Forced social isolation and mental health:

A study on 1006 Italians under COVID-19 lockdown

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Abstract

Countries are tackling the spread of the COVID-19 pandemic imposing people to social isolate. However, this measure carries risks for people's mental health. This study evaluated the psychological repercussions of objective isolation in 1006 Italians locked down. Although varying for the regional spread-rate of the contagion, results showed that the longer the isolation and the less adequate the physical space where people were isolated, the worse the mental health (e.g., depression). Offline and online social contacts could buffer the adverse effects of social restrictions. However, when offline contacts are limited, online contacts can protect mental health from isolation. The findings could speak about the possible temporal evolution by which the length of isolation is associated with worse mental health. Moreover, the results outlined the downsides of the massive social isolation imposed by COVID-19 spread, highlighting risk factors and resources to account for in the implementation of such isolation measures.

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From March 2020, the COVID-19 pandemic has been forcing more than one billion people to be confined to their homes. Social distancing has been adopted by most of the affected countries, including Italy, the first western country hit by the virus. The rapid spread of the COVID-19 forced the Italian government to apply drastic measures to tackle the contagion. In Northern Italy, schools and universities have been closed since the end of February 2020, with the government strongly encouraging people to stay at home. As the contagions increased, the government enacted a decree at the beginning of March 2020, imposing a lockdown to the whole country, aimed at preventing the coronavirus spread both in areas in which the contagion was already critical (e.g., Lombardy) and in those with only a few cases. Besides the closure of all the non-essential activities and public gatherings, the decree prohibited people from leaving their houses unless for proven necessity, otherwise meeting harsh sanctions (e.g., fines and imprisonment). If forced isolation effectively slows down the viral spread, the concurrent effects of this massive isolation - unprecedented in recent history - on people's mental health are yet to be uncovered.

The Impact of Social and Physical Isolation on Mental Health

Social isolation refers to an *objective* physical separation from others and is different from loneliness which is a *subjective* feeling of disconnectedness (Cacioppo & Patrick, 2008). It is known that brief forms of social disconnections can induce negative emotions (such as anger and sadness), decrease satisfaction of basic psychological needs (e.g., self-esteem) and cognitive abilities. On the other side, prolonged experiences of social disconnection have been linked with an increased risk of depression, suicidal thoughts, and risk of early mortality (Baumeister & Leary, 1995; Holt-Lunstad et al., 2010). The Temporal Need-Threat Model (Williams, 2009) suggests that

people exposed to long-lasting instances of social exclusion - defined as the experience of being kept apart from others physically or emotionally (Riva & Eck, 2016) - enter a stage of psychological resignation, characterized by feelings of depression, alienation, unworthiness, and helplessness. The resignation stage links variations in mental health with prolonged forms of ostracism and exclusion, lasting for months or even years (Zadro, 2004). Other theoretical models associated outcomes such as social withdrawal with the chronicity of rejection (Smart Richman & Leary, 2009). However, within this literature, a clear temporal definition of chronicity has never been provided, although some theoretical elaborations suggested a temporal reference of three months (Riva et al., 2014). In keeping with these notions, previous studies focused on samples experiencing forms of social disconnection for a long time. Exclusion-related implications for mental health have been found either in persistently marginalized social groups - such as immigrants (Marinucci & Riva, 2020) - or on individuals with experiences of ostracism that could last for years (Zadro, 2004). Finally, the literature on loneliness has highlighted a significant relationship with mental health (Cacioppo & Patrick, 2008). However, loneliness, besides being a subjective perception, refers to a stable individual disposition, hence to a construct that again persists over time.

The lockdown caused by COVID-19 allows testing the above-mentioned theoretical models against the possibility that the effects of social disconnection on mental health may occur even for short periods. Moreover, the lockdown permits the empirical investigation of the effects of *objective* conditions of social isolation on the general population, thus controlling for confounding correlation between the individual subjective perception of social disconnectedness (e.g., loneliness) and mental health. Ultimately, it allowed us to investigate whether forcing the general population to remain isolated for a limited period could produce a drop in mental health (Miller, 2020).

Previous research on people under quarantine showed that such experience can have significant downsides (Barbisch et al., 2015; Rubin & Wessely, 2020). A recent systematic review (Brooks et al., 2020) revealed that quarantined people reported various psychological issues, such as acute stress symptoms, anxiety, insomnia, and emotional exhaustion. However, the review included studies with heterogeneous samples, such as individuals quarantined for being in contact with infected people, individuals only living in outbreak sites, and nurses and physicians directly involved in tackling the infection. Moreover, only three studies out of 24 considered the length of quarantine as a predictor of mental health. Thus, the review does not account for the psychological impact of the lockdown length imposed on the general population. Indeed, the authors highlighted that the length of the quarantine and the disruption of social connections may be responsible for the negative psychological repercussions of the quarantine, calling for further studies directly assessing the role of these potential mechanisms.

