Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

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The role of online social comparison as a protective factor for psychological wellbeing: A longitudinal study during the COVID-19 quarantine

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ABSTRACT

During the COVID-19 pandemic crisis, the experience of quarantine has been an undesirable condition for people and it can have a negative impact on mental health and psychological wellbeing. Social isolation has led to an increase in time spent on social network sites, with people interacting more frequently with each other, and comparing online the way in which they are experiencing the same state of home confinement. Our study aimed to investigate the role of online social comparison on individuals' psychological distress and life satisfaction during the COVID-19-related quarantine. Specifically, a cross-lagged panel study at three-waves was conducted in Italy in order to examine the change in psychosocial distress levels (e.g. depression, anxiety, stress, loneliness, low life-satisfaction) from before the quarantine for a period of one month, as well as the predictive role of online social comparison to ameliorate individual distress. An online survey was distributed through a social media platform three times after the initial lockdown and at the epidemic's peak two and five weeks later. A total of 113 participants participated in an online survey between the 7th of March and 14th of April 2020. The results showed an increase in the levels of loneliness, depression, stress, anxiety and a decrease in the level of life satisfaction in the pre/post quarantine comparison. Our cross-lagged results also showed that online social comparison at T1 and T2 predicted the individual's improvement in levels of anxiety, stress, loneliness and life satisfaction over time. Overall, the results of the current study underline the positive effects of online social comparison on the reduction of psychological distress during the COVID-19 quarantine.

The COronaVIrus Infectious Disease 2019 (COVID-19) was first detected in November 2019 when the first case emerged in China. Since then there has been a progressive spread of the virus throughout the world, infecting millions of people and causing hundreds of thousands of deaths. On March 11th, 2020, the World Health Organization (WHO) declared a state of pandemic. Quarantine and isolation were considered the most helpful measures in containing the infection (WHO, 2020). However, the experience of quarantine is an undesirable condition and can have a negative impact on an individual's mental health and psychological wellbeing (Brooks et al., 2020). After the COVID-19 outbreak, some preliminary surveys from China showed a deterioration in psychological conditions (Cao et al., 2020; Duan & Zhu, 2020), even though research has still been lacking regarding the mental health consequences of COVID-19 over several months. Moreover, further research is needed to examine what personality characteristics can help people to cope with their distress during the pandemic (Rettie & Daniels, 2020). The current study aims to fill this gap in the literature regarding the influence of social comparison orientation (SCO) on mental health consequences caused by the COVID-19 outbreak.

As COVID-19 continues to spread, so does the research on the increasing use of social network sites (SNS) during the pandemic. This is not surprising because so many people are struggling with social isolation measures, and digital social platforms have been the only opportunity to communicate with others. Given the individual's marked involvement with SNS during quarantine, people tend to interact with each other more frequently, comparing with others the same state of social isolation they are experiencing. Consequently, online SCO has become one of the key elements of these social interactions (Robinson et al., 2019).

Prior research has demonstrated that self-evaluations relative to others have important implications for well-being (Buunk & Gibbons, 2007). Social comparison theory was introduced in the 1950s (Festinger, 1954), and became a central concept in social psychological research (Buunk & Gibbons, 2007). SCO refers to the tendency to compare one's

