; $p<0.001$) (see **table 2**). Regarding the insomnia symptoms, the ISI score evidenced that the 49,4% have reported no clinically significant insomnia, the 29,8% had subthreshold insomnia symptoms and the 20,8% have reported moderate (17,7%) and severe (3,1%) clinical insomnia.

Concerning the gender differences, women have always reported higher symptomatology (all $p< 0.001$; see **table 3**), whilst, with respect to the age differences, people older than 60 have shown low levels of Somatization, PTSD (Avoidance, Intrusion and Hyperarousal), stress and insomnia symptoms. Participants aged between 20 and 30 have reported higher anxiety, while people aged between 20 and 40 exhibited higher levels of depression. On the other hand, people that are more than 51 years old have reported lower anxiety and depressive symptomatology (see **table 4**).

Table 2. *Differences in symptomatology (BSI-18; IES-R; ISI) among levels of perceived stress*

	Means(SD)		
	Normal or low stress	Moderate stress	High stress
BSI-18 – Somatization	0.36 (±0.48)	0.48 (±0.48)	**0.83 (±0.67)** *
BSI-18 – Depression	0.61(±0.58)	0.77 (±0.64)	**1.40 (±0.85)** *
BSI-18 – Anxiety	0.50 (±0.441)	0.79 (±0.551)	**1.39 (±0.873)** *
IES-R – Intrusion	3.70 (±3.46)	5.19 (±4.88)	**9.26 (±6.21)** *
IES-R – Avoidance	4.68 (±4.48)	6.66 (±4.91)	**10.86 (±6.47)** *
IES-R – Hyperarousal	391 (±3.39)	5.72 (±4.28)	**10.52 (±6.21)** *
ISI – Total	5.93 (±4.81)	8.45 (±6.26)	**10.34 (±6.34)** *

Note. *BSI-18 = Brief Symptom Inventory–18; IES-R = Impact of Event Scale – Revised; ISI = Insomnia Severity Index*

Table 3. *Gender differences in symptomatology (BSI-18; IES-R; PSS-10)*

	Men (n= 109)	Woman (n=310)	F	p-value
BSI-18 – Somatization	0.45 (0.52)	**0.67 (0.63)**	$11.591_{(1,418)}$	0.001
BSI-18 – Depression	0.80 (0.80)	**1.12 (0.81)**	$12.447_{(1,418)}$	<0.001
BSI-18 – Anxiety	0.74 (0.64)	**1.09 (0.83)**	$16.211_{(1,418)}$	<0.001
IES-R – Intrusion	5.19 (5.37)	**7.30 (5.86)**	$10.883_{(1,418)}$	0.001
IES-R – Avoidance	5.76 (5.90)	**9.01 (6.10)**	$23.431_{(1,418)}$	<0.001
IES-R – Hyperarousal	5.28 (5.27)	**8.35 (5.86)**	$23.339_{(1,418)}$	<0.001
PSS-10	16.53 (5.47)	**18.50 (5.52)**	$10.266_{(1,418)}$	0.001
ISI Total	6.89 (5.86)	**9.40 (6.23)**	$13.441_{(1,418)}$	<0.001

Note. *BSI-18 = Brief Symptom Inventory–18; IES-R = Impact of Event Scale – Revised; ISI = Insomnia Severity Index; PSS-10 = Perceived Stress Scale-10*

Table 4. *Differences in symptomatology (BSI-18; IES-R; PSS-10) among different age groups*

	Age groups						
	20-30 years	31-40 years	41-50 years	51-60 years	≥ 61 years	F	p-value
BSI-18 – Somatization	0.71 (0.66)	0.58 (0.59)	0.71 (0.63)	0.63 (0.63)	**0.33 (0.38)***	$3.673_{(4,418)}$	**0.006**
BSI-18 – Depression	**1.47 (0.84)***	**1.03 (0.76)***	0.93 (0.82)	**0.77 (0.69)***	**0.63 (0.64)***	$12.921_{(4,418)}$	**>0.001**
BSI-18 – Anxiety	**1.29 (0.80)***	1.02 (0.79)	0.99 (0.80)	**0.82 (0.77)***	**0.58 (0.57)***	$7.541_{(4,418)}$	**>0.001**
IES-R – Intrusion	7.96 (6.38)	6.99 (5.85)	6.44 (5.50)	6.41 (5.70)	**4.44 (4.33)***	$3.065_{(4,418)}$	**0.017**
IES-R – Avoidance	9.58 (6.63)	8.55 (6.04)	7.77 (6.01)	7.89 (6.39)	**5.10 (4.62)***	$4.440_{(4,418)}$	**0.002**
IES-R – Hyperarousal	9.09 (5.89)	7.74 (6.07)	7.57 (5.78)	7.00 (5.88)	**4.27 (3.80)***	$5.619_{(4,418)}$	**>0.001**
ISI Total	9.49 (5.99)	8.99 (5.14)	9.02 (5.95)	9.39 (5.47)	**5.04 (4.08)***	$4.728_{(4,418)}$	**0.001**
PSS-10	19.26 (5.99)	18.02 (5.14)	18.08 (5.95)	17.89 (5.47)	**15.04 (4.08)***	$4.598_{(4,418)}$	**0.001**

