The psychological impact of COVID-19 on people suffering from dysfunctional eating behaviours: a linguistic analysis of the contents shared in an online community during the lockdown

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ABSTRACT

The coronavirus disease 2019 (COVID-19) spread several months ago from China and it is now a global pandemic. The experience of lockdown has been an undesirable condition for people with mental health problems, including eating disorders. The present study has the aim of understanding the impact of the first wave of the COVID-19 pandemic on people with self-reported disordered eating behaviours. A linguistic analysis was carried out with regard to the online posts and comments published by 1971 individuals (86% women) in a Facebook online community focusing on EDs during the lockdown. A total of 244 posts and 3603 comments were collected during the 56 days of lockdown (from the 10th of March until the 4th of May 2020) in Italy and were analysed by Linguistic Inquiry and Word Count (LIWC) software. The results showed that words related to peer support decreased in posts over time, and that anxiety and anger increased in the published comments. Moreover, greater feelings of negativity and anxiety were found in posts and comments throughout the COVID-19 pandemic, as well as lesser use of words related to positive emotions. Thematic qualitative analysis revealed eight themes that described the main subjective components of ED symptomatology and distress during the first COVID-19 lockdown. The current findings can help in delivering tailored treatments to people with eating disorders during the COVID-19 pandemic.

Key words: COVID-19; psychological distress; dysfunctional eating behaviours; Facebook online community; linguistic analysis.

Introduction

The outbreak in December 2019 of the new coronavirus disease 2019 (COVID-19) and the subsequent pandemic has prompted numerous governments worldwide to temporarily restrict 'non-essential activities' or to impose lockdown measures to limit the spread of infections. Previous research on the negative consequences of the COVID-19 outbreak on mental health evidenced high rates of psychological distress in the general population in several countries (Xiong *et al.*, 2020). Stress, family tensions, social isolation and abrupt changes in daily activities can foster psychologically negative effects on lifestyle during home confinement, especially for those already suffering from psychological disorders (Li *et al.*,

2020; Weissman, Klump & Rose, 2020; Pisot *et al.*, 2020). It was argued that the pandemic can trigger pathological behaviours and exacerbate existing symptoms via different pathways: restrictions to daily activities, emotional distress, fear of contagion, and low access to treatment and care (Rodgers *et al.*, 2020). Considering the high incidence of emotional disorders in people with eating disorders (EDs), it is expected that the current condition may cause a notable impact on the clinical population (Weissman, Klump & Rose, 2020). For example, public health measures designed to flatten the curve and the impact of COVID-19 can adversely affect the core symptoms of EDs, including dietary restriction, binge eating, and compensatory behaviours (Termorshuizen *et al.*, 2020). Moreover, the lockdown and social restrictions can have negative consequences for physical activity and sleep patterns, by increasing the risk of disordered eating behaviours (Rodgers *et al.*, 2020). During this period a considerable number of patients reported a deterioration of their quality of life, loneliness, inner restlessness and increased sadness (Schlegl, Maier, Meule & Voderholzer, 2020). Furthermore, the quarantine condition has hindered progress in treatment, causing relapses in symptoms, and/or comorbid psychiatric conditions (*e.g.*, depression, anxiety) that may get worse in the context of isolation and/or the economic impact of this pandemic (Scharmer *et al.*, 2020). A preliminary qualitative study (Fernandez-Aranda *et al.*, 2020) surveyed patients with EDs, specifically people with anorexia nervosa (AN) and bulimia nervosa (BN), on the impact of social distancing measures found evidence of an exacerbation of symptoms in patients, along with increased anxiety, and challenges associated with reduced contact with their treatment teams (Fernandez-Aranda *et al.*, 2020). An online survey with patients with AN showed that 70% of participants reported an increase in shape and weight concerns, longing for physical activity, loneliness and sadness during the pandemic (Schlegl *et al.*, 2020). Some online surveys also showed that individuals with a self-reported experience of EDs reported concerns with increased social isolation, changes in physical activity rates and relationship with food (Branley-Bell & Talbot, 2020).Thus, clinicians have highlighted the importance of attending to the individual needs of patients with EDs during this difficult time (Branley-Bell & Talbot, 2020; Fernandez-Aranda *et al.*, 2020; Weissman, Bauer & Thomas, 2020).

During the COVID-19 pandemic, attending online communities focusing on EDs (through social media) can increase feelings of being understood for those suffering from disordered eating, particularly if they are actively engaged on the website and seek out emotional support from other members (Csipke & Horne, 2007).

Considering the isolation resulting from the pandemic, maintaining social networks can provide an opportunity to share feelings and relieve stress (Rodgers *et al.*, 2020; Ruggieri *et al.*, 2021). On-line there are several social media

communities of individuals with eating problems, which offer social support, healthy advice, and recovery-oriented guidance (Moessner *et al.*, 2018; Rodgers *et al.*, 2016). Recent research into eating disorder treatments has linked the (peer)-support provided by peer mentors (people with past experience of EDs) to higher levels of working alliance (Albano *et al.*, 2021); in this context, sharing the same symptoms, negative emotions and dysfunctional behaviour facilitate the promotion of self-compassion, allowing one to be more sensitive and open to emotional suffering, with a commitment to alleviating distress through helpful and non-harmful strategies (Gilbert, 2005). However, the negative role of Social Network Sites such as Facebook in fostering and maintaining both disordered eating behaviours and cognitions has been well-documented (Walker *et al.*, 2015). Given that most of the online communities' sources are text-based (Chesley *et al.*, 2003), analysing the natural language that individuals with disordered eating behaviours use to communicate their attitudes and feelings online might help to better understand their stressful experience during the COVID-19 pandemic, and to inform practitioners on how online activities can be used by a certain group to cope with the pandemic.