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opinions and abilities with those of others for self-evaluation (Festinger, 1954). Prior research showed that the level of comparison changes from person to person and SCO represents the individual tendency to engage in social comparisons (Gibbons & Buunk, 1999). Seminal research on SCO has shown how people prefer to affiliate with others when experiencing stressful conditions (Buunk & Gibbons, 1997). According to Wills (1981), people who are undergoing a stressful experience may be more likely to compare themselves with others who are worse-off than they are, than those who are in a better state, through downward comparison (Buunk & Gibbons, 1997). SNS provide settings for people to engage in online social comparison, given that it commonly takes place when an individual believes others to be sharing similar opinions, beliefs and abilities to one's own (Gibbons & Buunk, 1999). Features such as Facebook's newsfeed or Instagram's daily stories provide a stream of information about friends' lives, achievements, abilities, emotions and personality, creating a perfect breeding ground for social comparison to take place (Gerson, Plagnol, & Corr, 2016; Ruggieri, Bonfanti, Passanisi, Pace, & Schimmenti, 2021). Therefore, researchers started examining how SCO operates in SNS, given that social media allow users to constantly monitor what friends are doing and talking about, and how others are responding (Haferkamp & Kramer, 2011). Some prior studies reported that Facebook-based negative SCO can have negative effects on an individual's self-perception and distress-level (Appel, Gerlach, & Crusius, 2016; Liu et al., 2017; Robinson et al., 2019). For example, it was suggested that people frequently engaging in social comparison on Facebook felt they were less socially connected to others (Lee, 2014), and were more likely to believe that others had better lives than themselves (Chou & Edge, 2012). It is also worth noting that people experiencing a fear of isolation are more likely to engage in social comparison on Facebook by monitoring their friends' activities for self-evaluation, and tend to self-present a favorable self-image (Lee & Cho, 2018). However, SCO is not in itself problematic and it can have several positive effects (e.g., self-improvement and self-enhancement) (Wood, 1989). Thus, it could be expected that people facing social isolation due to quarantine would be more likely to engage in social comparison on social media, with some positive consequences for an individual's self-evaluation and well-being. Although previous research suggested a negative relation between SCO and psychological wellbeing, this causal relationship is far from clear, given the cross-sectional level of evidence. Moreover, no previous longitudinal panel studies examined the predictive role of online SCO on individual distress during the COVID-19 pandemic crisis. It is possible that social comparison in social media during the pandemic might foster greater life-satisfaction and lower distress-levels, because users who all share the same condition will be more likely to compare themselves in a positive light. For example, Johnson and Knobloch-Westerwick (2014) found that when people experience a negative mood, they are motivated to repair their affective state through selective exposure to social comparisons, in order to restore their positive mood. Furthermore, people facing social restrictions can adopt social comparison in social media as a strategy to build and maintain relationships, thus reinforcing their own self-worth (Vogel, Rose, Roberts, & Eckles, 2014).

The present study aims to examine the longitudinal trend of psychosocial distress levels before and after quarantine, by a three-wave panel study. Moreover, we aim to explore the role of online SCO as a key variable in alleviating the negative effects of isolation due to the COVID-19 pandemic. Based on the evidence regarding the negative psychosocial consequences of quarantine, along with prior research on the effects of SNS social comparisons to well-being, the following hypotheses and research questions will be subject to empirical examination:

H1. Given that we measured individual distress at a baseline assessment before the lockdown, we expect an increase in levels of psychosocial distress levels (i.e., depression, anxiety, stress, loneliness, life satisfaction) during quarantine. Although the short and long-term effects of quarantine on psychological outcomes have been widely investigated (Brooks et al., 2020), to date, less is known about the abrupt change in individuals' psychological conditions due to the transition to quarantine.

RQ1: How would online SCO relate to psychosocial outcome variables over time? Specifically, we will explore whether a higher tendency towards social comparison on social media can prospectively predict a decrease in psychosocial distress during quarantine, by examining directionality of effects (see Fig. 1). At the same time, we will also explore, conversely, whether psychological distress might predict any changes in SCO over time. We included gender, age and time spent on SNS as covariate in the statistical model.

1. Method

1.1. Participants and procedure

In this longitudinal study, a convenience sample of 200 Italian Facebook users were invited to participate in an online survey about the psychological consequences of the COVID-19 outbreak. Respondents were recruited through online advertisements using e-mail lists and social media platforms groups (Facebook and WhatsApp). Our snowball sampling strategy focused on recruiting the general public living in Italy during the pandemic. All postings included the hyperlink to the electronic survey. 113 subjects agreed to participate and took the survey (45 men and 68 women; mean age = 32.05; SD = 8.01), ranged between 17 and 59 years, at the first measurement (T1); 24 men and 51 women (mean age = 32.13; SD = 7.65), ranged between 23 and 59 years, at the second measurement (T2); 27 men and 53 women (mean age = 32.35; SD = 7.87), ranged between 26 and 59 years, at the third measurement (T3).

This study was conducted from 7th March to 14th April, eighteen days apart. On the 11th of March the Italian Government advised the public to adopt social distancing and obliged all inhabitants to quarantine themselves. The lockdown was protracted until the 4th of May, 2020. The T1 took place on 7th–9th March. The T2 took place on 25th–27th March. The T3 took place on 12th–14th April. Participation in the study was voluntary and the participants could quit the survey at any point.