Beyond social distancing, the restrictions confining people to stay home for several consecutive days may represent a further risk factor for mental health. Indeed, the characteristics of the living space, including its size, luminosity, and the possibility of privacy, may crucially moderate people's experience of isolation (WHO/Europe, 2007). Literature suggests that an inadequate home environment (e.g., tiny apartments, low levels of natural light) can lead to both physical (e.g., respiratory morbidity) and psychological (e.g., negative feelings) consequences, compromising psychological well-being (Jones-Rounds et al., 2014). Although spending time outside might help people to cope with inadequate living spaces, the lockdown limits this opportunity and, therefore, inappropriate dwellings may worsen mental health.

The present study

The aim of this study is to test the relationship among the length of forced isolation and the adequacy of living space on mental health during the COVID-19 pandemic in Italy. We focused on mental health outcomes (e.g., depression) that previous research linked with prolonged exclusion

and isolation experiences (Williams, 2009). We tested whether the longer the forced isolation, the more negative mental health outcomes. We also tested whether the number of offline contacts available could mediate this relationship: fewer face-to-face relationships due to forced isolation could worsen mental health. Differently, online contacts could buffer the negative relationship between days of isolation and mental health. Indeed, when offline social contacts are not possible, online contacts may partially replace them (Waytz & Gray, 2018). Further, we tested whether being confined in inadequate physical spaces would be associated with worse mental health. Finally, given the high variability in the infection rate in Italy, we explored the role of the COVID-19 spread at the regional level on the tested paths.

Materials and Methods

Procedure. The survey was set up using Qualtrics© (Provo, UT, USA). The study was advertised on various social media with a brief post explaining our general aim (i.e., investigate habits and psychological well-being during the COVID-19 pandemic), providing the link to the online survey. Once clicked on the link, participants were initially presented with the information sheet and consent form approved by the Ethics Committee of the University in which the research was conducted. Data were collected after the enactment of the lockdown by the Italian government (March 9th), specifically between March 12th and 27th, 2020.

Materials. The Qualtrics platform automatically gathered the date of survey completion and the geographical area in which the survey was compiled. The date of completion of the survey was used to compute the number of days since the official lockdown, which was considered the main proxy for social isolation length. Thus, the first day of data collection (March 12th) was coded 4 (four days from the beginning of the lockdown on March 9th) and the last day (March 27th) was coded 20. The location was used to objectively assess the level of contagion in the region where participants lived, on the date of survey completion. Specifically, for each participant, we computed the daily percentage of regional COVID-19 positive individuals over the total infected in the Italian

population, based on the official data of the Italian public safety department (Dipartimento della Protezione Civile, 2020).

Beyond sociodemographic information (i.e., gender, age, nationality, occupation, education, number of people living with participants), the survey included the following measures.

Mental Health Issues. Based on Williams' theory (Williams, 2009), mental health issues were evaluated measuring the four long-term negative consequences of social isolation, namely depression, unworthiness, alienation, and helplessness. Following the procedure of previous research (Marinucci & Riva, 2020; Riva et al., 2017), we selected a subset of five items from psychometrically valid scales measuring the four constructs, to keep the measure as short as possible. Item selection was primarily based on items loading (i.e., the highest the better) and trying to avoid overlaps with items measuring other constructs. Participants were asked to indicate how often the events reported by the 20 items occurred during the last week, from 1 (not at all) to 7 (always). Items measuring depression derived from the Depression Anxiety and Stress Scales (α = .89; sample item: “I felt down-hearted and blue”; Henry & Crawford, 2005). Items measuring unworthiness derived from the Rosenberg Self-Esteem Scale (α = .78; sample item: “At times, I thought I am no good at all”; Rosenberg, 1965). Items measuring alienation derived from the Social Connectedness Scale (α = .82; sample item: “I felt disconnected from the world around me”; Lee & Robbins, 1995). Items measuring helplessness derived from the Beck Hopelessness Scale and the Beck Depression Inventory-II (α = .87; sample item: “My future seemed dark to me”; Beck et al., 1974, 1996). Scores of mental health issues were computed as the mean of the 20 items and showed excellent internal consistency (α = .93).

