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Can news with positive or negative content affect and a relaxation pause improve the emotional state of health care professionals? A randomized online experiment during COVID-19 pandemic

Paulo Rodrigo Bazán, Raymundo Machado de Azevedo Neto, Shirley Silva Lacerda, Maurício Watanabe Ribeiro, Joana Bisol Balardin, Edson Amaro Jr., Elisa Harumi Kozasa *

Hospital Israelita Albert Einstein, São Paulo, SP, Brazil

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ABSTRACT

A cause of mental distress during the COVID-19 pandemic is media exposure, which can impact health care professionals (HCPs) who must keep up to date with the statistics and procedures to fight the outbreak. This study aimed to evaluate the effects of listening to negative and positive news about COVID-19 pandemic and a relaxation pause audio. For that, we measured the emotional state through Likert items in a scale developed to assess how anxious, stressed, hopeful, conscious about emotions, irritated, despondent, joyful, optimistic, and preoccupied, he or she was feeling in the moment of evaluation. In an online experiment, an HCPs sample of 245 participants were randomly assigned to either listen to negative or positive news contents about COVID-19. After that, both groups were guided by a relaxation pause activity in which they paid attention to the body and breath. They were assessed before and after listening to each audio. After listening to negative news, participants entered in a more negative emotional state than at baseline ($p < 0.001$) and compared with participants who listened to positive news ($p < 0.001$). Both groups improved their emotional state after performing the proposed brief relaxation ($p < 0.001$). These results show the importance of HCPs being aware and controlling the content of consumed news. A brief relaxation practice can mitigate the negative effects of consuming information with negative content.

1. Introduction

On March 11th 2020, the World Health Organization declared the new coronavirus outbreak as a pandemic. By July 17th, there were 13,378,853 confirmed cases of COVID-19, 580,045 deaths in 216 countries, areas or territories (World Health Organization, 2020).

The involvement of health care professionals (HCP) with infected patients has affected their physical and mental health and well-being. Many studies have reported that their engagement in diagnosis and treatment of patients with COVID-19 are correlated with higher risks of depression, post-traumatic stress disorder (PTSD) among other mental health problems. Fear of contracting the disease, lack of training or equipment have exposed the frontline HCP to high levels of stress (Das et al., 2021). After a Medline and Pubmed search for studies on the prevalence of anxiety in health care workers published during the pandemic, 71 studies were included. The prevalence of anxiety in this group was 25%. In nurses it was 27% and 17% in medical doctors. Those who were in frontline presented 43%, suggesting that HCP are experiencing significant levels of anxiety during the COVID-19 pandemic (Santabárbara et al., 2021). In an umbrella review, 103 studies were found, and 7 studies were included. The results showed that the prevalence of anxiety and depression among healthcare workers during the COVID-19 was 24.94% and 24.83% respectively (Sahebi et al., 2021). Indeed, in a systematic review, HCP presented a relatively high prevalence of anxiety, insomnia, depression, PTSD, phobia, obsessive-compulsive and somatization symptoms during the pandemic (Hao et al., 2021). One possible cause of mental distress during the pandemic is media exposure, which can impact workers of health care institutions (Gao et al., 2020).

During the pandemic, employees of a major health-care institution in Brazil were invited to answer a cross-sectional on-line survey. The sample included 2646 professionals. Among them, 44.4% reported excessive or almost excessive access to data related to COVID-19 and 67.6% reported increased time spent on social media. Potential signs of

* Corresponding author.
E-mail address: ehkozasa@gmail.com (E.H. Kozasa).

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information overload related the pandemic were: 31% felt stressed by the amount of information they had to maintain, 80.0% experienced headache, eye twitching, restlessness or sleeping difficulty. There were more frequently reported by participants who increased their social media access. This study suggests that excessive information exposure may lead to distress and decrease mental health (Bazán et al., 2020).

Every day we are exposed to information with different valences and intensities. News with positive and negative content have been shown to affect people's emotional responses. In a study, participants were invited to listen to radio news. After that, they were requested to evaluate an anonymous person characteristic. Participants who listened to "good news" evaluated the person in a more pleasant way, than those who listened to "bad news". It suggests profound effects of news on how we perceive and evaluate others (Veitch and Griffitt, 1976). Another study about the consumers reaction to financial and economic news in Australia, demonstrated that they react asymmetrically to them, supporting the tendency to negative bias, because respondents only reacted to bad news: decreases in consumer feelings had a negative effect on consumer behavior and increases in these feelings had no effect (Nguyen and Claus, 2013). The effects of daily news on people's emotional states using an ecological momentary test, five times a day for 10 days, were evaluated in 63 participants. The results indicated that negative news were associated with more negative and less positive emotions, and these effects were not moderated by personality characteristics (de Hoog and Verboon, 2020).

HCPs need to access regular information about the coronavirus spread to protect themselves, improve their professional practice, as well as to help general public literacy about the pandemic (Chong et al., 2020). Given the possible impact of the negative news on emotional state, and the inevitable exposure to some bad news in our daily routine, it could be helpful to introduce interventions that can help reduce the adverse mental health outcomes, in addition to changing the focus to positive news. In this direction, a study with undergraduate students suggested that a 15-minute relaxation pause intervention provided a return to baseline emotional state after exposure to negative television news, compared to a distraction control condition (Szabo and Hopkinson, 2007). In an evaluation of a protocol to help health care professionals do improve situational awareness and the culture of mutual care, it improved psychiatric symptoms, perceived stress and self-compassion after one month of practices. One of the main components of the protocol was a brief relaxation pause of 5 min performed before the shift and during the working hours (Kozasa et al., 2020). The Relaxation Response "is a natural innate protective mechanism which allows us to turn off harmful effects from stress through changes that decrease heart rate, lower metabolism, decrease rate of breathing, and in this way being the body back into a healthier balance" (Benson and Klipper, 1975). Therefore, a relaxation pause may be an interesting procedure to recover from negative emotional episodes.