Participants were informed that the study was anonymous except for a nickname, chosen by the participant, to be used in the subsequent research phases. No information that might compromise the anonymity of anyone was requested throughout the research. Ethics approval for the project was obtained from the coordinating site. All participants signed statements of informed consent to participate in this study.

1.2. Measures

The study collected the following socio-demographic information: Age, gender, educational level and average daily time spent on SNS.

Depression, anxiety and stress were assessed using the Italian adaptation of the Depression, Anxiety and Stress Scale (DASS-21; Henry & Crawford, 2005). The participants were assessed by asking them to respond on a 4-point scale. The DASS-21 showed good psychometric properties (Bottesi et al., 2015) and in the current study the Cronbach's alphas were $\alpha_{T1} = 0.88$; $\alpha_{T2} = 0.85$; $\alpha_{T3} = 0.87$ for depression (e.g., "I was unable to become enthusiastic about anything"), $\alpha_{T1} = 0.78$; $\alpha_{T2} = 0.69$; $\alpha_{T3} = 0.78$ for anxiety (e.g., "I felt scared without any good reason"), and $\alpha_{T1} = 0.85$; $\alpha_{T2} = 0.86$; $\alpha_{T3} = 0.87$ for stress (e.g., "I found it difficult to relax"), respectively.

Life satisfaction was measured using the Italian version of the *Satisfaction with Life Scale* (SWLS; Diener, Emmons, Larsen, & Griffin, 1985). Respondents were asked how much they agree or disagree with each of the 5 items using a 7-point scale (e.g., "If I could live my life over, I would change almost nothing"). Internal consistency was $\alpha_{T1} = 0.92$; $\alpha_{T2} = 0.91$; $\alpha_{T3} = 0.91$, respectively.

Loneliness was measured using *The Three-Item Loneliness Scale*

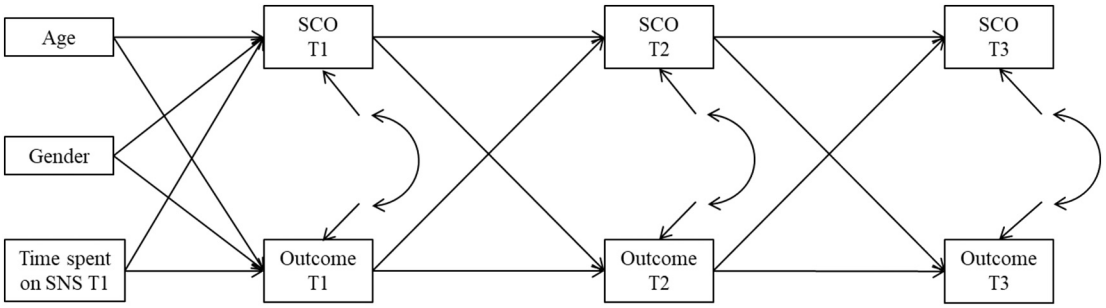

Fig. 1. Hypothetical autoregressive cross-lagged model.
Note. SCO social comparison orientation.

(Hughes, Waite, Hawkley, & Cacioppo, 2004). This shortened 3-item loneliness scale measured the sense of loneliness and the response categories were coded from 1 to 3 (e.g., "How often do you feel that you lack companionship?"). Internal consistency was $\alpha_{T1} = 0.71$; $\alpha_{T2} = 0.67$; $\alpha_{T3} = 0.60$, respectively.

Online SCO was assessed using an adapted version of the *Iowa-Netherlands Comparison Orientation Measure* (INCOM, Gibbons & Buunk, 1999), an 11-item self-report measure which assesses differences in social comparison orientation. Responses range from (1) *strongly disagree* to (5) *strongly agree* for each item (i.e., "I often compare myself with others with respect to what I have accomplished in life"). A high score indicates that individuals are prone to collecting information about others, and/or regularly comparing that information to their own circumstances. For the purposes of the current study, the scale was adapted by asking participants to think about the social interactions and behavior that are established on Social Networks. As a single scale, the INCOM had good internal reliability ($\alpha_{T1} = 0.86$; $\alpha_{T2} = 0.86$; $\alpha_{T3} = 0.86$).