Computerized text analysis was widely adopted in prior research into the linguistic features in ED websites (Moessner *et al.*, 2018). Preliminary studies regarding the language characteristics used on social media during the pandemic used the Linguistic Inquiry and Word Count (LIWC) and confirmed it as a valid tool for psychometric analysis (Su *et al.*, 2020); however, qualitative data describing the influence of the pandemic on people with eating disorders, are limited, and most findings focus on ED symptoms and treatment settings (Nutley *et al.*, 2021). Therefore, analysis of the language used in social media may represent an important research area to pursue during the pandemic, given that it provides indicators of mental health in people experiencing the stressful COVID-19-related restrictions (Ruggieri *et al.*, 2021; Su *et al.*, 2020).

The present study

There has been a lack of research on the linguistic aspects of online social communities focusing on eating disorders during the pandemic, so, in the current study, we have focused on the individual experiences as reported in the posts shared on Facebook by people suffering from disordered eating behaviours during home confinement. The overall aim is to highlight vulnerability factors related to home confinement or stressful situations as reflected in linguistic expression for people with dysfunctional eating behaviours.

Using the LIWC, we analysed the characteristics of the language categories employed by these individuals during COVID-19 home confinement, to explore whether posts and comments on social media would highlight high levels of concern and negative emotions during the lockdown. The current study builds upon previous research regarding

the negative consequences of the COVID-19 pandemic, for example, exacerbation of symptoms for those already suffering from psychological disorders, increased loneliness and negative feelings caused by forced isolation (Scharmer *et al.*, 2020; Termorshuizen *et al.*, 2020; Waller *et al.*, 2020; Weissman, Klump & Rose, 2020), by examining the following categories of words: Affective processes words (Positive emotions, Negative emotions, Anger, and Anxiety), Cognitive process words (Discrepancy), Personal pronouns (1st person singular and 1st person plural), and Social processes. Moreover, in line with previous work on linguistic expression and mental health (Coppersmith, Dredze & Harman, 2014; Rude, Gortner & Pennebaker, 2004), we added the following two variables: ED concerns (Being, Eating, Body, Physical) and Peer support (Social processes, Friends, Inclusion, We).

The first aim of the present study was to analyse the trend of the LIWC categories in all the shared contents in a Facebook online community dealing with eating disorders during the 56 days of the first lockdown in Italy. We hypothesized that the effect of the rigid restrictive measures would progressively lead to greater negative effects on subjects by increasing the perception of distress and suffering (Monteleone *et al.*, 2021; Richardson, 2020). Specifically, we expected an increasing trend over the 56 days in the use of linguistic categories related to negative emotions: Anxiety, Negative emotions (NEGEMO), Anger, ED Concerns; and a decreasing trend with words related to positive emotions and social connection: Discrepancy, Peer Support, and Positive emotions (POSEMO).

The second aim of this study was to explore the differences in the use of specific linguistic categories between Facebook contents dealing with the COVID-19-related concerns (*i.e.* COVID-19 Pandemic Posts and COVID-19 Pandemic Comments) and contents only dealing with ED concerns, without a clear reference to the experience of COVID-19 (*i.e.* ED Posts and ED Comments). Specifically, we aimed to explore potential differences in linguistic categories related to affectivity (*i.e.* anxiety), cognitive process (*i.e.* discrepancy), personal pronouns (*i.e.* 'we') linked to social relations and to sharing the same status, social processes and the two added categories (*i.e.* Peer support).

Finally, in line with previous qualitative results which documented the feelings and concerns of people with EDs during the pandemic (Termorshuizen *et al.*, 2020), a thematic analysis of all posts and comments shared during the 56 days of lockdown, in the Facebook online community, will be adopted, to explore how the COVID-19 pandemic affected the lives and experiences of individuals suffering from disordered eating behaviours. This qualitative analysis is the first to be characterized by analysis of the linguistic experiences of users posting original content in an ED-related discussion community, in which people with disordered eating problems freely describe the ways in which the pandemic has influenced their mental health and their engagement in disordered eating behaviours.

In the present study, we focused on the experience of individuals with disordered eating behaviours, without a reference to a formal diagnosis, in accordance with previous studies, which showed that the negative consequences of the lockdown measures were common concerns in individuals with eating problems, and with a worsening in global mental health (Branley-Bell & Talbot, 2020; Termorshuizen *et al.*, 2020; Quittkat *et al.*, 2020).

Materials and methods

Participants and materials

The posts and comments from 1971 individuals (86% being women) with disordered eating behaviours were collected through an Italian Facebook online community dealing with Eating Disorders. The community administrators allowed researchers to collect data within the community. The administrators also provided data regarding the age range of the community members as well as the average members' ED duration, but they did not provide information about specific ED diagnosis due to privacy issues. However, the community members self-reported AN, BN, and BED. The community also includes people who have recovered, those who are still being treated, or members who are refusing any kind of treatment or help. The majority of the members report a long and severe ED duration (at least 7 years of illness) with an age range from 16 to 60 years. Among the various events that triggered disordered eating, the subjects mentioned: family problems, bullying, sexual abuse, or problems related to body acceptance (internalized body image). Narrative data were extracted from the 10th of March 2020 until the 4th of May (*i.e.* the first Italian COVID-19 lockdown). From our initial screening, we selected N=298 posts and N=3811 comments. The members' narratives were included in our study if they reported: i) a text related to eating disorder concerns or diagnosis (AN, BN, BED), or ii) they involved any content based on the impact of the COVID-19 pandemic on their everyday life. After the second screening of selected data, we excluded N=54 posts and N=208 comments because they did not report contents dealing with the COVID-19 or eating behaviour concerns (*e.g.*, posts/comments based on recreational activities offered to members by people outside the group, such as professionals and students, through links, web pages, articles, *etc.*). The final sample contains N=244 posts and N=3603 comments.