Note. *BSI-18 = Brief Symptom Inventory–18; IES-R = Impact of Event Scale – Revised; ISI = Insomnia Severity Index; PSS-10 = Perceived Stress Scale-10*

The sociodemographic, work and economic situation findings shown that Single and Separated or Divorced exhibited more symptoms of Anxiety (F(3,418)=3,303; p<0.011), Depression (F(3,418)=5,918; p<0.001), Avoidance (F(3,418)=3,981; p=0.004), Intrusion (F(3,418)=3,550; p=0.007) and Hyperarousal (F(3,418)=3,539; p=0.007).

Unemployed, housewives and students reported more Anxiety (F(3,418)=3,350; p=0.003), Somatization (F(3,418)=5,097; p<0.001) and Depression (F(3,418)=6,123; p<0.001).

People losing their work reported more symptoms of Anxiety (F(3,418)=4,377; p=0.002), Somatization (F(3,418)=7,494; p<0.001) and Depression (F(3,418)=5,799; p<0.001), Avoidance (F(3,418)=3,378; p=0.010), Intrusion (F(3,418)=4,240; p=0.002) and Hyperarousal (F(3,418)=5,374; p<0.001) and Insomnia (F(3,418)=3,603; p=0.007). Data also demonstrated that healthcare workers have not reported greater psychopathological symptomatology than others.

In any case, people who completely lost their livelihood presented more symptoms of

Anxiety ($F_{(3,418)}$=3,240; p=0.012), Somatization ($F_{(3,418)}$=7,078; p<0.001) and Depression ($F_{(3,418)}$=7,189;

p<0.001), Avoidance ($F_{(3,418)}$=8,467; p<0.001), Intrusion ($F_{(3,418)}$=3,601; p=0.007) and Hyperarousal ($F_{(3,418)}$=5,513; p<0.001) and Insomnia ($F_{(3,418)}$=2,427; p=0.047).

No differences were found about the region of provenience, the educational level and the number of people living together. Pearson's correlations shown a very weak negative association between the number of children and the symptomatology, in fact higher symptoms of Anxiety (r=-0.124; p=0,011), Depression (r=-0.178; p<0.001) and PTSD symptoms (Avoidance: r=-0.146; p=0.003; Intrusion: r=-0.109; p=0.026; Hyperarousal: r=-0.150; p=0.002) were correlated with a lower number of children.

On the other hand, people who experienced higher discomfort for sharing living space with one or more persons exhibited symptoms of Anxiety (r=0.319; p<0.001), Somatization (r=0.261; p<0.001); Depression (r=0.358; p<0.001), Avoidance (r=0.284; p<0.001), Intrusion (r=0.312; p<0.001), Hyperarousal (r=0.388; p<0.001), Perceived stress (r=0.359; p<0.001) and Insomnia symptomatology (r=0.333; p<0.001). People experiencing higher discomfort in living alone have shown higher Anxiety (r=0.389; p=0.006), Somatization (r=0.323; p= 0.024), Depression (r=0.602; p<0.001) and Intrusion (r=0.303; p=0.034).

3.2. Change in health and lifestyle habits: impact of COVID-19 on the general population

3.2.1. Alcohol behaviour

During the confinement, people responding to AUDIT-C have reported drinking patterns and alcohol risk categories. When examining drinking categories, 27,5% were classified as harmful or hazardous drinkers, the 44,6% as low-risk drinkers and the 27,9% as non-drinkers (see **table 1**). Results evidenced a small reduction of harmful drinking (Before: 32,5% vs During: 27,5%) and an increase of non-drinkers (Before: 24,1% vs During: 27,9%) (p<0.001) when these latter are compared to the period before COVID-19.