Offline and Online Social Contacts. Quantity and quality of social contacts were measured separately for offline (i.e., face-to-face) and online (i.e., mediated by phone and social media) contacts, using a listing procedure adopted in prior research (Marinucci & Riva, 2020; Page-Gould, 2012). Specifically, participants were asked to list up to 10 persons they had interacted with during

the previous week and to rate how close they felt to each of them on a Likert scale ranging from 1 (not close at all) to 5 (extremely close). A final check question was included for both offline and online contacts. Specifically, if participants did not fill in any entry of the list, they were asked if it was intended (meaning that they had 0 offline or online contacts) or if it was a mistake. In this latter case, participants were asked to go back and fill in the list. Scores were computed as the sum of closeness rates for each person reported, obtaining two separate indices for offline and online contacts, respectively. Based on the check questions, scores of 0 were given to participants who left the list blank on purpose. Offline and online social contacts were randomly presented to the participants to control for possible order effect.

Space Adequacy. Three items were developed ad hoc to measure the adequacy of the space where participants were currently living. Participants were asked to rate how adequate were the (1) size, (2) brightness, and (3) privacy of their living space on a Likert scale ranging from 1 (not at all) to 7 (extremely). The space adequacy score was computed as the mean of the three items and showed adequate internal consistency ($\alpha = .73$).

Participants. Overall, a convenience sample of 2470 persons accessed the online study. However, 328 participants only opened the link and 22 did not give their consent, thus they did not fill in any question, reducing the sample size to 2120. Among these participants, 783 did not complete one or more independent variables (i.e., gender, age, space adequacy), further reducing the sample to 1337 individuals. Then, metadata on location were not automatically collected for 91 participants, whereas 11 participants compiled the survey abroad (i.e., outside Italy), thus the sample was further reduced to 1235 cases. A final reduction was done based on the answers to offline and online contacts questions. Specifically, for both offline and online contacts, cases were excluded if at least one of the following conditions was met: (1) at least one entry clearly referred to multiple persons (e.g., “relatives”, “friends”, “colleagues”); (2) at least one entry that missed either

the reference to a specific person or closeness rating; (3) all the entries were left blank and the participant declared it was not done on purpose.

Forty-nine participants did not meet at least one of the above criteria for offline contacts, 105 for online contacts, and 75 for both offline and online contacts. Thus, the final sample on which the analyses were conducted consisted of 1006 participants. The sample size was considered appropriate for the planned analysis, given that it largely exceeded the Kline's recommendation of 20 cases for each estimated parameter in a structural equation model (Kline, 2015). The sample was unbalanced for gender, including 807 females (80.2%), with an age range between 18 and 75 years, $M = 29.57$, $SD = 10.89$, and consisted of 984 participants of Italian nationality (97.8%). Concerning occupational status, 581 participants were employed (57.8%). Concerning education, 508 participants (50.5%) had a bachelor's degree or a higher education level, 463 (46.0%) a high school degree, and 35 (3.5%) a lower education level. The number of people living with participants ranged between 0 and 9, $M = 2.22$, $SD = 1.31$ (two participants did not answer this question).

Preliminary Analysis. The regional percentage of COVID-19 positive cases over the total number of infected in the Italian population ranged between 0.23% and 58.28%, $M = 31.86$, $SD = 23.20$. According to the regional severity of contagion, the sample was split into a "low contagion" (LC) subsample (n = 414), range: 0.23% – 13.94%, $M = 4.73$, $SD = 4.75$, and a "high contagion" (HC) subsample (n = 592), range: 43.71% – 58.28%, $M = 50.83$, $SD = 4.85$. Descriptive statistics of and comparison between the two subsamples on sociodemographic characteristics and predictor variables are presented in Table 1. All the variables did not differ between the two subsamples, except the number of people living with participants and days of forced social isolation. Specifically, compared to LC, HC participants lived with more people and completed the survey almost one day before, on average. However, these differences were associated with small effect sizes, thus they were considered negligible. All data and the codebook are available at https://osf.io/xb8yj/?view_only=966abafccc844b99924da85be3f76272.

Table 1. Descriptive statistics of and comparison between the low and high contagion subsamples.