This Facebook online community is intended to provide members with mutual help, by sharing awareness, achievements, efforts and emotions, whereas pro-ana statements are banned. The mandatory rules for all members in the group are: i) No description of symptoms/habits; and ii) do not publicize medication or

treatments whic'h have not been validated. The group is defined as: a mutual help and awareness group, where to share information, opinions, and emotions. For the purposes of this study, the administrators of the online community were informed about the aims of the research, and they answered general questions during the study procedure. The Facebook group administrators informed the members about the purposes of our study and once they had provided their authorization to collect data from the forum, two PhD students (GA, RCB) and a Master's student (EM) from the research team, were accepted as part of the group and started the data collection process. The posts/comments collected were anonymous and coded with a number; the forum group administrators filled out informed consent and both members/administrators did not receive any compensation for their participation. All procedures performed in this study were in accordance with the ethical standards of the Italian Psychological Association (AIP), as well as the Declaration of Helsinki.

Data analysis software

For this study, we used the Italian directory for the LIWC 2015 version (Pennebaker *et al*., 2015), and two licensed clinical psychologists and a Master's student worked independently during the first and second screening, dividing posts and comments respectively for N=56 days or N=8weeks of recruitment. Table S1 shows some examples of the posts and comments included in our sample. The software dictionary includes many word categories of linguistic features related to mental processes and human behaviours (Tausczik & Pennebaker, 2010). Each word included in the dictionary is assigned to a specific linguistic category; the output provided by the software represents a percentage of total words in the document associated with each category. In accordance with the aims of this study, we focused on some specific LIWC categories such as positive emotions (POSEMO), negative emotions (NEGEMO), anxiety, anger, sadness, cognitive processes, discrepancy, social processes, first singular pronoun-I, first plural pronoun-We. In Table S2 we report the minimum and maximum number of words used for posts and comments in the 56 days of detection and we provided some word examples related to each category, following the guidelines provided by Pennebaker *et al*., 2007.

Regarding the first aim of the study, using polynomial regression models, we examined a linear (steady increase or decrease) and quadratic (low-high-low trend or high-low-high trend) pattern over time for the selected linguistic categories. In the following formula the linguistic category, entered as dependent variable (Y), was regressed on time (X) and time squared (X²): $Y = \beta_0 + \beta_1 X + \beta_2 X^2 + e$. The procedure and analyses reported in this article were conducted using the Statistical Package for the Social Science (SPSS, Version 25.0).

Regarding the second aim of the study, the comparison between the posts dealing with the COVID-19 (COVID-19 Pandemic Posts and COVID-19 Pandemic Comments) and those not focusing on the experience of the COVID-19-related lockdown was run through the non-parametric test (Chi-square and Fisher-exact test). Regarding the third aim of the study, the thematic analysis (Braun & Clarke, 2006) of posts and comments was adopted. Through the description of themes and subthemes, defined during the narrative reading, it allows us to underline the association between the subjective experience of lockdown and the ED symptomatology, unhealthy behaviours or personal beliefs experienced during COVID-19 home confinement. GA and RCB familiarized themselves with the data through repeated readings, identified the initial codes (*i.e.*, sentence by sentence coding), and sorted the codes into themes and overarching themes through the support of NVivo software (version 11). The themes were then revised for coherence and distinctiveness and were defined and named (Braun & Clarke, 2006). Subsequent meetings under the clinical supervision of GL were held to reach a consensus on discrepant narratives; in this context coding procedures, coding practices assessed, and agreement obtained on emerging frameworks were discussed. After each discussion, themes were consolidated or merged into existing themes. Descriptive labels were altered to better reflect the subjective components of ED symptomatology and distress during the COVID-19-related lockdown.

Results

Quantitative analysis of the Linguistic Inquiry and Word Count software categories in the Facebook blog during the lockdown

Regarding the first hypothesis, Table 1 reports the results for posts and comments from all the word categories considered. For the selected shared posts we found both a linear and quadratic trend which approached significance for the Peer Support category ($\beta_1 = -0.259$; P=0.067, and $\beta_1 = -0.257$; P=0.068, respectively). We also found a significant linear decrease in the use of the first plural pronoun 'We' ($\beta_1 = -0.279$; P=0.047); finally, the Discrepancy words decreased over time with both linear and quadratic slopes ($\beta_1 = -0.315$; P=0.024; $\beta_1 = -0.325$, P=0.020, respectively). Contrary to H1, we did not find an increase over time in the word categories related to the use of the first singular pronoun 'I', NEGEMO, POSEMO, Anxiety, and Anger. Regarding the analysis of the shared comments, we found both a linear and quadratic increase for Anxiety ($\beta_1 = 0.393$; P=0.004; $\beta_1 = 0.420$, P=0.002, respectively), and a quadratic trend for the Anger words ($\beta_1 = 0.279$; P=0.047). We did not find an increase over time in the categories related to the use of the first plural pronoun 'We' and Peer Support.

Regarding the second aim of the study, results are re-

ported in Figure 1A and B. A greater use of words in the COVID-19 Pandemic Posts than EDs Posts was found for the following categories: use of first singular pronoun 'I' (c^2=25.40, P<0.001), NEGEMO (c^2=13.65, P=0.001), Anxiety (c^2=8.24, P=0.004), and Discrepancy (c^2=1096.91, P<0.001). We also found a significantly lower use of words related to POSEMO in the COVID-19 Pandemic Post (c^2=4.204, P=0.04033) than ED Posts.

Regarding the perception of social connectedness, we found a lesser use of words related to Social processes in the COVID-19 Pandemic Post (c^2=4.71, P=0.030) and comments (c^2=10.12, P=0.001) than in ED Posts and comments, respectively. Similarly, in both posts and comments regarding the experience of COVID-19 lockdown a lesser use of the pronoun 'We' and Peer Support

(c^2=12.18, P=0.001 and c^2=10.12, P=0.001, respectively) was found in comparison with ED Posts and comments, respectively. No other differences were found between the COVID-19 Pandemic and the EDs.