Among the current drinkers, the 8,1% reported binge drinking in the previous year at least once, the 5,7% reported binge drinking on a monthly frequency, the 1,9% on a weekly basis and the 0,7% binged daily or almost daily. Due to the coronavirus outbreak there was an increase of people responding "Never drink six or more standard drinks on one occasion" (Before: 77,6% vs During: 83,5%), but the frequent heavy drinking remained constant (p<0.001).

The evaluation of motives for alcohol consumption evidenced that the period of confinement gave rise to a decrease of motivations for people drinking for Social (drinking to improve parties or gatherings) (p<.001) and Conformity (drinking due to social pressure or a need to fit in) (p<.001). No differences were found for Enhancement (drinking to maintain or amplify positive affect) and Coping (drinking to avoid negative affect) motivations. Results on motivation for drinking evidenced a decrease in the motivation related to social relationships, but not a change in the internal motivation connected to positive or negative affect.

Regarding the craving, measured with a Visual Analogue Scale (VAS), harmful or hazardous drinkers reported a higher level of desire to drink (4,37±2,69) than low risk drinkers (1,87±2,12), ($F_{(2,418)}$=124,074; p<0.001).

No differences were found among no drinkers, low risk and harmful or hazardous drinkers in psychopathological symptomatology evaluated with BSI-18, IES-R, ISI and PSS-10. On the contrary, when comparing the risk of alcohol consumption with stress factors during

the confinement, results shown a higher score to the AUDIT-C in male (8,0±0,48) having someone death for COVID-19 than women (2,50±0,58), (Interaction Gender x Stress Factor: $F(1,418)=5,809$; $p=0.016$).

3.2.2. Smoking behaviour

The majority of the sample have never smoked (50,4%), the 33,4% were cigarette smokers while people who have quitted smoking were the 16,2%. The average of cigarettes smoked were 11 (sd 7,14). Among smokers the 76,4% had a low level of dependence, the 17,9% had a moderate level while the 5,7% had a high level of dependence (see **table 1**). The average craving for smoke was 6,10 (sd 2,80) for active smokers and 2,78 (sd 2,94) for people who quitted smoking.

Concerning the psychopathological symptomatology, active smokers and people who quitted smoking reported higher levels of Anxiety ($F(2,418)=3,890$; $p=0.021$), Depression ($F(2,418)=4,536$; $p=0.011$) and Somatization ($F(2,418)=4,106$; $p=0.017$), higher symptoms of PTSD as Avoidance ($F(2,418)=4,074$; $= 0.018$), Hyperarousal ($F(2,418)=4,023$; $p=0.019$) and Perceived Stress ($F(2,418)=3,490$; $p=0.031$) when compared to non-smokers.

Moreover, 40% of active smokers also shown harmful or hazardous consumption of alcohol, and smoking people and people who quitted smoking reported high levels of craving versus alcoholic beverage ($F(2,418)=8,957$; $p<0.001$; mean smokers: 2,58±2,64; mean quitted smokers: 2,66±2,64) and high scores on AUDIT-C ($F(2,418)=16,979$; $p<0.001$; mean smokers: 2,44±2,06; mean quitted smokers: 2,43±1,86) with respect non-smokers (1,56±2,33 for craving and 1,43±1,49 for AUDIT-C score). On the contrary, harmful or hazardous drinkers did not present craving for smoke or an increased number of smoked cigarettes.

3.2.3. Eating behaviour and physical activity

Regarding the eating behaviour changes during the COVID-19 lockdown, most of the population declared healthier eating habits, particularly said to spend the mealtime at home and to skip no meals. Weight gain was observed only in the 22.6% of the population, the 7,7% viewed their BMI to be reduced and the 69,7% did not have variations in weight.

Concerning the unhealthy eating habits, there was a significant increase of people who always had lunch in front of the computer, the television or other technological devices (from 41,1% to 46,3%) and a significant increase of people who consumed junk food very frequently or who grazed in front of the computer, the television or other technological devices (from 10,8% to 18,2%).