The content of the information to which HCPs have access might affect their mental health differently. How would news with positive and negative content about COVID-19 change the emotional state of HCPs in the pandemic context? Moreover, may a brief relaxation pause intervention help HCPs improve their emotional states?

We designed an experiment to address these questions. An HCP sample was randomized into two groups, one exposed to negative news, and the other to positive news contents. After listening to the news, both groups were guided by a brief relaxation pause exercise paying attention to the body and breath.

We hypothesized that audio with negative news should lead individuals to higher scores in negative emotional states, as opposed to the positive audio. The audio with positive news should improve positive emotional states, as opposed to the negative audio. The pause effect should be more pronounced in the group that went through the audio with negative content.

2. Material and methods

To compare the effects of positive and negative news, this study used a randomized online experiment design. Health care professionals from a major hospital in Sao Paulo were invited to participate in the study by institutional e-mails. Among them, those who decided to participate assessed a REDCap (Harris et al., 2009, 2019) online platform, accepted the Informed Consent form and were randomized to listen to positive or negative news about COVID-19. After that, the effects of a relaxation pause were also evaluated by submitting all participants to a relaxation audio. There was not a control group for the relaxation pause audio, as all participants listened to it. The objective of the relaxation pause audio was to minimize the chance of the volunteers being in a worse emotional state after the experiment, especially due to the negative news. As this was a self-conducted experiment, it was important to prevent any risks related to participation in the experiment. This study and its analysis plan were not preregistered. The analysis code is provided as a supplementary material (S1), and access to the original data can be requested by email to the corresponding author and will undergo an evaluation by the local ethics committee.

2.1. Participants

Health care professionals (medical doctors, nursing professionals, dentists, physiotherapists, speech therapists, biomedical scientists, technicians, and hospital waiters) working in a private hospital, considered the best in Latin America and a reference in COVID-19 treatment (the first reported cases in Brazil were treated by this institution), were invited to participate in this study. An email invitation to participate in the study was sent on June 9th of 2020 to the institutional email of workers classified as working directly with patients. The online experiment was available until June 25th of 2020. Out of 7627 HCPs who received the recruitment e-mail to the online experiment, 4076 opened it and 781 clicked in the link. The HCPs who started the experiment were 748 and 245 finished it and were included in the analysis (Fig. 1).

Inclusion criteria: availability of time to participate in the experiment (approximate time of 10 to 15 min), working during the study data acquisition period (from June 9th to June 25th).

Exclusion criteria: did not complete the experiment (did not complete the survey questions or did not listen to the entire audios) or took more than 30 min to finish it. The study was approved by the Ethics Committee of Hospital Israelita Albert Einstein (CAAE 32344820.6.0000.0071).

2.2. Audios

Audios containing material regarding positive or negative news about the current COVID-19 pandemic were recorded. These audios were generated based on real news about the pandemic. The positive news covered social initiatives, number of recovered cases, development of new improved tests for COVID-19 detection, among others. The negative news mentioned the number of cases and deaths in the world, number of affected countries, economic impacts of the pandemic, among other topics. The number of facts reported in the audios were balanced, and both had the same duration (2 min and 3 s). Participants were randomly assigned to groups that listened to positive or negative news. Both groups, after the news audios (see Section 2.4), were guided by a relaxation pause audio (3 min and 19 s). This audio suggested the participants to sit in a comfortable position and guided them to take deep breaths and relax their bodies, while paying attention to their bodies and respirations. The original audios in Portuguese and the translated transcript of the audios are provided as supplementary materials (S2-S7). The time that the participants spent in each page of the REDCap survey was recorded, and only participants who stayed for at least the entire audio durations in the audio pages were included in the analysis.