Qualitative thematic analysis of posts and comments during the lockdown

Regarding the third aim of the study, 3847 shared contents focusing on the association between the experience of lockdown and the ED symptomatology during the 56 days of lockdown were extracted and reported in Figure 2. Eight themes and twenty-five subthemes emerged via thematic analysis, describing the main subjective components of ED symptomatology and distress during the COVID-19-related lockdown. The first theme focused on

Table 1. Polynomial regression models of linear and quadratic patterns over time for the selected linguistic categories.

	Posts						Comments					
	R^2	Adj R^2	SE coeff	β	t-test	P-value	R^2	Adj R^2	SE coeff	β	t-test	P-value
Peer support												
Linear	0.067	0.048	0.005	−0.259	−10.877	0.067	0.004	−0.016	0.004	0.066	0.460	0.647
Quadratic	0.066	0.047	0.000	−0.257	−10.865	0.068	0.002	−0.018	0.000	0.046	0.325	0.747
Pro ED												
Linear	0.023	0.003	0.008	0.152	10.080	0.285	0.005	−0.015	0.004	−0.073	−0.509	0.613
Quadratic	0.019	−0.001	0.137	−0.000	0.966	0.339	0.004	−0.016	0.000	−0.064	−0.449	0.655
Social processes												
Linear	0.021	0.001	0.020	−0.146	−10.030	0.308	0.013	−0.007	0.012	0.114	0.805	0.425
Quadratic	0.026	0.006	0.000	−0.162	−10.147	0.257	0.009	−0.011	0.000	0.096	0.677	0.502
Discrepancy												
Linear	0.099	0.081	0.010	−0.315	−20.322	0.024	0.022	0.002	0.010	−0.147	−10.042	0.303
Quadratic	0.106	0.088	0.000	−0.325	−20.409	0.020	0.019	−0.001	0.000	−0.140	−0.987	0.329
'We'												
Linear	0.078	0.059	0.004	−0.279	−20.033	0.047	0.001	−0.019	0.004	−0.033	−0.232	0.818
Quadratic	0.052	0.033	0.000	−0.228	−10.641	0.107	0.002	−0.019	0.000	−0.042	−0.292	0.772
'I'												
Linear	0.055	0.036	0.017	0.235	10.689	0.098	0.007	−0.013	0.012	−0.086	−0.604	0.549
Quadratic	0.053	0.033	0.000	0.229	10.648	0.106	0.009	−0.011	0.000	−0.096	−0.678	0.501
Cognitive processes												
Linear	0.011	−0.009	0.021	−0.105	−0.737	0.465	0.000	−0.020	0.013	0.022	0.153	0.879
Quadratic	0.004	−0.016	0.000	−0.064	−0.450	0.655	0.001	−0.020	0.000	−0.023	−0.159	0.874
Sadness												
Linear	0.000	−0.020	0.008	−0.019	−0.135	0.893	0.015	−0.005	0.008	−0.121	−0.854	0.397
Quadratic	0.001	−0.019	0.000	−0.030	−0.213	0.832	0.017	−0.003	0.000	−0.129	−0.909	0.368
Anger												
Linear	0.019	−0.001	0.004	0.136	0.963	0.340	0.075	0.056	0.003	0.274	10.997	0.051
Quadratic	0.014	−0.006	0.000	0.120	0.848	0.401	0.078	0.059	0.000	0.279	20.036	0.047
Anxiety												
Linear	0.025	0.005	0.008	0.159	10.128	0.265	0.154	0.137	0.003	0.393	20.990	0.004
Quadratic	0.026	0.006	0.000	0.162	10.148	0.257	0.177	0.160	0.000	0.420	30.243	0.002
Negemo												
Linear	0.033	0.013	0.014	0.181	10.289	0.203	0.023	0.003	0.012	0.152	10.078	0.286
Quadratic	0.019	−0.001	0.000	0.139	0.980	0.332	0.029	0.010	0.000	0.172	10.220	0.228
Posemo												
Linear	0.000	−0.020	0.005	−0.010	−0.070	0.945	0.007	−0.014	0.009	−0.081	−0.570	0.571
Quadratic	0.002	−0.019	0.000	−0.039	−0.273	0.786	0.010	−0.010	0.000	−0.102	−0.715	0.478

SE, standard error; ED, eating disorders.

eating concerns and symptomatic aspects (n=77), considering the influence of COVID-19 restrictions on eating habits and symptom management. Under this theme we identified the following six subthemes:

1. Concerns in managing meals during the lockdown (n=13):
   (Excerpted example) - Hi everyone, I've never written because I'm very shy. It's almost time for lunch and I'm very scared. I don't want to eat, but I don't know what to tell my parents. […] But now I'm at home because of COVID19. I feel trapped I don't know at all how to get out of this bad situation that has been dragging on for years.

2. Lockdown impact on eating habits (n=14):
   (Excerpted example) - [...] Then another thing that scares me is the food reserves in the pantries, I generally buy everything to avoid unpleasant inconveniences, only lately, challenging my ED I have kept more stuff than usual (sometimes I won, sometimes she won). The fact that this no longer becomes a choice but a necessity terrifies me.

3. EDs relapses during the lockdown (n=20):
   (Excerpted example) - I was followed for a while by my unit but then I gave up the therapy and for about a year I was calm, in the sense that I had 'critical' but sporadic episodes. This quarantine and other things concerning my private sphere are putting a strain on me and I have had a relapse that has been going on for days.

4. Worsening of symptoms (n=10):
   (Excerpted example) - Nothing new .... ED and depression that prevent me from focusing on work and study and difficulty sleeping.

5. Don't get stuck in the illness (n=7):
   (Excerpted example) - This talk of the symptoms among you 1) does not improve your situation; 2) it hurts the reader 3) it is an outlet, but it damages everyone, and it does not solve anything.