	Low Contagion (n = 414)	High Contagion (n = 592)	Inferential Statistic	Effect Size
Gender			$\chi^2(1) = 3.19$, $p = .074$	$\varphi = .06$
Males	93 (22.5%)	106 (17.9%)		
Females	321 (77.5%)	486 (82.1%)		
Age	29.55 (10.82)	29.58 (10.95)	$t(1004) = 0.05$, $p = .96$	$d = .003$
Nationality			$\chi^2(1) = 0.001$, $p = .98$	$\varphi = .001$
Italian	405 (97.8%)	579 (97.8%)		
Other	9 (2.2%)	13 (2.2%)		
Occupation			$\chi^2(1) = 0.01$, $p = .93$	$\varphi = .003$
Employed	240 (58.0%)	341 (57.6%)		
Not employed	174 (42.0%)	250 (42.2%)		
Education			$\chi^2(2) = 1.84$, $p = .40$	$\varphi = .04$
< High school	17 (4.1%)	18 (3.0%)		
High school	197 (47.6%)	266 (44.9%)		
≥ Bachelor	200 (48.3%)	308 (52.0%)		
People living with participants	2.10 (1.32)	2.31 (1.30)	$t(1002) = 2.47$, $p = .014$	$d = .16$
Social Isolation	10.57 (4.90)	9.73 (4.64)	$t(1004) = 3.01$, $p = .003$	$d = .19$
Space Adequacy	4.84 (1.43)	4.95 (1.38)	$t(1004) = 1.23$, $p = .22$	$d = .08$

Note. Number of cases and percentages within the subsample (in brackets) were reported for categorical variables (i.e., gender, nationality, occupation, education), mean (and standard deviation) for the other variables.

Results

A multi-group path analysis investigated the association of social isolation length and space adequacy with quarantine mental health issues and whether these relationships were mediated by offline and online contacts, estimating separate models for participants in low contagion (LC; n = 414) and high contagion (HC; n = 592) areas. Gender and age were entered as further predictors of the two mediators and the outcome, to control for their effect. The analysis was run using Mplus, version 7 (Muthén & Muthén, 2012). The model is graphically depicted in Figure 1; the complete

list of parameters is reported in Table 2. The variance of mental health issues explained by the model was .23 for LC and .14 for HC.