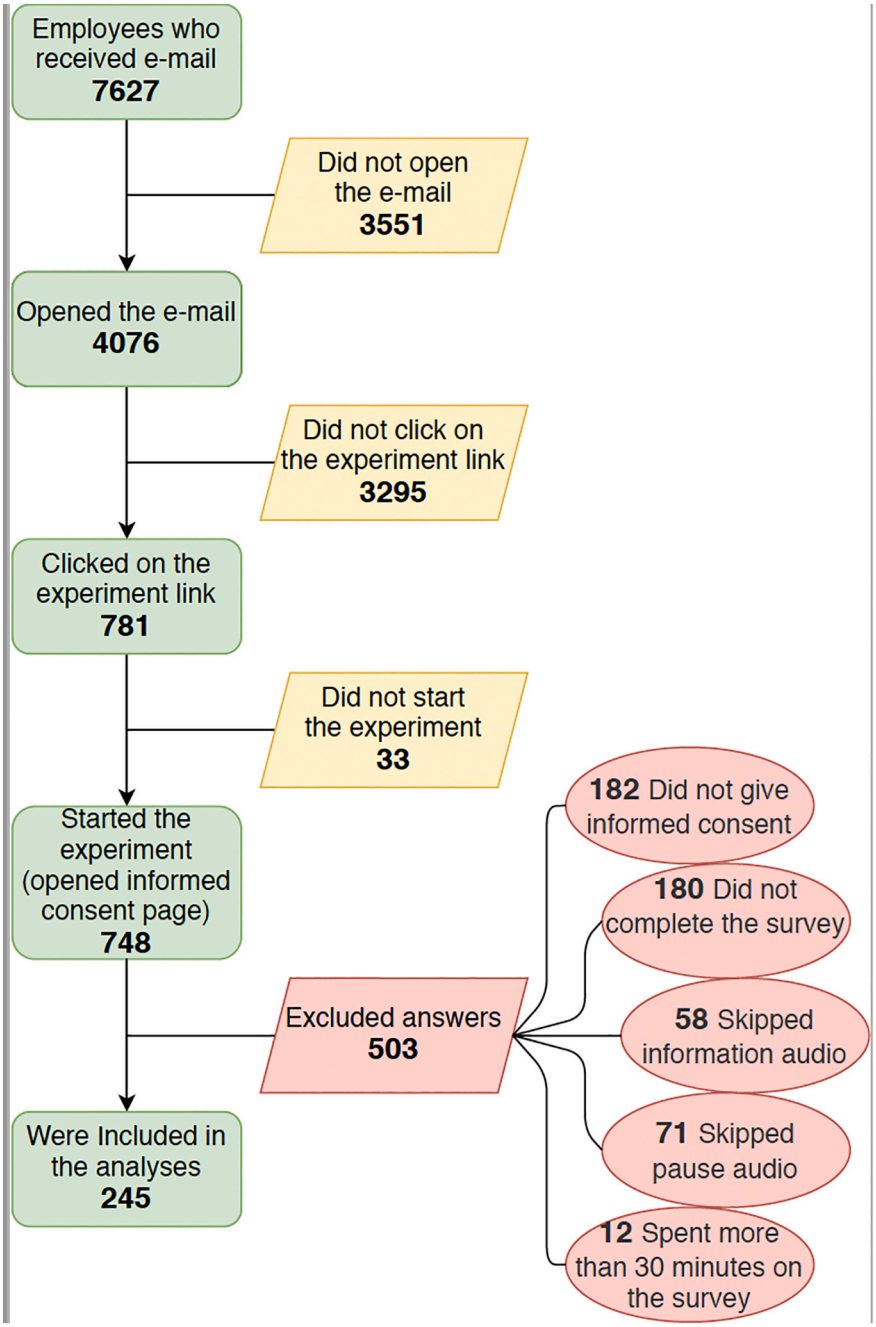

Fig. 1. Flow chart of the experiment recruitment and participants inclusion.

2.3. Scale

To measure the emotional state, before the experiment, after listening the positive or negative audio, and after the relaxation pause, we developed the Emotional State Scale (ESS). The scale contained 9 items, each evaluating a different feeling. The participant had to give a grade in a Likert scale from 0 (not at all) to 10 (to the extreme) based on how he or she was experiencing each feeling in the moment of evaluation. The 9 items evaluated were: anxious, stressed, hopeful, conscious about emotions, irritated, despondent, joyful, optimistic, and preoccupied (see supplementary material S8 for the original Portuguese version of the questionnaire). Considering the valence of these emotions, 5 of the items were expected to be negative (anxious, stressed, irritated, despondent, and preoccupied) and 4 were expected to be positive (joyful, conscious about emotions, hopeful, optimistic). Indeed, an Exploratory Factorial Analysis (JASP version 0.13.1) on ESS scores confirmed the separation of these items into two factors with a good fit index of Kaiser-Meyer-Olkin test (KMOT = 0.839), Bartlett's test ($p < 0.001$); root-mean-squared error of approximation (RMSEA = 0.068) and Tucker–Lewis index (TLI = 0.968). Therefore, for the generation of the total score of the ESS, the positive items were inverted and them all item scores were summed. In this way, higher scores indicate a more negative emotional state, while lower scores suggest a more positive emotional state. Responses to all items presented high reliability after inversion of positive scores, as evidenced by a Cronbach's α of 0.865. Additionally, the positive and negative items also presented high reliability separately (positive items Cronbach's α of 0.769; negative items Cronbach's α of 0.893). Based on this, a positive score was generated by summing the four positive items before inversion, in a way that higher scores represent more positive emotional states. Similarly, the five

negative items were summed to for the negative score (higher values suggest more negative emotional states). These three scores were used in the statistical analysis (Section 2.5)

2.4. Procedure

After signing the Informed Consent electronically, participants provided sociodemographic information (age, gender, education and whether they were working at COVID-19 frontline) and were randomized to the Negative News (NN) or Positive News (PN) groups. For this randomization, the automatically generated identification number (ID), created when a participant started the survey (opened informed consent page) was used. Even IDs were assigned to the positive audio, while odd IDs were assigned to the negative audios. The IDs are generated sequentially. This is expected to provide an appropriate randomization between groups, given that these assignments are not controlled by the researchers, as volunteers could respond the questionnaire at any time, as this was an online survey. Also, the participants were not aware of their IDs nor of the distribution rules, so they could also not manipulate the randomization between the news groups.

This experiment had three assessments of the participant's emotional state: before listening to any of the audios (Pre); after listening to the news audios (Post news); and after the relaxation pause (Post pause). In detail, both groups answered the ESS as an initial or baseline assessment of their emotional state right after giving the informed consent. Then the NN group were subjected to an audio with negative content about COVID-19 and the PN group to positive content (as described in Section 2.2 and supplementary materials S2-S5). Both groups answered the questions of the ESS again, after the audio. After that, both groups listened an audio of guiding relaxation. In this audio, the participants had to pay attention to the breath and relax the body (Section 2.2, supplementary materials S6-S7). At the end of the relaxation exercise, they answered the same series of questions of the ESS.

2.5. Statistical analysis

To assess the effect of positive and negative news and a pause exercise on participants feelings, we created three different scores from our 9-item Likert-scale (from 0 to 10) questionnaire. We first create an overall score by summing the responses from all items, reversing the responses for what we call positive items (i.e. happy, optimistic, hopeful, and conscious, see Section 2.3). We then separated positive and negative items and summed participants responses for these two categories of items separately, creating a positive and negative score.