6. Sport as a compensatory behaviour (n=13):
   (Excerpted example) - Knee bones that hurt - absurd. I heard from my trainer who forced me to stop exercising and reduce training to just three days a week for half an hour. I have overtraining pains. [...]

The second theme deals with the individual cognitive processes (n=19), which includes the following three subthemes:

1. Rigidity in thinking style (n=6):
   (Excerpted example) - I'm back in the all-or-nothing period (and I've been restricting myself a lot lately, apart from a couple of days when I've fallen for the opposite effect), I'm preparing myself psychologically to face a challenge tomorrow. [...]

2. Ambivalence and need to control (n=7):
   (Excerpted example) - The loss of control goes in waves where I think I can indulge in things that I then end up not controlling or limiting everything by counting all calories. [...] Now although I am trying, I see my weight increasing and this thing knocks me down
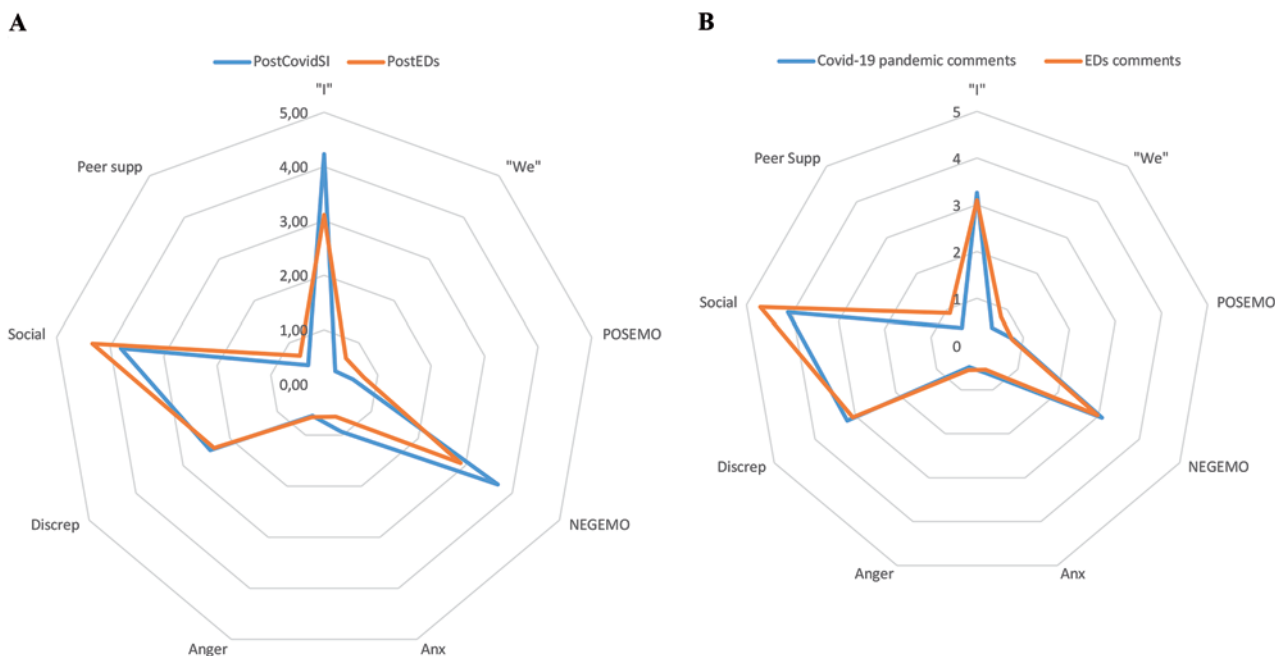

Figure 1. A) Differences between the COVID-19 Posts and eating disorders (EDs) Posts in Linguistic Inquiry and Word Count (LIWC) software categories; B) Differences between the COVID-19 Comments and ED Comments in LIWC categories. 'I', first singular pronoun 'I'; 'We', first plural pronoun 'We'; Anx, anxiety; Discrep, discrepancy; Social, social processes; Peer supp, peer support.

because even if I try, I notice that what I do is not enough

3. Attempts to change thoughts by providing a helpful meaning (n= 6):

(Excerpted example) - The only way to heal is to do therapy and good hospitalization [...] However even today ... I transformed food ... into love ... I was all night cooking gnocchi for my family.

The third theme is focused on the individual emotional processes (n=28), which includes the following three sub-themes:

1. Strategies on anxiety reduction (n=9):

(Excerpted example) - [...] to me it's working with meditation and music, as well as the food / emotional diary. Let's say that I'm taking small steps but after even 5 minutes of meditation I feel more relaxed and the anxiety that my brain promptly sparks off in me, is attenuated.

2. Emotional self-disclosure (n=9):

(Excerpted example) - In my opinion, you need to fill your day with things to do and think. Stay on your emotions and try to understand them, name them. Don't run away, don't delete them.

3. Learning to develop self-compassion (n=10):

(Excerpted example) - Very good you said the right

thing day by day! I believe we should learn to forgive our faults and think we can always recover!

The fourth theme is focused on the interpersonal processes (n=50), which includes the following four sub-themes:

1. Issues in being understood by others (n=22):

(Excerpted example) - [...] sometimes it is difficult for them to understand! ... I have been suffering from eating disorders for 25 years and unfortunately, my mother has never been able to understand my situation well.

2. Difficulties in sharing the own EDs (n=7):

(Excerpted example) - I live with four other people (my family) who keep an eye on me and punish me after every binge. I feel humiliated after every scolding. I have repeatedly disappointed them with my BED, which is why I can't tell them I'm sick. I prefer them to think I'm greedy rather than sick.

3. Negative consequences due to isolation and home confinement (n=7):

(Excerpted example) - What has been happening to me for 6 years without stopping ... and is now even worse. I feel closed in and can't even go out to avoid eating.