1.3. Attrition analyses

Of the 113 participants who provided data at T1, data were obtained for 75 at T2 and for 80 at T3; moreover, data were obtained for 15 (13%) participants at T1 and T3 alone. Cases with complete data on all time points totalled 65 (57%). Attrition analyses between participants in the study at T1, who participated versus not participated in the study at T2 and T3, revealed no significant differences on demographic or primary outcome measures, Little's (1988) MCAR test was not significant, $\chi^2(33) = 31.78$, $p = .53$, indicating that drop-out likely occurred at random. Hence, the missing data were dealt with through the expectation maximization algorithm for analyses with manifest variables and through full-information maximum likelihood (Enders & Bandalos, 2001) for analyses with latent variables.

2. Results

2.1. Preliminary analyses

Means, standard deviations, skewness, kurtosis, and range of study variable scores are presented in Table 1.

A series of univariate ANOVAs was performed in order to detect gender differences in study variables. Results revealed no significant effects of gender. Pearson correlation coefficients among study variables are reported in Table S1. There were strong recurring correlations between the same variables, suggesting a good level of reporting consistency. At T1, online SCO was positively associated with loneliness, depression, anxiety and stress, and negatively associated with life satisfaction; at T2, online SCO was positively associated only with depression; at T3, online SCO was positively related with depression and life satisfaction.

Table 1
Means, standard deviations, skewness, kurtosis and scores range of study variables.

	M	SD	Skewness	Kurtosis	Observed range	Range
T1 online SCO	24.43	8.30	0.39	−0.30	11–49	11–55
T2 online SCO	25.49	7.83	0.56	0.14	11–51	11–55
T3 online SCO	25.77	7.60	0.36	0.02	11–51	11–55
T1 loneliness	4.80	1.47	0.89	0.39	3–9	3–9
T2 loneliness	5.40	1.36	0.55	0.11	3–9	3–9
T3 loneliness	6.10	1.37	0.14	−0.12	3–9	3–9
T1 depression	5.21	3.85	1.27	2.58	0–21	0–21
T2 depression	6.67	4.02	0.45	−0.31	0–17	0–21
T3 depression	7.03	3.84	0.24	−0.38	0–17	0–21
T1 anxiety	3.33	2.93	0.87	0.22	0–13	0–21
T2 anxiety	5.53	2.93	0.30	−0.01	0–13	0–21
T3 anxiety	6.30	3.43	0.37	−0.16	0–15	0–21
T1 stress	7.20	3.66	0.76	0.64	0–20	0–21
T2 stress	8.98	3.59	0.16	−0.69	2–17	0–21
T3 stress	10.20	3.94	0.00	−0.93	2–18	0–21
T1 life satisfaction	20.61	6.96	−0.04	−0.77	5–35	5–35
T2 life satisfaction	19.20	6.45	0.19	−0.13	1–35	5–35
T3 life satisfaction	17.75	5.89	0.39	−0.21	7–34	5–35

2.2. Test of hypotheses

Regarding the first aim of the study, we tested the differences in mean scores across the three time points in study variables via a series of repeated measures ANOVAs (Table 2).

Significant differences from T1 to T2 were found for all variables: participants reported higher levels of loneliness, depression, anxiety and stress, and lower levels of life satisfaction at T2; significant differences were also found for online SCO, but with a small effect size. Finally, significant differences from T2 to T3 were found for loneliness, anxiety, stress and life satisfaction: participants reported increased levels of loneliness, anxiety, stress and decreased levels of life satisfaction at T3.

To examine the longitudinal associations between online SCO and psychosocial distress indicators, we used autoregressive cross-lagged modeling through structural equation modeling (SEM), with Mplus software (Version 7; Muthén & Muthén, 2012). All variables included in

Table 2
Results of repeated measures ANOVAs.

	$F(2, 224)$	p	η^2
Online SCO	5.78	.008	0.05
Loneliness	60.28	<.001	0.35
Depression	33.33	<.001	0.23
Anxiety	68.51	<.001	0.38
Stress	63.71	<.001	0.36
Life satisfaction	23.85	<.001	0.18

the model were specified as observed variables. In order to take into account the potential effect of gender, age and the time spent on SNS at T1, we specified them as covariates for variables at T1. We corrected for the non-normality observed in depression at T1 through robust maximum likelihood estimation (MLR). Evaluation of model fit was based on the chi-square index and the cut-off of 0.06 for the Root Mean Square Error of Approximation (RMSEA). Moreover, a Comparative Fit Index (CFI) of 0.95 or higher also indicates a good fit (Marsh, Hau, & Wen, 2004). We tested the model, which included (a) stability coefficients for all constructs (i.e., autoregressive paths), (b) within-time correlations between the variables, and (c) cross-lagged paths between each of the constructs. Goodness of fit indexes are reported in Table S2, the standardized solution of parameter estimates for the tested models is reported in Fig. 2.