The effect of news and pause on these three scores were evaluated through a 2-way mixed ANOVA, with factors news group (positive vs. negative contents) and time (pre news, post news, post pause), with the later been a repeated measures factor. Before running the ANOVAs, we checked for any violations of its assumptions. To assess normality of residuals, we used the Shapiro-Wilk tests (supplementary tables ST1, ST16 and ST31 inside supplementary material S9) and QQplots (supplementary figures SF2, SF4 and SF6 inside supplementary material S9). To assess homogeneity of variance, we used Levene's test (supplementary tables SF2, SF17 and SF32 inside supplementary material S9). To assess homogeneity of covariance for the news group factor, we used Box's M test (supplementary material S9). To assess sphericity assumption, we used Mauchly's test. For all tests applied, significance level was set at alpha = 0.05, except for the Box's M test which, because of being too sensitive, was set to 0.001. When appropriate, post hoc tests were applied (pairwise comparisons using *t*-tests and Cohen's *d* effect-size, assuming or not equal variances following results of Levene's test), applying Bonferroni correction for multiple comparisons. In case of violation of the sphericity assumption, we corrected it using the Greenhouse-Geisser and Huynh-Feldt corrections (supplementary tables ST4, ST19 and ST34 inside supplementary material S9). For the case where other violations occur (normality, homoscedasticity, and homogeneity of covariance), we did not transform the data to solve the issue to keep the results interpretable, but we applied non-parametric tests and robust ANOVA (supplementary tables ST11-ST15, ST26-ST30, and ST40-ST44 inside supplementary material S9) to evaluate if the results from the canonical ANOVA still hold. In addition, we explicitly note the violation accompanying the analysis (supplementary material S9).

All analyses were run using the statistical programming language R (RCoreTeam, 2020) and packages (Bavel et al., 2020; Edwards, 2020; Grolemund and Wickham, 2011; Henry et al., 2016; Kassambara, 2020a, 2020b; Lawrence, 2016; Mair et al., 2020; Müller, 2017; Rodriguez-Sanchez, 2018; Wickham, 2011, 2020; Wickham and Wickham, 2019).

3. Results

Health care professionals working in a private hospital, reference in COVID treatment, were invited to participate in an online experiment, of which 245 completed the study. After agreeing to participate in the study through an online consent, participants responded to an Emotional State Scale (ESS), a brief scale created for an online study purpose (see Methods Section 2.3 for more details on the scale), in three time points: before listening to audio news (Pre), after listening to audio news (Post news), and after listening to a relaxation pause audio (Post pause). Participants were randomly assigned to either listen to audio news with positive (n = 124, 50.6%) or negative (n = 121, 49.4%) content. These two groups only presented sociodemographic differences in gender ($p = 0.023$). There were no differences in age, education and whether they were working in the frontline or not (Table 1). Both groups had more females, which is a characteristic of the health care sector (Fontenot, 2012).

Participants were self-classified as either frontline ($N = 188$, 76.7%) or non-frontline ($N = 57$, 23.3%) workers, based on their direct interaction at work with confirmed or suspected cases of COVID-19. We decided to aggregate data from both groups for further analysis since the two groups showed no differences in the ESS at Pre time point (Kolmogorov-Smirnov test: D = 0.1224, $p = 0.528$).

We first created a total score to evaluate the effects of news contents and relaxation pause on the emotional state of the participants. This score was created by summing all the responses of the ESS. The scale consisted of 9 items evaluated using a Likert-scale ranging from 0 to 10. Higher scores indicate a more negative emotional state. Analyzing this the distribution of the total score (Fig. 2), we found significant ANOVA effects of group, time and of their interaction ($p < 0.001$, Table 2). Further details of the ANOVA results are provided in supplementary tables ST3 and ST4 inside supplementary material S9. Post hoc tests suggested that these effects were related to the opposite effects of positive and negative news and the to the effects of the relaxation pause in both news groups (Tables 3 and 4). We verified, that before listening to the news, negative and positive news groups did not differ ($p = 0.237$). After listening to the audio news, the negative news (NN) group presented significantly higher scores than the positive news (PN) group ($p < 0.001$), as they increased their total score ($p < 0.001$], whilst the PN group reduced their total score ($p < 0.001$). Finally, both groups decreased their total scores after the relaxation pause ($p < 0.001$), especially the NN group, which presented a large reduction (Cohen's $d = 0.81$). Both the negative ($p < 0.001$) and the positive news ($p = 0.006$) groups reached lower scores after the relaxation pause than the ones they had in the beginning of the experiment, indicating the beneficial effect of this practice. Nonetheless, the NN group still presented higher levels of negative emotional state than the PN group after the relaxation pause ($p = 0.019$). Summary statistics of each News Group, in each time are displayed in Table 5.

After evaluating the total score, we further explored the fact that the ESS contains both positive and negative questions. First, we analyzed positive scores by summing responses only from positive items (joy, optimistic, hopeful and consciousness about emotions). In this analysis,

Table 1
Sociodemographic information.