4. Negative affect in interpersonal circumstances (n=14):

(Excerpted example) - Good evening .... this post is more of an outlet and a search for help ... [...] maybe
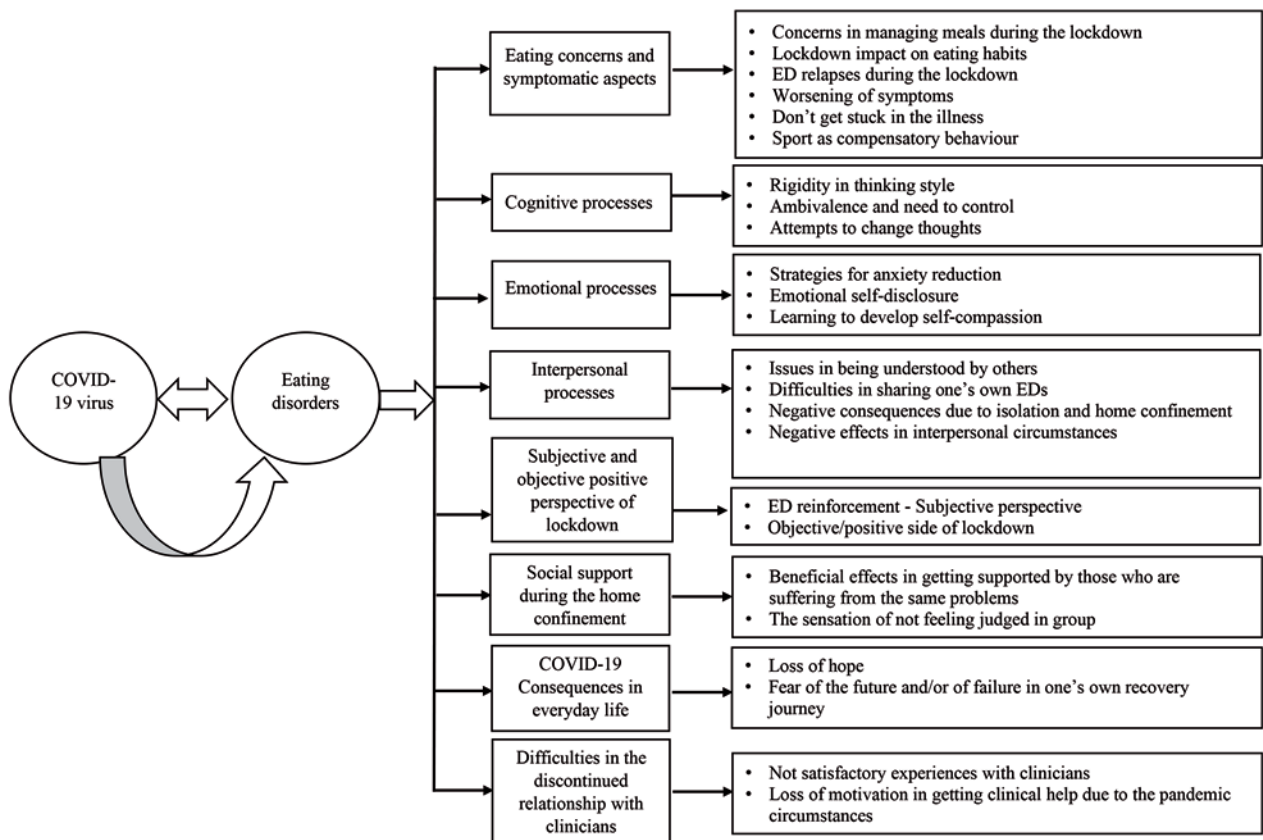

Figure 2. Shared contents focused on the association between the experience of lockdown and the eating disorders (ED) symptomatology.

it's desperation that leads me to seek help in every way ... 1 year and a half ... 1 state that unfortunately we both suffer from ED, but she has been in the disease for 7 long years ... [...] I'm afraid of losing her ... and I don't know how to behave ... this along with my problem and quarantine is only increasing my anxiety ... and my malaise. I don't know why I wrote here ... I need I don't even know what ... I just want to have hope ... I just want to figure out how to help her.

The fifth theme deals with participants' self-reported subjective and objective positive perspective of lockdown (n=23), which includes the following two subthemes:

1. ED reinforcement - Subjective perspective (n=7):
   (Excerpted example) - Quarantine extended until after Easter. I look on the positive side ... no lunch with relatives, endless binges, the agony that accompanies every occasion in which you only think about eating [...]
2. Objective/positive side of lockdown (n=16):
   (Excerpted example) - Ok, the bright side of this period: i) less pollution, ii) 7 days that I have not binged, iii) I'm talking to people about my bulimia

The sixth theme deals with the importance of social support during home confinement (n=79) which includes the following two subthemes:

1. Beneficial effects in getting supported by those who are suffering from the same problems (n=66):
   (Excerpted example) - As far as I can I am close to you ... I hope [...] that things can improve!
2. The sensation of not feeling judged in group (n=13):
   (Excerpted example) - The great thing about these groups is that they feel understood because, at least for me, it is really difficult to feel understood.

The seventh theme deals with the COVID-19 consequences in everyday life (n= 38), which includes the following three subthemes:

1. Loss of hope (n=6):
   (Excerpted example) - I have a loss of control ... what an effort ...
2. Fear of the future and/or fear of failure in one's own recovery journey (n=12):
   (Excerpted example) - This morning I finally weighed 1 kilo less after too many binges I am afraid of failing for the umpteenth time ... It is my first week that I have restarted a correct diet. This quarantine has destroyed me, and I do not know about the next months...
3. Need to be free from the COVID-19 virus (n=20):
   (Excerpted example) - Today I have not really made it .... it was February 12 that it first caused exhaustion and then Covid 19. I am stuck at home except to take the dog out for 200 meters. [...] I put the headphones on with music and went out to walk in the rain ... without a mask without gloves just a scarf ... 4 km of pure freedom in the middle of the fields ... I have remorse ... I do not regret it; indeed I would do it again 1000 times.