With regard to loneliness, the structural model fit the data well, even though RMSEA was higher than the cut-off value; the model is presented in Fig. 2a. As for the within-time correlations, online SCO at T1 was associated with more loneliness at T1. More importantly, in terms of cross-lagged associations, online SCO at previous time predicted relative decreases in loneliness. Finally, the time spent on SNS at T1 was positively and significantly related with online SCO.

With regard to depression, the structural model fit the data well and is presented in Fig. 2b. As for the within-time correlations, both at T1 and T2, online SCO was associated with more depression. No significant cross-lagged path was found. Finally, the time spent on SNS at T1 was positively and significantly related with online SCO and depression.

With regard to anxiety, the structural model fit the data well and is presented in Fig. 2c. As for the within-time correlations, online SCO at T1 was associated with more anxiety at T1. In terms of cross-lagged associations, online SCO at previous time predicted relative decreases in anxiety. Finally, the time spent on SNS at T1 was positively and significantly related with online SCO and anxiety.

With regard to stress, the structural model fit the data well and is presented in Fig. 2d. As for the within-time correlations, online SCO at T1 was associated with more stress at T1. In terms of cross-lagged associations, online SCO at previous time predicted relative decreases in stress. Finally, the time spent on SNS at T1 was positively and significantly related with online SCO and stress.

With regard to life satisfaction, the structural model fit the data well, even though RMSEA was higher than the cut-off value; the model is presented in Fig. 2e. As for the within-time correlations, online SCO at T1 was associated with lower life-satisfaction at T1. In terms of cross-lagged associations, online SCO at previous time predicted relative increases in life satisfaction. Finally, the time spent on SNS at T1 was positively related with online SCO, and negatively with life satisfaction.

3. Discussion

The current study examined whether SCO in social media is prospectively related to an individual's distress as experienced during the COVID-19 quarantine, taking into account the bottom-line of distress prior to the COVID-19 outbreak with a three-wave panel study. Our primary findings revealed that participants reported increasing levels of loneliness, depression, anxiety, stress and lower life-satisfaction at T2 from the baseline assessment. These findings suggest that quarantine due to the COVID-19 can have negatively influenced several aspects of individual psychological wellbeing, consistently with prior research (Duan & Zhu, 2020). Our results also showed a worsening of loneliness, anxiety, stress, and life satisfaction increased from T2 to T3 during quarantine, whereas the depression levels did not change in this time lag. These findings seem to be in line with those of other COVID-19 community estimates, which evidenced varying levels of anxiety and depression in China (Elhai, Yang, McKay, & Asmundson, 2020; Wang et al., 2020), but further research is necessary to examine the spread of