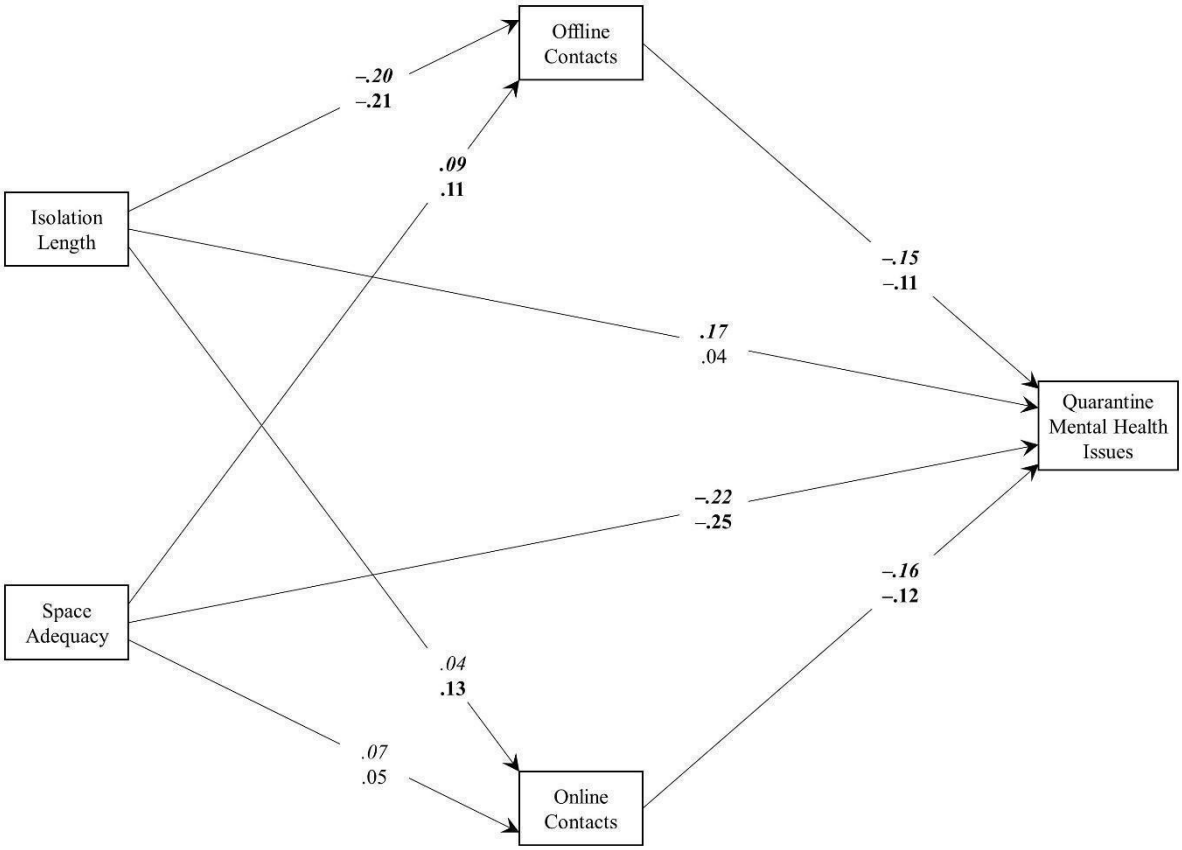

Fig. 1. The results of the multi-group path analysis model. Parameters for the LC and HC subsamples are reported in italics and plain text, respectively. Parameters in bold are significant at level $p < .05$.

Table 2. The results of the multi-group path analysis.

	Low Contagion (*n* = 414)			High Contagion (*n* = 592)		
	β	95% C.I.	*p*	*β*	95% C.I.	*p*
Regressions						
Isolation length → QMHI	.17	.08, .26	<.001	.04	–.04, .12	.278
Space adequacy → QMHI	–.22	–.31, –.14	<.001	–.25	–.32, –.18	<.001
Offline contacts → QMHI	–.15	–.24, –.06	.001	–.11	–.19, –.03	.005
Online contacts → QMHI	–.16	–.24, –.07	<.001	–.12	–.20, –.05	.001
Gender → QMHI	.01	–.08, .09	.860	–.05	–.13, .02	.181
Age → QMHI	–.20	–.29, –.12	<.001	–.13	–.21, –.06	.001
Isolation length → Offline contacts	–.20	–.29, –.10	<.001	–.21	–.28, –.13	<.001
Space adequacy → Offline contacts	.09	–.004, .18	.059	.11	.03, .19	.006
Gender → Offline contacts	.12	–.03, .22	.010	.06	–.02, .14	.143
Age → Offline contacts	.03	–.06, .13	.493	–.03	–.11, .05	.514
Isolation length → Online contacts	.04	–.05, .14	.360	.13	.05, .21	.001
Space adequacy → Online contacts	.07	–.03, .16	.155	.05	–.03, .13	.195
Gender → Online contacts	–.08	–.17, .02	.103	–.04	–.12, .04	.377
Age → Online contacts	.19	.10, .29	<.001	.07	–.02, .15	.109
Correlations						
Offline contacts – Online contacts	.16	.06, .25	.001	.12	.04, .20	.002
Intercepts						
QMHI	4.29	3.85, 4.73	<.001	4.60	4.23, 4.97	<.001
Offline contacts	1.60	1.13, 2.07	<.001	1.67	1.29, 2.06	<.001
Online contacts	1.30	0.81, 1.79	<.001	1.48	1.08, 1.88	<.001
Residual variances						
QMHI	.77	.70, .84	<.001	.86	.81, .91	<.001
Offline contacts	.93	.88, .98	<.001	.95	.91, .98	<.001
Online contacts	.95	.91, .99	<.001	.97	.95, 1.00	<.001

Note. All the parameters were standardized. The column "coeff." reports β for regressions and Pearson r for correlations. Gender was coded as 0 for females and as 1 for males. QMHI = Quarantine mental health issues.

While space adequacy was negatively associated with mental health issues for both LC and HC participants, social isolation had a significant, direct effect on it only for the LC subsample: the longer the isolation, the higher the quarantine mental health issues. Moreover, the direct effect of space adequacy on mental health issues was significantly higher than that of isolation length for both LC, $\Delta b = .23$, $p < .001$, and HC, $\Delta b = .21$, $p < .001$. Both offline and online social contacts had significant negative associations with mental health issues, irrespectively from the level of contagion. For both LC and HC participants, (a) the longer the social isolation, the less the offline contacts, and (b) the worse the space adequacy, the fewer the offline contacts. Conversely, the only significant association of online contacts was with the length of isolation, which showed a positive effect only for the HC subsample.

Mediation paths were evaluated using the bootstrapping technique, computing the 95% confidence interval based on 5,000 resamplings. Concerning the LC subsample, offline contacts significantly mediated the relationship between social isolation and the outcome, $\beta = .029$, 95% C.I. [.006, .051], meaning that the negative association between forced isolation and mental health was partially due to reduced face-to-face contacts. The total effect (i.e., direct plus indirect effects) of the length of isolation on quarantine mental health issues was significant and positive, $\beta = .191$, 95% C.I. [.108, .275]. Conversely, offline contacts did not mediate the link between space adequacy and mental health issues, $\beta = -.013$, 95% C.I. [-.029, .002], and no indirect effects through online contacts were found (social isolation: $\beta = -.007$, 95% C.I. [-.022, .008]; space adequacy: $\beta = -.011$, 95% C.I. [-.027, .005]).