One way Analysis of Variance shown that people who more frequently exhibited eating pattern of grazing, during the confinement, also reported higher symptoms of Anxiety ($F(2,410)=3,275$; $p=0.039$), Depression ($F(2,410)=5,473$; $p=0.005$), moreover, higher symptoms of PTSD as Avoidance ($F(2,410)=3,565$; $p=0.029$), Intrusion ($F(2,410)=5,297$; $p=0.005$) and Hyperarousal ($F(2,410)=6,236$; $p=0.002$) and finally an higher desire to smoke ($F(2,410)= 3,664$; $p=0.027$).

Concerning the vigorous physical activity, the interviewed declared a reduction in the frequency of the training in the period of the emergency (39,9%) with respect to the previous period (46,2%). In addition, people who did not train during COVID-19 lockdown (60,2%) were less than the ones who did not train at all in the period before (53,8%). Similarly, regarding the moderate physical activity, the frequency of this latter showed a reduction during the lockdown (79,6%) with respect to the previous period (88,1%).

Now, concerning the psychopathological symptomatology, people who moderately train reported higher levels of Depression (F(1,409)= 4,107; p = 0.043; means: 1,19±0,97 versus 0,99±0,77) and a higher number of smoked cigarettes (F(1,409)= 4,320; p = 0.040; means: 13,64±10,38 versus 10,40±6,11) when these ones are compared with people who do not train at all.

4. Discussion

The present study investigated the impact of the Italian restriction measures on the psychological well-being, stress and health habits during the lockdown, with a focus to the last two weeks of the phase one. We evaluated the presence of stress, psychopathological symptomatology and posttraumatic stress symptoms and the association with the changes in lifestyle and health habits (eating habits, physical activity, smoking and alcohol consumption) on the Italian general population, afterward the strict and hard phase of home confinement. Participants who completed an online survey were 419, mainly of female gender, particularly they had a high educational level, while the number of people who declared work or economic problems was small, finally the 56,1% did not change and increased the economic situation. Nevertheless, our primary findings demonstrated that the 76,6% of participants have reported moderate or high levels of stress and the major stressors were the difficulty in carrying out daily activities and the social distancing from family and other significant people, nonetheless the loss or reduction in working, the constraint to live in a place where they do not want to be and the difficulties related to the smart working and to the learning at home of their sons. Only 4 participants did not present any stressors, and the remaining sample reported from one to five stressors.

People who showed the highest stress levels significantly reported lower mental health, like the presence of depressive, somatization and anxiety symptoms, insomnia and the three distinct symptoms cluster of Post-Traumatic Stress Disorder: Avoidance, Hyperarousal and Intrusion. Females were mainly affected by these symptoms, whilst young people reported higher depressive and anxious symptoms. Furthermore, data showed that participants older than 60 reported higher mental wellbeing even though they had a high risk for physical health due to pandemic. Moreover, single and divorced, unemployed people, housewives, students, people who lost their work or had a large reduction in economic situation presented more anxiety, depression and posttraumatic symptoms. Other studies demonstrated that the perceived negative impact of the pandemic on livelihood gave rise to mental health problems (Guo et al., 2020).

It is necessary to highlight that in our sample an important impact on mental health was given by the discomfort felt for living with other people or living alone. Sure, the higher the discomfort the higher the symptomatology. Findings related to people living with others evidenced higher stress and symptoms of depression, anxiety, somatization and the three posttraumatic symptoms cluster, on the other hand, people living alone showed higher anxiety, somatization and intrusion, and particularly also high depressive symptoms. No significant association between the number of people living together and the psychopathological symptomatology was found. At the best of our knowledge, no other studies have investigated the discomfort experienced in living with others or staying alone during the lockdown restrictions.

No significant impact on perceived stress and mental health was due to risk factors directly related to COVID-19, indeed, the 4,10% considered as a stressor the fact to have a family member affected or killed (1,20%) by COVID-19. It is worthwhile to mention that in our sample

only 3 people contracted the COVID-19.

The present study also examined the changes in health behaviors of smoking and alcohol use, eating behaviors and physical activities during the pandemic and the association between health behaviors and stress and mental health.

