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# Online Media Consumption, Fear, Mental Wellbeing, and Behavioral Compliance During the COVID-19 Pandemic: A Longitudinal Study

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This study explored how online media consumption, fear, mental wellbeing, and behavioral compliance with COVID-19 measures were related to one another during the COVID-19 pandemic. Employing a four-wave longitudinal survey research design ( $n = 1,092$ ), this study found positive relationships between online media consumption and fear of COVID-19, between fear of COVID-19 and behavioral compliance, and between behavioral compliance and mental wellbeing in the general Dutch population. Results showed a negative relationship between fear of COVID-19 and mental wellbeing. Repeated measures ANOVAs indicated that participants' online media consumption, fear of COVID-19, and behavioral compliance with COVID-19 measures all gradually decreased as the pandemic progressed, while mental wellbeing gradually recovered as the pandemic progressed. Recognizing the negative relationship between fear of COVID-19 and mental wellbeing, policymakers may be encouraged to focus on implementing interventions and communication strategies to support mental health during pandemics. Using other types of appeals (e.g. hope appeals) in addition to the commonly used fear appeals when developing online public health messages could ensure behavioral compliance during pandemics without triggering high levels of fear. This can contribute to maintaining people's mental wellbeing when they have to cope with life-threatening public health crises while still promoting behavioral compliance with necessary public health measures.

## KEYWORDS

Fear; COVID-19; Longitudinal study; Behavioural Compliance; Online Media

The years 2020 and onwards have been turbulent and challenging due to the COVID-19 outbreak. The precautionary measures introduced to limit the spread of the virus included vigilant handwashing, maintaining spatial distances of 1.5 m and avoiding crowded areas (Prati et al., 2011a). Exceptional was the implementation of lockdowns, which led to the shutdown of numerous public venues (Centres for Disease Control and Prevention, 2020). As these lockdowns induced prolonged home time and increased sedentary

behavior, individuals increased their online media consumption (Gao et al., 2020; Torous et al., 2020; Wiederhold, 2020).

To make sense of and stay informed about public health crises, people frequently seek information online to cope with negative emotions (Taha et al., 2014). At the start of the COVID-19 pandemic, online media consumption indeed increased substantially to visit government and public health authorities' official websites and online news portals (Bendau et al., 2020). Simultaneously, fear of COVID-19 was experienced, and combined with online media use, this increased levels of anxiety and depressive symptoms, threatening people's mental wellbeing (Nekliudov et al., 2020). When people fail to manage the fear experienced from online media consumption, this can lead to impairments in daily functioning and deteriorate mental wellbeing (Sell et al., 2017). As heightened levels of fear and decreased mental wellbeing can, in turn, encourage one to consume *more* media, the relationship between these variables may create "a cycle that can be difficult to break" (Holmes et al., 2020, p. 552). Simultaneously, feelings of worry and fear can also encourage protective health behaviors though (Harper et al., 2020; Prati et al., 2011b).

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The extent to which individuals engage in online media consumption, experience fear alongside decreased mental wellbeing, and comply with recommended health behaviors partly depends on time (Collinson et al., 2015; Ho et al., 2013; Smith et al., 2013). The longer a crisis is around, the more its novelty minimizes as more information is available (Taylor, 1991). Subsequently, while some recommended behaviors may remain due to habit formation (Cava et al., 2005), individuals' online media consumption, fear, and decreased mental wellbeing may all eventually decrease over time—thus, weakening their impact on protective behaviors.

To validate whether relationships between the above-mentioned variables exist and explore how they may develop over time, researchers indicated further studies employing a longitudinal research design are needed (Zhao et al., 2020). Although most studies (Cao et al., 2020; Kivi et al., 2021; Saurabh & Ranjan, 2020) focused on the mental wellbeing of specific populations, there is a growing body of empirical evidence that the general population also suffered from a deterioration in mental wellbeing because of the pandemic (e.g., Solomou & Constantinidou, 2020). This study fills the above-mentioned gaps on the relationships between online media consumption, fear of COVID-19, mental wellbeing, and behavioral compliance with COVID-19 measures by employing a longitudinal survey design among the general Dutch population. Our results can be used to provide future directions to governmental bodies on the long-term needs of developing timely, tailored interventions targeted to encourage behavioral compliance.