Concerning the HC subsample, both offline, $\beta = .023$, 95% C.I. [.005, .041], and online, $\beta = -.016$, 95% C.I. [-.031, -.001], contacts were significant mediators of the relationship between social isolation and the outcome. This means that, if fewer and less satisfying face-to-face contacts might decrease mental health due to forced isolation, quantity and quality of online contacts might buffer the negative consequences of social isolation. The total effect (i.e., direct plus indirect effects) of

the length of isolation on quarantine mental health issues was not significant, β = .049, 95% C.I. [-.023, .122]. This was likely due to the two mediation effects that had opposite sign. Offline contacts, β = -.012, 95% C.I. [-.024, .000], and online ones, β = -.007, 95% C.I. [-.018, .005], did not significantly mediate the link between space adequacy and mental health issues.

Discussion

The COVID-19 pandemic led many nations to impose severe social restrictions on their citizens. Although this measure contains the spread of the virus, it could also have significant repercussions on people's mental health.

Our data, based on 1006 respondents in Italy, showed that even a rather limited period of forced isolation can be associated with lower mental health constructs typically considered rather stable, especially in areas experiencing relatively low levels of contagion. These findings challenge and advance existing theoretical models on the consequences of different instances of social disconnectedness. Indeed, existing theories predict health consequences only concerning pervasive and long-lasting experiences of rejections and ostracism. Although the research design did not allow making causal inferences, the present findings indicated that, even in a relatively brief time span, social deprivation could lead to relevant repercussions for individuals' psychological well-being, showing that the longer the isolation, the worse the mental health.

Previous knowledge of the effects of long-term social isolation could be considered with what revealed by our data according to two main standpoints. First, the COVID-19, as an exceptionally extreme event in recent history, may have elicited intense feelings of fear and threat for human survival, boosting the development of psychological issues. Second, the imposed isolation can further impact mental health via a reduced sense of perceived control and agency especially in people who did not perceive the COVID-19 virus as severely threatening their existence, such as those living in low-contagion areas. Accordingly, people in low contagion areas might perceive the government's restrictions as exaggerated for their current situation, and therefore

suffer more from forced isolation. Conversely, people in high-contagion areas might better understand the need for social distancing, accepting it and feeling that their adherence to it is essential. Overall, these results suggest that governments and policymakers should take special care to explain the reasons for forced isolation in areas where the infection rate is still low. Nevertheless, our data do not allow a direct test of these speculations; thus, future studies should investigate the plausibility of the interpretations above.

Our results suggested a potential mechanism that should be further tested with a longitudinal design and that links the length of isolation with quarantine mental health issues, depending upon the spread of contagion in the area of residence and varying degrees of face-to-face and online connections. Indeed, the longer the isolation, the fewer the face-to-face contacts, and the more negative the mental health outcomes. However, in high-contagion areas, we found a positive association between isolation length and online social contacts. Likely, the restrictions to face-to-face contacts could have lead people to seek more online connections, which seemed to act as a buffer against the negative impact of social restrictions. This did not occur in low-contagion areas. This finding concurs with the above speculation in explaining the direct and stronger relationship between the length of isolation and mental health in low-contagion areas. Thus, it is possible that, compared to participants in low-contagion areas, the higher perception of threat could have prompted those in high-contagion areas to search (and provide) social support through online contacts, protecting them from the adverse effect of isolation length. This interpretation is consistent with studies on the beneficial impact of online social contacts in disadvantaged individuals (e.g., physically restricted elderly; Delello & McWhorter, 2015) and people facing health challenges (e.g., breast cancer patients; Fogel et al., 2002), indicating that previous results might be broadened to the general population. Moreover, our results enrich the ongoing debate on the role of social networking sites on well-being, which is at least controversial and primarily focused on their negative effects (Kuss & Griffiths, 2017). Several authors highlighted the risks of

the screen time - also encompassing social networking - for mental health given that the time spent online reduced the commitment in offline activities and interactions (Twenge et al., 2018). Conversely, the present results suggest that online social connections can replace the supportive effect of face-to-face interactions, especially when the latter are not available and in time of uncertainty and mass threat.