During the social isolation, people declared harmful or hazardous drinking (27,5%), low-risk drinking (44,6%) and non-drinking (27,9%). These results were compared with Istat data from 2019 on alcohol consumption in Italy and the latter indicated that the 66.8% of people aged from 11 onwards have consumed alcoholic beverages in the last year, the 20.2% every day, the 46.6% occasionally and the 33.2% have never consumed alcohol (Istat, 2020). In our sample there was a small reduction in harmful drinking (5%) and a small increase of non-drinkers (3,8%) by looking at a comparison between the actual consumption and the period before COVID-19. Other studies have found a reduction in alcohol consumption since the beginning of spread of COVID-19, this was probably due to the closures of social meeting places, such as bars, restaurants, discotheques and the difficulties of alcohol purchases as non-primary goods (Stanton et al., 2020; The Lancet Gastroenterology & Hepatology, 2020).

In addition, our results evidenced a reduction of binge drinking which occasionally occurred (5,3%), rather in people who frequently binged before we observed a dysfunctional behavior which remained constant during the confinement period. Note also that regarding these findings, it is important to keep in mind that in the third question of AUDIT-C binge drinking is considered six or more standard drinks on the same occasion, so this might lead to an underestimation of the proportion of hazardous drinkers and an underestimation of the alcohol consumption level, this is not in accordance with the National Institute on Alcohol Abuse and Alcoholism (NIAAA) and Substance Abuse and Mental Health Services Administration (SAMHSA) indicators.

Previous studies conducted in the era of SARS showed altered alcohol consumption patterns during the confinement, in particular, alcohol misuse was related to the fact of working in health care services during the epidemic, the exposure to the virus and the consequent isolation were identified as risk factors (Wu et al., 2008). On the other hand, having family members affected or killed by SARS, or also being exposed to news about the epidemic, were not related to alcohol abuse and dependence (Wu et al., 2008). In our sample it is important to highlight that people using alcohol for social motives reduced the alcohol assumption, while the internal motivation of individuals who essentially drink for Enhancement, say drinking for augmenting positive mood states, or Coping, namely drinking for alleviating negative mood, have not changed. These data suggest that a group of participants adopt maladaptive coping strategies in order to manage positive and negative emotions and mood states by following unhealthy drinking behaviours. In addition, they established potentially dangerous patterns of alcohol consumption during lockdown where the latter could increase the risk of developing alcohol dependence in stress situations, as suggested by the literature (Temmen and Crockett, 2018; Thomas et al., 2014). Consequently, harmful intake of alcohol leads to neuroadaptations which exacerbate alcohol cravings during times of stress (Koob and Kreek, 2007). Therefore, social isolation, coupled with changes in employment and economic status or other domestic stressful situations, may trigger an increase in alcohol intake for vulnerable individuals (Clay and Parker, 2020). People who showed alcohol adaptation increased susceptibility to stress, alcohol induced negative symptoms and alcohol seeking and desire. All of these can facilitate excessive ingestion of alcohol (Breese et al., 2011). For these reasons, in our sample higher craving and desire for alcohol intake was declared by people with harmful or hazardous alcohol consumption, although no significant association with psychopathological symptomatology was found.

The 33,4% of survey respondents were smokers. It happens that this percentage is more than the 23,3% prevalence of smoking recently reported among Italian adults (Ministero della Salute, 2020). The 16,2% quitted smoking during the last year. According to the previous researches (Dedert et al., 2018; Rodríguez-Cano et al., 2018), evidences from our data suggested a significant association between active smokers and people who quitted smoking with higher levels of Anxiety, Depression and Somatization, higher symptoms of PTSD, in particular Hyperarousal and Avoidance, and a high rate of perceived stress than non-smokers. They both showed the desire to smoke. Almost 40% of active smokers also responded to harmful or hazardous alcohol consumption, then people who smoke and quitted smoke reported high levels of craving versus alcoholic beverage and a high score on AUDIT-C. Individuals reported increase in cigarette craving as a consequence of emotionally distressing events, also associated with other consummatory behavior such as eating food and drinking alcohol, nonetheless for alcohol and appetitive craving (Rodríguez-Cano et al., 2018; Veilleux and Skinner, 2015). According to the literature, alcohol consumption increases cigarette craving among heavy drinking smokers (Lim et al., 2018) but in our sample harmful or hazardous drinkers did not refer to craving for smoke or more cigarettes smoked. Cigarette smoking is likely a coping strategy to alleviate stress and psychological problems, also stress can induce craving for nicotine (Kasdovasilis et al., 2019). Moreover, studies evidenced that individuals with higher anxiety presented craving for cigarettes and greater smoking to cope behaviors (Watson et al., 2018).