### **Online Media Consumption, Fear, and Mental Wellbeing**

*Media System Dependency Theory* (Ball-Rokeach & DeFleur, 1976) suggests that when individuals are confronted with ambiguous situations, they are likely to gather information from media to relieve the discomfort associated with ambiguity (Boukes et al., 2019). The extent to which individuals turn to the media depends on the availability of alternative sources, such as one's interpersonal network, which is limited in times of social distancing measures. Consequently, during pandemic-induced lockdowns, individuals may become more media-dependent "to learn what is going on" (Boukes et al., 2019, p. 6). Although media help individuals to stay informed, the information processed could negatively affect one's emotions (Bendau et al., 2020; Dillard et al., 2021; Nekliudov et al., 2020). Media often use risk-amplifying frames to dramatize public health crisis information (i.e., Choi et al., 2017; Rossman et al., 2018). This risk-infused information significantly influences one's appraisals of threat, which, in turn, exacerbates *fear* (Fischhoff et al., 2018; Garfin et al., 2020), "a negative emotion symptomized by extreme levels of emotional avoidance in relation to specific stimuli" (Harper et al., 2020, p. 3; Perin et al., 2015).

Negative emotions, such as fear, are also related to online media consumption (Dervin & Reinhard, 2007). The *Information Seeking Process Model* postulates that cognitive, affective, and physical factors all contribute to how much an individual actively searches for health information (Kuhlthau, 1991). Empirical studies indicate that the affective component (predominantly negative emotions) plays the most considerable role in motivating an individual to engage in online information-seeking behavior (Holmes et al., 2020; Myrick, 2017; Savolainen, 2014). During the early stages of this pandemic,

individuals have used online media excessively (Holmes et al., 2020). Subsequently, individuals are likely to have experienced heightened levels of negative emotions, such as fear of COVID-19. Synchronously, the negative affect can, in turn, fuel individuals' online information-seeking behavior and thus, increase their overall online media consumption.

When individuals experience fear, it often decreases their *mental wellbeing* (Zhao et al., 2020). An individual's *mental wellbeing* does not only refer to the extent to which one is free from mental disorders but also to the extent one can face the stressors derived from daily life, manage the negative emotions experienced from it, work productively, and contribute to their communities (World Health Organization, 2021). In addition, Sell and colleagues (2017) indicate that when individuals cannot manage the stress and fear experienced concerning media consumption, this induces impaired functioning, and negatively affects mental wellbeing.

Following this, we posit the following associations between variables (i.e., we do not test causal order):

**H<sub>1a</sub>:** There is a positive relationship between online media consumption and fear of COVID-19.

**H<sub>1b</sub>:** There is a negative relationship between fear of COVID-19 and mental wellbeing.

Pervasive media coverage of public crises "may lead to desensitisation of media reports" (Collinson et al., 2015, p. 2), and therefore a decreased amount of negative emotional response toward such information (Kinnick et al., 1996; Smith et al., 2013). According to the *mobilization-minimization hypothesis* (Taylor, 1991) adverse events can evoke a strong negative emotional response due to their novelty and ambiguity. Contrary to the impact of positive events that tend to linger, an adverse event's negative impact on individuals' emotions minimizes quickly over time. This is achieved via "short-term mobilisation and long-term minimisation" (Taylor, 1991, p. 76), where individuals use available cognitive resources to minimize the adverse event by blurring its impact from one's memory. This implies that as individuals become habituated to risk-infused media coverages related to crises, their attention toward these media reports subsequently decreases. Indeed, a previous study (Ho et al., 2013) found that media consumption about the SARS outbreak was highest at the beginning of the outbreak and decreased over time. Applying this to the current context, there is a high likelihood that as individuals are exposed to COVID-19 over time, the decreasing novelty of COVID-19 will lead to a reduction in online media consumption, and correspondingly, fear of COVID-19 will decrease. As fear levels decrease, attention to online information about COVID-19 and the desire to seek more information will decrease (Bento et al., 2020). Therefore, we posit the following patterns:

**H<sub>1c</sub>:** Fear of COVID-19 decreases as the pandemic progresses.

**H<sub>1d</sub>:** Online media consumption decreases as the pandemic progresses.

**H<sub>1c</sub>:** Online media consumption and fear of COVID-19 remain positively and synchronously associated over time as the pandemic progresses.

### **Online Media Consumption, Fear, and Behavioural Compliance**

Although fear may harm mental wellbeing (Fofana et al., 2020; Satici et al., 2020), the *Extended Parallel Process Model (EPPM)* (Witte, 1992) proposes that fear appeals can have a positive impact on *physical* wellbeing (Pakpour & Griffiths, 2020; Wong & Sam, 2011) as it encourages compliance with recommended behaviors. According to the EPPM, if one experiences fear from a message, one will appraise whether one can carry out the suggested behavior (i.e., self-efficacy) and whether the suggested behavior will indeed be effective (i.e., response efficacy). If both efficacies are high, one attempts to control the experienced danger by following the recommended instructions. Hence, fear appeals are only effective when these include messages that enhance self- and response-efficacies (Biana & Joaquin, 2020; Demirtaş-Madran, 2021). Those who have high levels of self- and response-efficacies are often physically and mentally fit individuals (Hastings et al., 2004). For physically and mentally vulnerable individuals, fear appeals are less effective and may trigger maladaptive responses (e.g., avoidance-coping). Since fear appeals make vulnerable people more susceptible to risk and are disproportionately more effective for mentally and socially well individuals, the use of fear appeals does raise ethical concerns (Hastings et al., 2004).