Crucially, we also found a key role in space adequacy in both low- and high-contagion areas. Indeed, the more adequate the space where participants were confined, the less mental health issues. Moreover, this association was even stronger than that between the length of isolation and mental health. This result underlines the role of economic inequalities in relation to people's psychological well-being, suggesting that people who have the opportunity to live in relatively large and bright houses, guaranteeing privacy, suffer significantly less the adverse effects of quarantine. Inevitably, special attention should be devoted when considering the impact of forced isolation for those living in inadequate dwellings.

There are some limitations regarding the current study. The main limitation concerns its cross-sectional design. Although we have followed the evolution of the most critical phase of the pandemic over multiple days, this does not exclude that third variables (e.g., increased fear of infection) may account for the effects we have found. Moreover, some of the self-reported scales we used might have issues of validity. For instance, the space adequacy scale was created ad-hoc based on some of the fundamental dimensions reported in the literature (i.e., size, luminosity, and privacy). Future studies might consider a wider range of variables to control for potential confoundings and adopt more comprehensive and previously validated instruments.

Beyond the advancement of the psychological impact of the COVID-19 quarantine, the present work provided contributions at both the theoretical and empirical levels. At the theoretical level, none of the existing theories would predict that only a few days of social distancing would cause, under specified conditions, a drop in the mental health of the general population. Previous

theoretical works debated about similar effects in relation to months or even years of prolonged ostracism and rejection experiences (Williams, 2009). Moreover, although our results are consistent with the literature on loneliness (Cacioppo & Patrick, 2008), our data concern an objective situation (i.e., number of days of isolation) rather than a subjective and stable experience. Empirically, the exceptional nature of the COVID-19 pandemic made it possible to study an objective form of social isolation on a large scale, instead of limiting the research on certain marginalized social groups (e.g., Marinucci & Riva, 2020). Moreover, the assessment of the level of contagion based on official, objective reports related to the participants' geographical area and the exact day of survey completion, can be considered a strength of the present study.

Overall, this study suggests that restricting the mobility of people, although essential to slow the spread of the infection, can put a significant strain on people's mental health on a scale unprecedented in recent history. Thus, in addition to trying to slow the spread of the pandemic, we must work to make multiple forms of psychological support available to manage the most critical situations, that is, those who have (a) few face-to-face contacts, (b) limited ability to use online contacts as buffers, and (c) inadequate physical spaces to live in.

References

Barbisch, D., Koenig, K. L., & Shih, F. Y. (2015). Is there a case for quarantine? Perspectives from SARS to Ebola. *Disaster Medicine and Public Preparedness*, *9*, 547–553. https://doi.org/10.1017/dmp.2015.38

Baumeister, R. F., & Leary, M. R. (1995). The need to belong: Desire for interpersonal attachments as a fundamental human motivation. *Psychological Bulletin*, *117*(3), 497–529. https://doi.org/0033-2909

Beck, A. T., Weissman, A., Lester, D., & Trexler, L. (1974). The measurement of pessimism: The Hopelessness Scale. *Journal of Consulting and Clinical Psychology*, *42*(6), 861–865. https://doi.org/10.1037/h0037562

Beck, A. T., Steer, R. A., & Brown, G. K. (1996). *Manual for the Beck Depression Inventory-II.* San Antonio, TX: Psychological Corporation.

Brooks, S. K., Webster, R. K., Smith, L. E., Woodland, L., Wessely, S., Greenberg, N., & Rubin, G. J. (2020). The psychological impact of quarantine and how to reduce it: Rapid review of the evidence. *The Lancet*, *395*, 912–920. https://doi.org/10.1016/S0140-6736(20)30460-8

Cacioppo, J. T., & Patrick, W. (2008). Loneliness: Human nature and the need for social connection. New York (NY): Norton.

Delello, J. A., & McWhorter, R. R. (2015). Reducing the digital divide: Connecting the elderly to iPad technology. *Journal of Applied Gerontology, 36*, 3-28. https://doi.org/10.1177/0733464815589985

Dipartimento della Protezione Civile. (2020). COVID-19 Italia - Monitoraggio della situazione. Retrieved March 27th, 2020, from http://opendatadpc.maps.arcgis.com/apps/opsdashboard/index.html#/b0c68bce2cce478eaac82fe38d4138b1

Fogel, J., Albert, S. M., Schnabel, F., Ditkoff, B. A., & Neugut, A. I. (2002). Internet use and social support in women with breast cancer. *Health Psychology, 21*(4), 398-404. https://doi.org/10.1037/0278-6133.21.4.398

Henry, J. D., & Crawford, J. R. (2005). The short-form version of the Depression Anxiety Stress Scales (DASS-21): Construct validity and normative data in a large non-clinical sample. *British Journal of Clinical Psychology*, *44*, 227–239. https://doi.org/10.1348/014466505X29657