	Positive news ($N = 124$)	Negative news ($N = 121$)	Total ($N = 245$)	p-Value
Gender*				
Female	105 (84.7%)	87 (71.9%)	192 (78.4%)	.023[a]
Male	19 (15.3%)	34 (28.1%)	53 (21.6%)	
Age (years)				
Mean (SD)	37.7 (9.13)	38.6 (8.61)	38.1 (8.87)	.427[b]
Median [Min, Max]	37.5 [20, 78]	38 [20, 73]	38 [20, 78]	.378[c]
Age groups (years)				
18-25	6 (4.8%)	5 (4.1%)	11 (4.5%)	1.00[a]
25-34	39 (31.5)	35 (28.9%)	74 (30.2%)	.771[a]
35-44	53 (42.4%)	57 (47.1%)	110 (44.9%)	.577[a]
45-54	22 (17.7%)	19 (15.7%)	41 (16.7%)	.798[a]
55-64	3 (2.4%)	3 (2.5%)	6 (2.4%)	1.00[a]
≥65	1 (0.8%)	2 (1.7%)	3 (1.2%)	.983[a]
Education				
Higher secondary education	30 (24.2%)	22 (18.2%)	52 (21.2%)	.320[a]
Undergraduate/ bachelor	37 (29.8%)	28 (23.1%)	65 (26.5%)	.297[a]
Graduate, MBA, MSc, PhD	57 (46.0%)	71 (58.7%)	128 (52.2%)	.062[a]
Working at COVID-19 frontline				
No	32 (25.8%)	25 (20.7%)	57 (23.3%)	.423[a]
Yes	92 (74.2%)	96 (79.3%)	188 (76.7%)	

Note. The p-values refer to tests comparing the Positive and the Negative News groups; N = sample size; SD = standard deviation; Min = Minimum observed value; Max = maximum observed value.
[a] Proportion test.
[b] t-Test.
[c] Wilcoxon rank sum test.
* $p < .05$.

higher scores represent a more positive emotional state. The distribution of the scores is presented in Fig. 3. All the ANOVA effects were significant ($p < .002$ Table 2, supplementary tables ST18 and ST19 inside supplementary material S9). The post hoc test indicated that these effects were associated with changes observed especially in the negative news group (Tables 3 and 4). Before listening to the news, there was no difference between negative and positive news groups for positive scores ($p = 1.00$). After listening to news, the NN group decreased their positive scores ($p < 0.001$), presenting a difference in relation to PN group ($p < 0.001$), which did not increase their score significantly ($p = 0.066$). After the relaxation pause, there was no difference for PN ($p = 1.00$) and an increase for the NN ($p < 0.001$), returning to no difference between groups ($p = 0.162$). To summarize, only the NN group presented differences over time in the positive score.

Considering only the negative scores (Fig. 4), such that higher scores indicate a more negative emotional state, all the ANOVA effects were significant ($p < .001$Table 2, supplementary tables ST33 and ST34 inside supplementary material S9). Post hoc tests (Tables 3 and 4) found that, before listening to the news, there was already a difference between groups for negative scores ($p = 0.048$). As in the total score analysis, after listening to news, PN group decreased ($p < 0.001$) and NN increased ($p < 0.001$) their negative scores, presenting a difference between groups at this point ($p < .001$). After the relaxation pause, there were decreases for both PN and NN in negative scores ($p < 0.001$), persisting the difference between groups ($p = 0.027$). Also, the scores after pause were lower values than before listening to the audios ($p < 0.001$). Again, the analysis highlighted opposite effects of negative and positive news audios, and an effect of the relaxation audio in both groups.

4. Discussion

Here we aimed to verify if health care professionals, a population under heavy burden during the COVID-19 pandemic, would have their emotional state affected by listening to news with different valence contents and if a brief relaxation pause would be able to improve their emotional state. To address these questions, participants responded to an online experiment, in which an emotional state score was estimated three times: before listening to either positive or negative content news, after listening to the news, and after a brief relaxation pause. We hypothesized that audio with negative news should lead individuals to higher scores in negative emotional states, as opposed to the positive audio. The audio with positive news should improve positive emotional states, as opposed to the negative audio. The pause effect should be more pronounced in the group that went through the audio with negative content. Overall, our results show that, after listening to negative news, participants entered in a more negative emotional state than at baseline and compared with participants who listened to positive news. Furthermore, both groups improved their emotional state after performing the proposed brief relaxation practice. These results indicate the importance of being aware and controlling the content of consumed news, especially for the sensitive and at risk HCPs population(Lai et al., 2020; Chen et al., 2020). Additionally, our results suggest that even a brief relaxation practice is able to mitigate the negative effects of

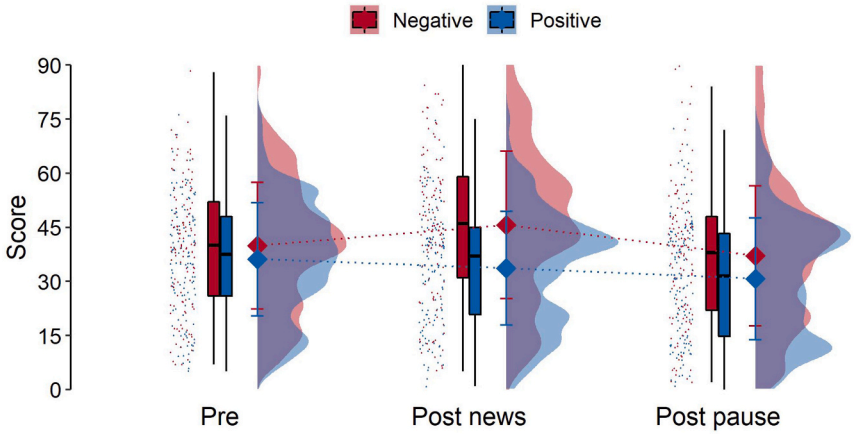

Fig. 2. Total scores of the Emotional State Scale before the experiment (Pre), after positive or negative news (Post news) and after the relaxation pause (Post pause). The ANOVA revealed a significant main effect of news group ($p < 0.001$), main effect of time ($p < 0.001$) and significant news group by time interaction ($p < 0.001$). Bonferroni corrected post hoc tests indicated that these effects were associated with differences between groups Post news ($p < 0.001$) and Post pause ($p = 0.019$), and with differences observed in both groups from Pre to Post news ($p < 0.001$) and to Post pause (PN: $p < 0.001$; NN: $p = 0.006$), as well as differences from Post news to Post pause ($p < 0.001$).