During the COVID-19 pandemic, diagnoses of several psychological disorders – anxiety, stress, and depression – increased (Salari et al., 2020). Additionally, if excessive fear-arousing messages are used, it may lead to boomerang outcomes in behavioral compliance (Kok et al., 2018), implying that optimal levels of fear should be thoroughly tested before fear appeals are being implemented in practice. Against this background, using fear appeals may not be the best solution. An alternative would be to use hope and fear appeals simultaneously, as individuals exposed to both appeals showed better understanding and behavioral compliance with COVID-19 measures than simply using fear appeals (Petersen et al., 2022).

Despite these ethical concerns, recent studies have found that people who feared contracting COVID-19 exercised greater danger control and showed greater compliance with recommended behaviors (Jahangiry et al., 2020; Wise et al., 2020). The main reason behind high compliance levels with recommended behaviors (e.g., handwashing) was likely because of its easy implementation (Nazione et al., 2021). Given that online media about COVID-19 were fear-inducing (Cox & Brewster, 2020), this media-induced fear may thus have motivated individuals to follow preventive behaviors against COVID-19. Therefore, we posit the following association:

**H<sub>2a</sub>:** There is a positive relationship between fear of COVID-19 and behavioral compliance with COVID-19 measures.

As explained above, media consumption about COVID-19 may have decreased over time. Therefore, fear of COVID-19 may also have decreased. Nevertheless, several studies (Cava et al.,

2005; Garcia-Continente et al., 2013; Lau et al., 2003) suggest that even after the end of the SARS and H<sub>1</sub>N<sub>1</sub> outbreaks, some preventive behaviors were incorporated into people's daily lives. Due to habit-formation (Lally & Gardner, 2013), it is predicted that behavioral compliance with the COVID-19 measures will be maintained over time. We therefore hypothesize that:

**H<sub>2b</sub>:** Behavioral compliance with COVID-19 measures remains unchanged as the pandemic progressed.

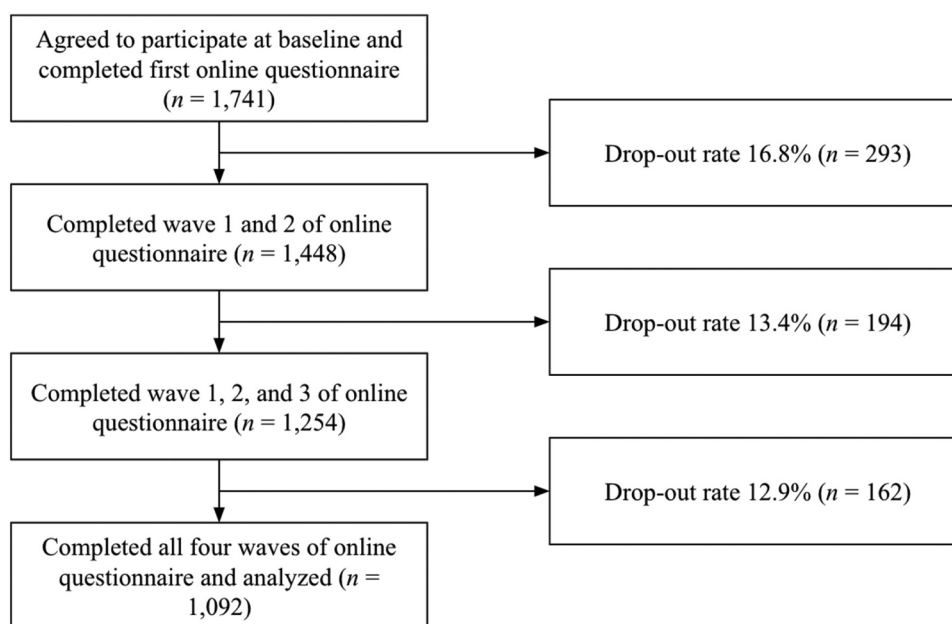
### **Behavioural Compliance and Mental Wellbeing**