Holt-Lunstad, J., Smith, T. B., & Layton, J. B. (2010). Social relationships and mortality risk: A meta-analytic review. *PLoS Medicine*, *7*, e1000316. https://doi.org/10.1371/journal.pmed.1000316

Jones-Rounds, M. K. L., Evans, G. W., & Braubach, M. (2014). The interactive effects of housing and neighbourhood quality on psychological well-being. *Journal of Epidemiology and Community Health*, *68*(2), 171–175. https://doi.org/10.1136/jech-2013-202431

Kline, R. B. (2015). Principles and practice of structural equation modeling. New York (NY): Guilford publications.

Kuss, D. J., & Griffiths, M. D. (2017). Social networking sites and addiction: Ten lessons learned. *International Journal of Environmental Research and Public Health, 14*(3), 311. https://doi.org/10.3390/ijerph14030311

Lee, R. M., & Robbins, S. B. (1995). Measuring belongingness: The Social Connectedness and Social Assurance scales. *Journal of Counseling Psychology*, *42*(2), 232–241. https://doi.org/10.1037/0022-0167.42.2.232

Marinucci, M., & Riva, P. (2020). How intergroup social connections shape immigrants' responses to social exclusion. *Group Processes & Intergroup Relations*. Advance online publication. https://doi.org/10.1177/1368430219894620

Miller, G. (2020). Social distancing prevents infections, but it can have unintended consequences. *Science News*. https://doi.org/10.1126/science.abb7506

Muthén, L. K., & Muthén, B. O. (2012). Mplus user's guide. Seventh edition. Los Angeles (CA): Muthén & Muthén.

Page-Gould, E. (2012). To whom can I turn? Maintenance of positive intergroup relations in the face of intergroup conflict. *Social Psychological and Personality Science*, *3*, 462–470. https://doi.org/10.1177/1948550611426937

Qualtrics. (2020). Qualtrics. Provo, UT, USA. Retrieved from http://www.qualtrics.com

Riva, P., & Eck, J. (2016). *Social exclusion: Psychological approaches to understanding and reducing its impact*. New York, NY: Springer.

Riva, P., Montali, L., Wirth, J. H., Curioni, S., & Williams, K. D. (2017). Chronic social exclusion and evidence for the resignation stage: An empirical investigation. *Journal of Social and Personal Relationships*, *34*(4), 541–564. https://doi.org/10.1177/0265407516644348

Riva, P., Wesselmann, E. D., Wirth, J. H., Carter-Sowell, A. R., & Williams, K. D. (2014). When pain does not heal: The common antecedents and consequences of chronic social and physical pain. *Basic and Applied Social Psychology, 36*, 329-346. https://doi.org/10.1080/01973533.2014.917975

Rosenberg, M. (1965). *Society and the adolescent self-image*. Princeton, NJ: Princeton University Press.

Rubin, G. J., & Wessely, S. (2020). The psychological effects of quarantining a city. *British Medical Journal*, *368*, m313. https://doi.org/10.1136/bmj.m313

Smart Richman, L., & Leary, M. R. (2009). Reactions to discrimination, stigmatization, ostracism, and other forms of interpersonal rejection: A multimotive model. *Psychological Review, 116*(2), 365-383. https://doi.org/10.1037/a0015250

Twenge, J. M., Martin, G. N., & Campbell, W. K. (2018). Decreases in psychological well-being among American adolescents after 2012 and links to screen time during the rise of smartphone technology. *Emotion*, *18*(6), 765–780. https://doi.org/10.1037/emo0000403

Waytz, A., & Gray, K. (2018). Does online technology make us more or less sociable? A preliminary review and call for research. *Perspectives on Psychological Science, 13*(4), 473-491. https://doi.org/10.1177/1745691617746509

WHO/Europe. (2007). *Large analysis and review of European housing and health status (LARES)*. Retrieved from http://www.euro.who.int/__data/assets/pdf_file/0007/107476/lares_result.pdf?ua=1

Williams, K. D. (2009). Ostracism: A temporal need-threat model. In M. P. Zanna (Ed.), *Advances in experimental social psychology* (Vol. 41, pp. 275–314). San Diego, CA: Elsevier Academic Press.

Zadro, L. (2004). Ostracism: Empirical studies inspired by real-world experiences of silence and exclusion (Unpublished doctoral dissertation). University of New South Wales, Sydney, Australia. Retrieved from https://www.unsworks.unsw.edu.au/primo-explore/fulldisplay/unsworks_35328/UNSWORKS