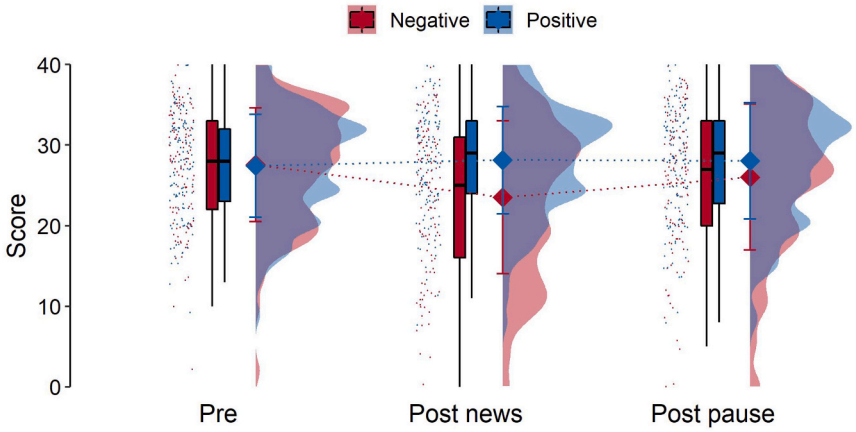

Fig. 3. Positive scores of the Emotional State Scale before the experiment (Pre), after positive or negative news (Post news) and after the relaxation pause (Post pause). There was a significant main effect of news group ($p = 0.022$), main effect of time ($p < 0.001$), and significant news group by time interaction ($p < 0.001$) for which we ran post hoc pairwise comparisons of means, using Bonferroni's correction. Only after news a significant difference in positive scores between news groups ($p < 0.001$). Negative news group presented differences from before to after news ($p < 0.001$) but not the positive news group ($p = 0.066$). In after news to after relaxation pause, and before news and after relaxation pause, the negative news group presented a difference ($p = 0.001$), however the positive news group did not present it. There were no significant differences before news and after relaxation pause for the positive news group, only for the negative news group ($p < 0.001$).

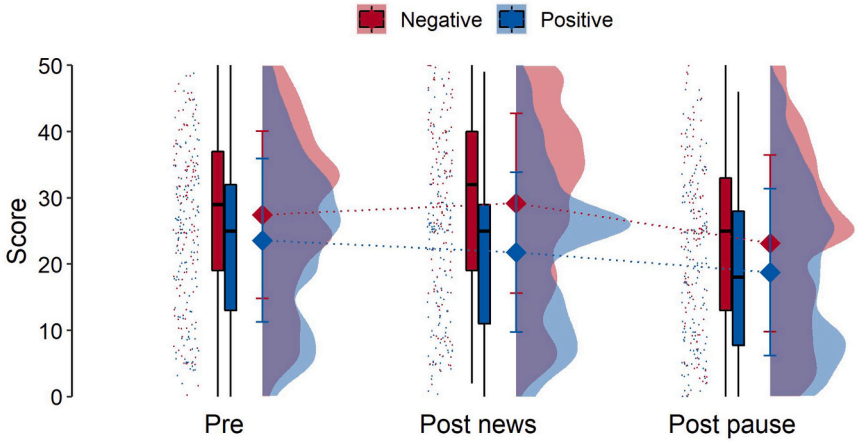

Fig. 4. Negative scores of the Emotional State Scale before the experiment (Pre), after positive or negative news (Post news) and after the relaxation pause (Post pause). There was a significant main effect of news group ($p < 0.001$), main effect of time ($p < 0.001$), and significant news group by time interaction ($p < 0.001$) for which we ran a post hoc pairwise comparison of means, correcting for multiple comparisons using Bonferroni. There were differences between groups before the news ($p = 0.0474$), after news ($p < 0.001$) and after relaxation pause ($p = 0.026$). There were significant differences from before to after news ($p = 0.024$; $p < 0.001$ respectively), and before to after pause ($p < 0.001$) and after news and after pause ($p < 0.001$).

Table 2
Post hoc tests of news group in each time.

Time	Mean difference	t	DF	Corrected *p*	Cohen's *d*	Magnitude[a]
Overall score						
Pre	3.74	1.76	243	0.237	0.23	Small
Post news	11.99	5.13	225.4	<0.001***	0.66	Moderate
Post pause	6.40	2.75	243	0.018*	0.35	Small
Positive score						
Pre	0.13	0.16	243	1.00	0.02	Negligible
Post news	-4.62	-4.39	214.5	<0.001***	-0.56	Moderate
Post pause	-2.02	-1.94	243	0.162	-0.25	Small
Negative score						
Pre	3.87	2.43	243	0.048*	0.31	Small
Post news	7.38	4.5	243	<0.001***	0.58	Moderate
Post pause	4.37	2.64	243	0.027*	0.34	Small

Note. The results in this table refer to tests comparing the Positive and the Negative News groups in each time; DF = Degrees of freedom.
[a] Magnitude of the effect size: negligible |d| < 0.2; small |d| <0.5; moderate |d| < 0.8; large |d| ≥ 08.
* $p < 0.05$.
*** $p < 0.001$.

consuming information with negative content.

For our study, we decided to devise a very brief new scale to assess the emotional state of the participants instead of using previous validated scales, such as PANAS (Watson et al., 1988), because we perceived in a pilot test that the length of the scale would be crucial for adherence to complete the experimental protocol. In online environments people tend to give up answering questions if they perceive that it would take a long period of time. There is a decrease in time spent answering each question as surveys grow in length, and the survey abandon rates increase for surveys that took more than 7-8 min to complete (Chudoba, 2020).