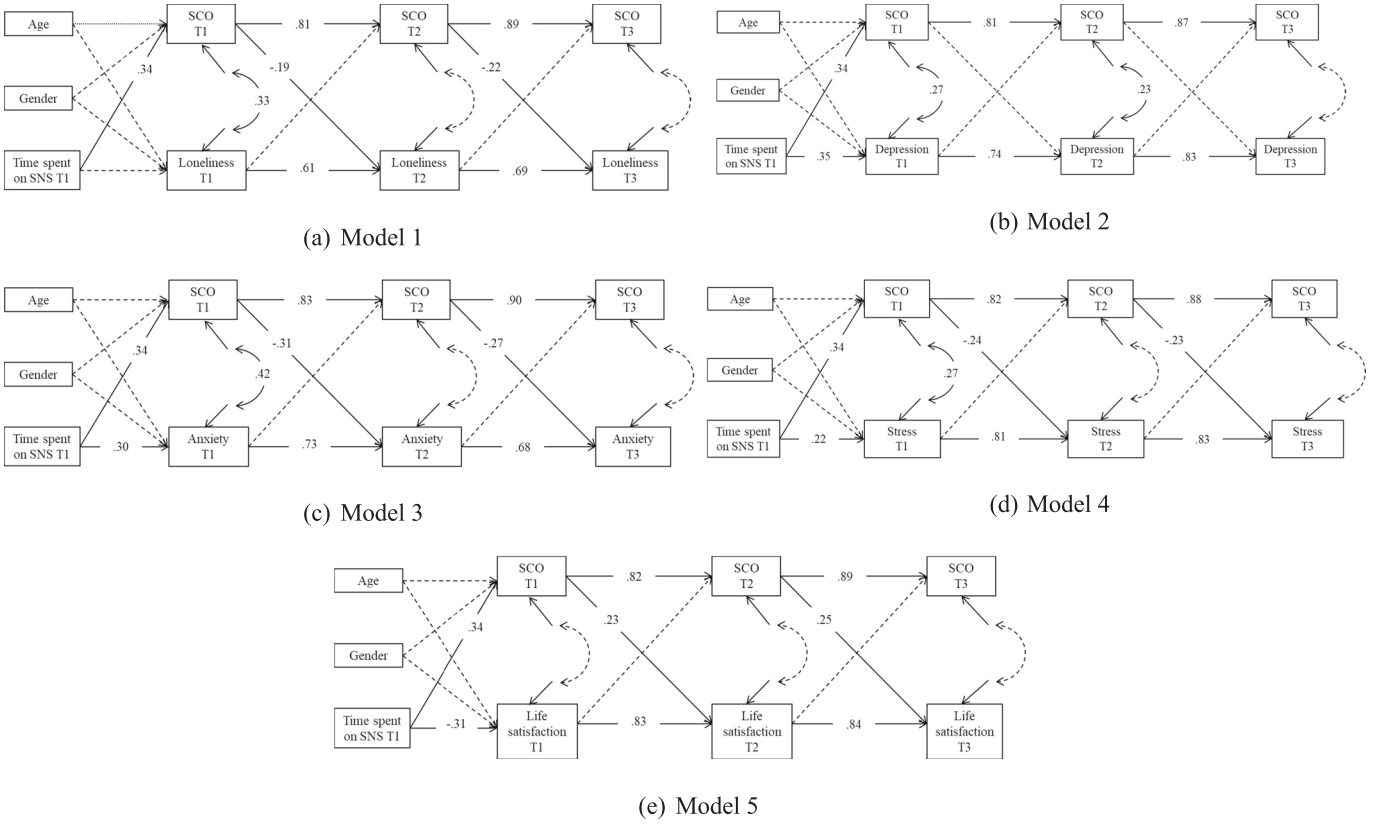

Fig. 2. Statistical models of the relations between SCO and loneliness (a), depression (b), anxiety (c), stress (d), and life satisfaction (e). Standardized solution. *Note*. All parameters are significant with $p < .05$, except those represented by dashed lines.

psychological distress among populations from different cultural contexts. Taken together, these preliminary findings might support the view that COVID-19 quarantine can have had lasting effects on psychological well-being, with an abrupt shift from a baseline (i.e. the first week of March 2020) to the subsequent quarantine period (i.e. after one month) in which social isolation and home confinement had become part of everyday life. Our findings also add to the previous literature on the negative consequences of COVID-19 by showing an increasing trend in feelings of loneliness and a decreasing trend in levels of life satisfaction. These results are only partially consistent with those reported in some recent studies from China and USA (Luchetti et al., 2020; Wang et al., 2020) which monitored the trend of distress or loneliness during the COVID-19 quarantine condition, and did not detect any substantial change in these variables during the quarantine.