Concerning the eating behaviour, participants declared a positive change in healthy habits, like having lunch at home. This is obviously due to the impossibility to eat outside during the confinement. They also declared to regularly do the three daily main meals. The majority of participants, about 70%, did not have weight variations and only the 22,6% of the population put on weight. However, participants also exhibit a positive augmenting of unhealthy eating habits, such as eating in front of the computer, television or other technological devices along with an increased snacking and grazing. It is well known that stress leads subjects towards overeating, especially junk or comfort foods, this is defined as food craving (Sinha, 2018). Moreover, the absence of clear routines and markers of time and space, such as mealtimes or separations between home and work areas, may increase the risk of unhealthy eating behaviours, and this happens by letting fall the structures supporting eating plans. This also leads to increased snacking and grazing behaviour during the isolation (Rodgers et al., 2020). It is well known how the experience of negative emotions can lead to overeating. The so- called emotional eating lead to unhealthy eating behaviour (Litwin et al., 2017; Steinsbekk et al., 2018) and the interrelations between food and smoke craving (Meule et al., 2018; Rodríguez-Cano et al., 2018; Veilleux and Skinner, 2015). In this regard, we found that people who grazed have reported negative psychological and emotional responses to the COVID-19 outbreak as anxiety, depression, posttraumatic stress disorder and craving for smoking. In order to contrast the negative experience of confinement, people could be more prone to look for reward and gratification or to avoid monotony by means of the physiologically associated food consumption.

People who did not moderately train during the lockdown could show depressive symptomatology and a high number of smoked cigarettes. Research has consistently shown that regular physical activity may protect against the development and maintenance of depression and anxiety, whereas sedentary behaviour may exacerbate depression in patients with substance use disorders (Tull et al., 2018). Additive effects of smoking and low levels of physical activity were reported in the literature (Jackson et al., 2019), then physical activity may be a factor to consider in evaluating risk for depression and emotional distress during the confinement.

Finally, we mainly discovered that the social isolation and the difficulty to carry out daily usual activities and worries that are not only confined to economic and working problems could produce a higher level of perceived stress in over two thirds of the population. Moreover, in stressed people there was an association with depression, anxiety, depression, insomnia and posttraumatic stress disorder symptoms. Furthermore, lifestyle may result substantially changed due to the containment measures, with the consequence to increase the risk of augmenting smoking and alcohol habits, overeating and sedentary behaviours, as coping strategies in order to alleviate the stress and the psychological distress caused by the lockdown. It is necessary to highlight the importance of each of these lifestyle risk behaviours for psychopathological disease onset or maintenance.

This study suggests that people during the lockdown tried several strategies to cope with psychological distress and exhibit the presence of maladaptive unhealthy behaviours, associated with psychological problems, that could be potential risk factors for possible long-term mental health effects.

Recently, a meta-analysis evidenced high levels of both posttraumatic and psychological stress associated with COVID-19. Findings suggested that about one-in-four adults require mental health services during the ongoing pandemic. While elevations in stress during a global pandemic are to be expected, the long-term implications of these elevations are cause for concern. In fact, elevations in stress are risk factors or precipitants for the onset of comorbid mental health difficulties such as anxiety, depression, or substance use and can also lead to accelerated disease processes and the exacerbation of chronic health conditions (Cooke et al., 2020).

Other studies suggested that pandemic impacted majorly on women, young and families with young children. For example, family stress includes balancing work with childcare/homeschooling and financial instability (Carroll et al., 2020). Young women in particular are being exposed to the economic fallout, especially those women in their 20s, wanting more work and more hours (Churchill, 2020). Women, students and the population with a lower level of economic income, in addition to those having less available space per person in the household presented a more significant psychological impact and worse mental health (Parrado-González & León-Jariego, 2020).

Our results provide evidence necessary to implement future public health strategies with the aim to manage psychological outcomes due to lockdown, such as income supplements, childcare, and development of broadly available prevention and intervention programs that promote stress-reduction strategies such as healthy eating, physical activity, and good sleep habits.

Limitations

The research carried out in our paper has several strengths and limitations. First of all, we have a high number of females and a sample with a higher educational level. There could be a sort of selection bias in the sample. We were unable to interview participants *de visu* so we used online self-report scales which exclude people with low familiarity with technological devices. On the other hand, the psychological distress was assessed in the peak of the restrictive rules by proposing a long survey with a lot of questionnaires that allow to detect psychological sufferance with validated instruments.

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