We designed the EES containing both positive and negative valence Likert-type items, which, after proper inversion, is summed to assess an overall emotional state. Although the Emotional State Scale is not a validated instrument, it presented good internal consistency for the current sample (see Material and methods sections for details). In

Table 3
ANOVA results.

Effect	DFn	DFd	F	*p*	*p*[GG]	*p*[HF]
Overall score						
Group	1	243	11.47	<0.001***	–	–*
Time	2	486	63.55	<0.001***	<0.001***	<0.001***
Group:time	2	486	32.10	<0.001***	<0.001***	<0.001***
Positive score						
Group	1	243	5.29	0.002**	–	–
Time	2	486	22.75	<0.001***	<0.001***	<0.001***
Group:time	2	486	43.67	<0.001***	<0.001***	<0.001***
Negative score						
Group	1	243	11.16	<0.001***	–	–
Time	2	486	82.59	<0.001***	<0.001***	<0.001***
Group:time	2	486	10.74	<0.001***	<0.001***	<0.001***

Note. DFn = Numerator degrees of freedom; DFd = Denominator degrees of freedom; Group:Time = Group by time interaction effect; *p*[GG] = *p*-value after Greenhouse-Geisser sphericity correction; *p*[HF] = *p*-value after Huynh-Feldt sphericity correction.
* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

addition, Exploratory Factor Analysis (EFA) indicated that ESS showed 2 main factors with a good fit index (factor 1 with negative scores = anxious, stressed, irritated, despondent, and preoccupied; and factor 2 with positive scores = hopeful, conscious, joyful, and optimistic). Therefore, we tested the possibility of evaluating positive and negative emotional states separately. Qualitatively, the results of the total and negative scores are the same. However, the positive score was not able to show evidence for difference between news groups after the relaxation pause. This absence of difference might be due to a real absence of difference between groups as assessed by the positive emotions. However, it could also mean that the positive score is less sensitive than the overall and the negative scores, possibly due to being composed of only 4 items. For this reason, the results of the current experiment might be better interpreted together, in light of the total score, and the ability to evaluate positive and negative states separately should be addressed in future studies.

Our results show that listening to negative news increases HCPs scores in the ESS scale, which indicate a more negative emotional state. Negative content news could be a potential danger to HCPs. The increase in negative emotional state, coupled with other sources of stress common to their work, might contribute to the emergence of physical and mental health issues, such as insomnia, depression, burnout, anxiety, fear of transmitting infection, increased substance-dependence and other mental problems (Dubey et al., 2020). Indeed, social media exposure during the pandemic has been associated with the presence of depression, anxiety and combination of depression and anxiety (CDA) symptoms (Gao et al., 2020). Note, however, that we did not test for the association between CDA symptoms and the direct effects of listening to news and the ESS scores.

Women and men deal differently with negative content news, with women having stronger negative effects (Marin et al., 2012). However, even though the positive news group had more women than the negative news group, the effects were stronger in the negative group. This suggests that the results and differences observed between the groups are most likely caused by the news content and not only by the gender difference.

To mitigate the effects of being exposed to negative news, one might try to change news consumption habits and start to look for more positive uptakes on the news. Our results indicate that such strategy ameliorate participants emotional state, as shown by a decrease in ESS score from before to after listening to positive content news. In agreement with this result, an online survey in Chicago revealed that the relationship between fear of crime and depression is weaker for residents who pay more attention to positive local news (Yamamoto, 2018). In addition, a study with preadolescents showed the importance of exposing them to constructive (solution-based news including positive emotions) news. Constructive compared with non-constructive news lead to more positive emotional responses and less negative emotional responses (Kleemans et al., 2017). Further, an adult sample from Amazon Mechanical Turk had a positive affect after reading a positive news when compared to negative news and to silver lining news (which finishes with a positive focus after negative news) (McIntyre and Gibson, 2016). These indicate that taking control over the valence of news that is

Table 4
Post hoc tests of times in each news group.

Group	Comparison	Mean difference	t	DF	Corrected-*p*	Cohen's *d*	Magnitude[a]
Overall score							
Negative	Pre vs. post news	-5.75	-6.96	120	<0.001***	-0.63	Moderate
Negative	Pre vs. post pause	2.79	3.38	120	0.006**	0.31	Small
Negative	Post news vs. post pause	8.55	8.92	120	<0.001***	0.81	Large
Positive	Pre vs. post news	2.5	5.03	123	<0.001***	0.45	Small
Positive	Pre vs. post pause	5.45	7.5	123	<0.001***	0.67	Moderate
Positive	Post news vs. post pause	2.95	5.53	123	<0.001***	0.5	Small
Positive score							
Negative	Pre vs. post news	4.03	8.38	120	<0.001***	0.76	Moderate
Negative	Pre vs. post pause	1.52	3.84	120	0.001*	0.35	Small
Negative	Post news vs. post pause	-2.51	-6.11	120	<0.001***	-0.56	Moderate
Positive	Pre vs. post news	-0.72	-2.58	123	0.066	-0.23	Small
Positive	Pre vs. post pause	-0.64	-1.99	123	0.294	-0.18	Negligible
Positive	Post news vs. post pause	0.08	0.37	123	1.00	0.03	Negligible
Negative score							
Negative	Pre vs. post news	-1.72	-2.95	120	0.024*	-0.27	Small
Negative	Pre vs. post pause	4.31	6.16	120	<0.001***	0.56	Moderate
Negative	Post news vs. post pause	6.03	8.62	120	<0.001***	0.78	Moderate
Positive	Pre vs. post news	1.78	4.51	123	<0.001***	0.4	Small
Positive	Pre vs. post pause	4.81	8.21	123	<0.001***	0.74	Moderate
Positive	Post news vs. post pause	3.03	6.78	123	<0.001***	0.61	Moderate

Note. The results in this table refer to pairwise tests comparing the Times in each News group. DF = Degrees of freedom.
[a] Magnitude of the effect size: negligible |d| < 0.2; small |d| <0.5; moderate |d| < 0.8; large |d| ≥ 08.
* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

Table 5
Summary statistics of each News Group, in each Time and for each score type.