In the current study, we also examined the role of online SCO in predicting the effects of isolation due to the COVID-19 pandemic. Consistently with our expectations, the SCO level did not change over time, in accordance with some scholars who suggested that the tendency to make social comparisons may represent a personality characteristic (Hemphill & Lehman, 1991). Individuals spending more time on SNS were more likely to report higher SCO levels at T1. Most importantly, the results of the cross-lagged panel analyses showed somewhat mixed patterns: a) Before the beginning of lockdown, a higher tendency to online SCO was cross-sectionally associated with greater psychosocial distress, loneliness and lower life satisfaction. However, this link between SCO and psychological outcomes was no longer significant at T2 and T3, during the COVID-19 quarantine, with the exception of the association between SCO and depression at T2; b) However, we found significant longitudinal cross-lagged effects, with SCO at both T1 and T2 assessments predicting lower levels of loneliness, anxiety, stress and higher life satisfaction. Taken together, these findings suggest that SCO and time spent on SNS played a different role in predicting psychological variables before and after the lockdown. Although our results at T1 are in line with previous research, which suggested that social comparison in SNS can have negative effects on an individual's self-evaluation and distress (Lee, 2014; Liu et al., 2017; Robinson et al., 2019), it seems that during the COVID-19-related quarantine, online SCO may have fostered lower distress as well as greater life satisfaction and social connectedness, given that people felt that they were sharing the same difficult time, thus lessening the negative impact of social comparisons (Chou & Edge, 2012). This finding seems in line with those showing that individuals who are under threatening conditions of health tend to spontaneously compare themselves with disadvantaged friends in an effort to bolster self-esteem (Buunk & Gibbons, 2007). We could also speculate that during the COVID-19 pandemic, online social comparison may lead the person to elevate his/her own wellbeing in order to be in the same category as other friends and peers, consistent with the assimilation effect (Collins, 2000). The current study is the first to longitudinally examine both autoregressive and cross-lagged paths between online SCO and psychological distress during the COVID-19 quarantine, and results seem to suggest that people facing a difficult time due to the COVID-19-induced home-confinement were more likely to engage in online social comparison as a positive resource for improving social connections and sharing their feelings of fear and uncertainty. Interestingly, our results regarding the association between online SCO and depression at T1 and T2 seem to suggest that people with feelings of poor self-worth and a negative mood are more likely to engage in online SCO as a means of managing negative effects. There is research evidence regarding the interplay between social comparison in SNS and depression, even though the specific processes at work have not yet been disentangled (Appel et al., 2016).

The study has certain limitations. Firstly, this study relied on the participants' self-reports on their psychosocial distress and SCO, and might well be susceptible to response tendencies such as social desirability. Secondly, our study used a convenience sample with a small number of Facebook users, and the non-random sampling procedure limits the generalizability of our findings. Finally, in the current study we did not differentiate the role of social comparison between various SNS, and further research is needed to examine whether specific patterns of use of SNS such as Facebook, Instagram, Pinterest, can predict psychological outcomes (Lo Coco, Maiorana, Mirisola, Salerno, & Boca, 2018), given their distinctive content and design properties.

4. Conclusions

The current longitudinal cross-lagged study examined two important aspects of life during the COVID-19-related quarantine: the increase in psychological distress and the beneficial role that online social comparison can play in mitigating this psychological state. Overall, our results suggest that online SCO can play an important role as a protective factor with respect to the problems encountered during the COVID-19 quarantine. Future research should take into account the role of social comparison when explaining the relationship between SNS and individual's well-being during the COVID-19 pandemic crisis. Although a number of studies suggested that social comparisons on SNS can result in declines in well-being (Alfasi, 2019; Verduyn, Gugushvili, Massar, Täht, & Kross, 2020), further research is needed to examine the main components underlying the SCO in order to refine our understanding of the impact of social comparison on individual's distress during the pandemic. With home confinement and social distancing becoming more dramatic, research into online social comparisons can help to understand how the processes involved in online social interactions can help people to stay in contact. For example, a key challenge for future research is to study SCO in online support groups. These online interventions can satisfy, especially in difficult conditions, the individual's needs for affiliation, emotional support, and also of social comparison, in order to positively compare their own living conditions with the living conditions of others (Suls & Wheeler, 2012). Consistently with the saying *misery loves company*, observing that others are in the same uncomfortable situation in as oneself, mitigates the effects of the shared discomfort. Future research will benefit from examining the positive side of online SCO during the COVID-19 crisis.

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CRediT authorship contribution statement

S.R.: Conceptualization, Investigation, Methodology, Writing – Original draft, Writing – review & editing. S.I.: Methodology, Formal statistical analysis, Writing – Original draft, Writing – review & editing. R.C.B.: Conceptualization, Investigation, Writing – Original draft, Writing – review & editing. G.L.C.: Conceptualization, Methodology, Writing – review & editing. Designed the study and wrote the protocol.

Role of funding source

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Declaration of competing interest

All authors declare that they have no conflicts of interest with this study.

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