Finally, the eighth theme and the following excerpted examples, deal with issues and difficulties in the discontinued relationship with clinicians and treatment (n=18). Some participants indicated:

1. Not satisfactory experiences with clinicians (n=6):
   (Excerpted example) - As I have written several times, I have had bad experiences with doctors to treat my DCA and now I am afraid of being treated in general.
2. Loss of motivation in getting clinical help due to the pandemic circumstances (n=12):
   (Excerpted example) - ... I am aware that I need to be treated and now I don't know what to do since I have no contact with the doctor, and I have no one who could help me even virtually. The situation got out of hand, I need help.

Discussion

The current study aims to explore the impact of COVID-19 related to lockdown, on individuals suffering from disordered eating behaviours by examining the linguistic interaction of members via public conversations in an Eating Disorder-related community on Facebook. Overall, the results suggested that during the 56 days of the first COVID-19 lockdown in Italy (March and April 2020) individuals with disordered eating behaviours reported feelings related to anxiety, social isolation and negative emotions, which were observable in their communication style online shared contents. This is the first study that has investigated the impact of the COVID-19 pandemic, with regard to online linguistic expressions, in a sample of individuals suffering from disordered eating behaviours.

Looking at the trend of the linguistic categories in the shared contents, our results largely supported the first hypothesis (H1), with a decreasing trend of the categories We, Peer Support and Discrepancy in the published posts, as well as an increasing trend of Anxiety and Anger in published comments over time. On the one hand, these findings are in line with previous research which reported a worsening of individual mental states and an increase in negative emotions, such as fear and uncertainty, during the COVID-19 lockdown in people with self-reported EDs (Fernandez-Aranda *et al.*, 2020; Vuillier *et al.*, 2021; Weissman, Klump & Rose, 2020). There is also previous evidence of worsening anxiety in ED clinical samples from the USA and the Netherlands (Termorshuizen *et al.*, 2020). The consequences of lockdown measures in people with EDs are common concerns (Rodgers *et al.*, 2020) and our findings suggest that they experienced social isolation and decreased support along with a mounting long-term level of anxiety and anger. Furthermore, the textual analysis showed that coping with lockdown is taxing and people with disordered eating behaviours express feelings of anger and distress for being confined at home with no way of escape nor distancing themselves from food. Moreover, most subjects reported difficulties in coping with treatment discontinuation, which could have fostered feelings of anger and distress. Preliminary evidence highlighted the

fact that people are more inclined to isolate and exclude themselves during the lockdown (Banerjee & Rai, 2020) and that the poor quality of therapeutic relationships and increased isolation are associated with a worsening of ED psychopathology (Monteleone *et al.*, 2021; Termorshuizen *et al.*, 2020). As indicated by thematic analysis, participants reported a fall in their support network by staying too close and communicating badly with their families. However, qualitative results also showed that in this difficult time, the online ED community can have a beneficial effect by improving an individual's feeling of support from people who are suffering from the same problems. Our findings did not support an increasing trend in the categories NEGEMO and ED Concerns, nor a decreasing trend in the category POSEMO. It could be speculated that these non-significant findings are due to the short period of time in which the data were collected (from the 10th of March 2020 until the 4th of May), which did not make it possible to grasp the decreasing or increasing trends of these linguistic categories. Moreover, in the current study information about specific diagnoses of community members was not collected and further research is needed to enable comparisons between different clinical sub-groups to be made. However, some previous studies on the impact of the pandemic on EDs have suggested that the negative consequences of the lockdown measures were common concerns in individuals with EDs (Termorshuizen *et al.*, 2020), and these concerns could be shared in online Facebook posts and comments.

The second aim of the study was to further explore the differences in the use of linguistic categories among the shared contents dealing with concerns related to COVID-19 and those dealing only with EDs, without any reference to experiences of COVID-19, in line with our second hypothesis (H2), the results showed higher occurrence of Negemo, Anxiety, and Discrepancy in posts dealing with COVID-19, compared to those not focusing on the experience of the COVID-19 lockdown, as well as significantly lower use of POSEMO and Social categories. These findings further suggest the negative impact of the experience of lockdown on mental health states, by analysing the specificity of use of certain linguistic categories when writing online COVID-19. The LIWC allowed the mapping of different linguistic and language categories, such as positive and negative emotion words, social and cognitive processes, as they were being used daily in a closed online group, with good external validity. There is evidence that online groups, especially during a difficult time, can satisfy individual needs of affiliation, information acquisition and emotional support (Carmack Taylor *et al.*, 2007; Ruggieri *et al.*, 2021) and can offer social support, healthy advice and recovery-oriented guidance to people with disordered eating behaviours (Moessner *et al.*, 2018). Thus, shared online contents during the COVID-19 pandemic are worth examining and represent a research area to be pursued in the field of eating disorders.

The findings of our thematic analyses highlighted the most affected areas of the eating disorder psychopathology due to COVID-19 lockdown. As indicated from textual analysis, a range of concerns regarding eating behaviours were reported. Participants referred to worsening of symptoms, difficulties in managing meals during the lockdown, relapses and spending excessive time on indoor sports activities.