Group	Time	N	Min	Max	Median	Q1	Q3	Mad	Mean	SD	SE	CI
Overall score												
Negative	Pre	121	7	88	40	26	52	19.3	39.9	17.5	1.6	3.2
Negative	Post news	121	5	90	46	31	59	19.3	45.7	20.5	1.9	3.7
Negative	Post pause	121	2	90	38	22	48	20.8	37.1	19.5	1.8	3.5
Positive	Pre	124	5	76	38	26	48	16.3	36.2	15.7	1.4	2.8
Positive	Post news	124	1	75	37	21	45	17.8	33.7	15.8	1.4	2.8
Positive	Post pause	124	0	72	32	15	43	20.0	30.7	16.9	1.5	3.0
Positive score												
Negative	Pre	121	2	40	28	22	33	8.9	27.6	7.0	0.6	1.3
Negative	Post news	121	0	40	25	16	31	10.4	23.5	9.5	0.9	1.7
Negative	Post pause	121	0	40	27	20	33	10.4	26.0	9.1	0.8	1.6
Positive	Pre	124	9	40	28	23	32	5.9	27.4	6.4	0.6	1.1
Positive	Post news	124	8	40	29	24	33	6.7	28.1	6.7	0.6	1.2
Positive	Post pause	124	8	40	29	23	33	7.4	28.1	7.2	0.7	1.3
Negative score												
Negative	Pre	121	0	50	29	19	37	13.3	27.5	12.6	1.2	2.3
Negative	Post news	121	2	50	32	19	40	14.8	29.2	13.6	1.2	2.4
Negative	Post pause	121	0	50	25	13	33	14.8	23.1	13.3	1.2	2.4
Positive	Pre	124	0	50	25	13	32	11.9	23.6	12.3	1.1	2.2
Positive	Post news	124	0	49	25	11	29	13.3	21.8	12.1	1.1	2.1
Positive	Post pause	124	0	46	18	8	28	14.8	18.8	12.6	1.1	2.2

Note. N = sample size; Min = Minimum observed value; Max = maximum observed value; Q1 = First quartile; Q3 = Third quartile; Mad = Median absolute deviation; SD = standard deviation; SE = standard error; CI = Margin of error based on the 95% confidence interval.

consumed can improve mental health quality, which might be especially beneficial to HCPs under high stress.

Another way to alleviate the mental health symptoms experienced by HCPs could be the introduction of a brief relaxation pause. Our results clearly show that this practice improve participants emotional state, in agreement with previous studies (Lacerda et al., 2018; Szabo and Hopkinson, 2007). Most important, we introduced a very brief intervention (~3 min) which can be introduced during the health care routine, and, if necessary, many times in a day. However, further studies should evaluate long-term effects, as well as effects in other mental health and well-being parameters. The pause is anchored in slowing the breathing rhythm and the subsequently activation of the parasympathetic nervous system which may induce a relaxation state, attenuating the cardiac autonomic responses and anxiety symptoms (Sakakibara and Hayano, 1996). In the absence of a control group that performs similar but different activity, the pause effects in the present work might be related to a placebo effect. We argue, however, that the physiological principles of slow respiration rate and well-being might have a significant role in improving participants emotional state (Joseph et al., 2005; Laborde et al., 2019; Zaccaro et al., 2018). The use of e-mental health resources to help people to cope with mental symptoms becomes an important alternative due to the coronavirus (Wind et al., 2020) and a pause could be a simple and effective to improve emotional health.

Limitations: Our emotional state scale is not a validated instrument despite its reliability and the results of the exploratory factorial analysis with separated the positive and negative emotional states. This is a preliminary study exploring the effects of news on emotions, therefore, it has limitations such as not being designed to test whether break/distraction would be helpful instead of the relaxation pause, or even if there is no need for interventions to recover from the exposure to negative news.

In summary, our study indicates that the valence of the news content that HCPs listen to affect their emotional state: whereas negative news content deteriorates HCPs emotional state, positive news improves it. Furthermore, a brief relaxation pause seems able to counteract the detrimental effects of negative news content. Moreover, a guide to healthcare professionals mental health may suggest avoiding excessive search for negative news and include instructions to cultivate a relaxation pause in their daily routine.

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CRediT authorship contribution statement

PRB: Conceptualization of the current project; Participated in the development of the Emotional State Scale and implementation of data acquisition in REDCap; Performed data analysis; Contributed with Interpretation of data and paper writing and significant revision. RMAN: Conceptualization of the current project; Participated in the development of the Emotional State Scale; Performed data analysis; Contributed with Interpretation of data, paper writing and significant revision. SSL: Participated in the development of the Emotional State Scale; Performed data analysis; Contributed with Interpretation of data, paper significant revision. MWR: Contributed with Interpretation of data, paper significant revision. JBB: Contributed with Interpretation of data, paper significant revision. EAJ: Contributed with Interpretation of data, paper significant revision. EHK: Conceptualization of the current project; Writing of the project; Conceptualized and participated in the development of the Emotional State Scale; Contributed with Interpretation of data, paper writing and significant revision.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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