These results are in line with those showing an exacerbation of disordered eating behaviours in daily life during the pandemic (Fernández-Aranda *et al.*, 2020; Vuillier *et al.*, 2021). The introduction of lockdown measures in Italy has been associated with the interruption of everyday life; consequently, eating habits, patterns and routines (Rodgers *et al*, 2020), compensatory behaviours (such as physical activities) and relapse management have had a considerable impact on the lives of the participants involved. Our thematic analysis suggests that the ambivalence towards the lockdown measures was in line with participants' feelings towards routines and a sense of responsibility for their recovery. We might speculate that, from a negative perspective, the experience of lockdown is experienced as ED reinforcement, and, from the positive, as an objective challenge to be tackled using one's own coping strategies. As reported by Brown *et al.* (2021) the subjective experiences of disordered eating during COVID-19 home confinement can be seen as either facilitated or limited by restrictions, depending on the participant's living and working situation, as well as his/her eating disorder progression. These conditions increase the feelings of anger and uncertainty in individuals with dysfunctional eating behaviour (Vuillier *et al.*, 2021). However, our findings suggest that involvement in an online community enabled participants to share emotions and develop self-compassion, in trying to reduce anxiety.

Interestingly, fewer participants expressed any positive aspects of the lockdown for their eating problems ('… I look on the positive side ... no lunch with relatives, endless binges…The bright side of this period: less pollution… 7 days without binging… talking to people about my bulimia'). Preliminary qualitative investigations in the ED field suggested that the changes due to COVID-19 can have positive consequences, such as a greater focus on recovery-oriented goals and engagement in adaptive coping skills (Termorshuizen *et al.*, 2020). Describing the positive aspects of the pandemic, in addition to the reported negative effects, highlights the multifaceted experience of people with disordered eating during the lockdown. A few participants reported having to redesign and restructure the everyday aspects of their lives, because with the COVID-19 pandemic there had been an increase in awareness of individual behavioural intentions and coping strategies in managing unexpected events (Brown *et al.*, 2021; Vuillier *et al.*, 2021); therefore, lockdown consequences in normal life (*e.g.*, 'loss of hope' and 'fear of failure') and the importance of social support (*e.g.*, 'peer

support' and the 'importance of being loved') tend to be the most widely-shared/posted contents in the Facebook online community.

The current study has highlighted certain vulnerability factors related to home confinement or stressful situations for people with dysfunctional eating behaviours. These findings can have relevant clinical implications. For example, they might help clinicians to tailor preventive and therapeutic approaches, developing self-compassion strategies and improving social support (from recovered individuals) for this clinical population, in order to regulate negative effects and social distress. These findings may also help to prioritize those who might need more help, and psychologists and mental health professionals might provide services to, at least, start addressing mental health issues, even during lockdown. For example, other studies on the COVID-19 pandemic and EDs have suggested using digital interventions to ensure access to people (Fernandez-Aranda *et al.*, 2020; Weissman *et al.*, 2020). The COVID-19 pandemic poses great challenges to patients with dysfunctional eating behaviours; ED-related thoughts, negative emotions, and isolation may be used as dysfunctional coping mechanisms to regain control over the current circumstances. E-mental health interventions appear to be promising for supporting people with dysfunctional eating behaviours during these hard times. Furthermore, interventions addressing symptoms of depression and anxiety, as well as intolerance toward uncertainty, might help them manage their ED symptoms.

Limitations and future directions

Certain strong-points from this study should be highlighted. For instance, it adopted an innovative linguistic analysis tool (*i.e.* the LIWC software), which has never been used before for the analysis of online linguistic expressions related to the COVID-19 pandemic. Also, a study was carried out on the trend of linguistic expressions based on daily data collection, to comprehend the evolution of linguistic expressions during all the 56 days of the first Italian lockdown. Finally, text analysis may help identify potentially harmful feelings expressed in posts and comments for a clinical population, and consequently, it could be useful in hypothesizing specific types of intervention.

Several limitations should also be considered when interpreting the current results. Firstly, we only assessed the contents shared by people belonging to an ED online group, with a self-reported diagnosis of eating disorder. Thus, further research is necessary to extend the study's findings to a clinical population in medical settings. Secondly, we were not able to differentiate ED diagnoses due to privacy issues of the Facebook online community. Thus, further research is needed to examine whether the posts and comments on Facebook might reflect the pandemic effects on illness behaviours that were consistent with diagnoses (*i.e.* AN, BN or BED). Thirdly, all the data were collected in an online group on Facebook and cannot

be representative of the online contents shared via social media during the COVID-19 lockdown. Fourthly, we were not able to differentiate the linguistic categories based on the ED diagnosis and it is not clear which concerns expressed regarding COVID-19 are linked to the clinical characteristics of the participants. Eating disorders represent a classification that encompasses a range of different psychological conditions with a wide variety of symptoms and behaviours. Extending the results to all the different types of eating disorders and a possible unambiguous explanation may present a challenge. However, prior research suggested that a worsening of eating behaviour was common across ED disorders during the COVID-19 pandemic (Castellini *et al.*, 2020; Schlegl, Maier, Meule & Voderholzer, 2020; Termorshuizen *et al.*, 2020). As a result of its exploratory design, this study may contribute to providing evidence on the impact that COVID-19 is having on ED development, in worsening of symptoms and in problems with emotional regulation as a trigger of ED symptoms (Manasse *et al.*, 2018; Masheb, Dorflinger, Rolls, Mitchell, & Grilo, 2016). A further limitation was that we could not have access to descriptive data for our sample (we only collected posts and comments), therefore the age range in this context is very wide, as is the variability of expression of EDs in their different stages of life. On the other hand, we decided to collect only posts and comments in order to perform our linguistic analysis, to maintain the personal details of the members of the Facebook forum private and confidential. Finally, although the current study examined all the posts published during the first lockdown in Italy, comparison is lacking with posts published before the COVID-19 pandemic. Further research is necessary to examine how the use of linguistic categories changed from pre- to post-COVID-19 experience in people suffering from disordered eating problems.

Conclusions

Seen as a whole, this study suggests that, during the COVID-19 pandemic, people with dysfunctional eating behaviours reported several concerns and dysfunctional behaviours. The linguistic expression in ED online groups may play an important role to further understand the negative and positive feelings of people suffering from dysfunctional eating behaviours during the quarantine phase.

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