Several studies demonstrated a positive association between compliance with COVID-19 measures and increased levels of depression and loneliness (Brooks et al., 2020; Hwang et al., 2020). Following the *Stress-Coping Model* (Folkman & Lazarus, 1980), individuals are highly dependent on their social resources to handle stressors; people can employ either the approach-coping mechanism or the avoidance-coping mechanism to handle such stressors. While approach-coping refers to adopting a problem-solving mind-set to proactively confront and overcome stressors, avoidance-coping refers to engaging in irrelevant activities or simply being in denial of these stressors (Elgar et al., 2003). A key factor in approach-coping is the amount of physical social support one has, which helps to regulate emotions and positive psychological outcomes (Kalpidou et al., 2011; Valenzuela et al., 2009). Indeed, respondents who stayed at home all the time during the COVID-19 pandemic also reported experiencing more depressive symptoms compared to people who did not stay home as much (Kivi et al., 2021). Previous literature indicated that different age cohorts are equally susceptible to feeling lonely and depressed (i.e., low mental wellbeing) in the absence of physical social support (Holmes et al., 2020; Mushtaq et al., 2014; Qualter et al., 2010).

Besides complying with lockdown measures, research conducted during the SARS and COVID-19 outbreaks (DiGiovanni et al., 2004; Solomou & Constantinidou, 2020) found that compliance with hygiene-related behaviors harmed individuals' mental wellbeing due to over-indulgence in these behaviors and lack of full protection from such behaviors (Cheng & Tang, 2004). As individuals faced the COVID-19 pandemic with a lack of physical social support due to lockdowns and complied with preventive behaviors albeit knowing that they were not fully effective, individuals likely experienced decreased levels of mental wellbeing. Thus, we hypothesize that:

**H<sub>3a</sub>:** Higher levels of compliance with COVID-19 measures are negatively related to mental wellbeing.

A large contributing factor is the boredom experienced by self-isolating at home (Zhao et al., 2020). A report published by the Dutch Ministry of Infrastructure and Water Management (2020) showed that the Dutch population's mobility in mid-March 2020 did indeed come to a standstill when the first lockdown was implemented from March 2020 to June 2020. However, once lockdown measures were relaxed, mobility rates increased again and the Dutch population



**Figure 1.** Flowchart of participants' drop-out rates.

partially resumed their normal activities (National Institute for Public Health and the Environment, 2020). Hence, individuals may feel a decline in their mental wellbeing during lockdown periods, but when lockdowns were lifted, they could return to their social circle for physical social support, thus alleviating their feelings of loneliness and boredom. As such, we hypothesize that:

**H<sub>3b</sub>:** The level of mental wellbeing increases over time as the lockdown measures were relaxed.

## Materials and Methods

### Participants

Data were collected through a four-wave online panel study from April 2020 to July 2020 (see Figure 1 and Appendix B). At baseline, 1741 participants (49.1% male, 50.9% female) were recruited by *I&O Research*, an ISO-certified research company. The sample was representative of the Dutch population by using stratified sampling on sex, age, region, and level of education. Only participants who completed all four waves of the online questionnaire were included in the analyses. The final sample consisted of 1092 participants (62.7%; see Table 1 for sample characteristics). A flowchart of respondents' drop-out rates per wave is depicted in Figure 1. Besides age, no significant differences were found across the four waves for the sociodemographic variables, indicating that drop-out has been random (see Table 2).

### Procedure

Only in the first wave, participants were asked to fill out items regarding their sociodemographic characteristics. The

remainder of the survey asked about their online media consumption, fear of COVID-19, mental wellbeing, and behavioral compliance with preventive behaviors in all four waves; therefore, we used the repeated measurements design of this panel survey in our data analysis.<sup>1</sup>

### Measurements

*Online media consumption* was measured by asking on a scale from 1 to 7 days to report the daily frequency of online COVID-19-related media consumption, such as mobile applications commonly used by the Dutch population (see Appendix A for survey). At baseline, participants spent approximately 3 days per week using online media ( $M = 3.18$ ,  $SD = 1.06$ ), with the highest usage allocated to *WhatsApp* ( $M = 6.52$ ,  $SD = 2.56$ ).

*Fear of COVID-19* was assessed using the "Fear of COVID-19 Scale" (FCV-19S) (Ahorsu et al., 2020). Participants were asked to rate seven items on a 7-point Likert scale ranging from 1 ("completely disagree") to 7 ("completely agree"). The items included statements such as "My hands get clammy when I think about the coronavirus-19." Cronbach's  $\alpha$  was higher than .83 for all four waves ( $M = 2.64$ ,  $SD = 1.15$ ).

*Mental wellbeing* was measured with the mental wellbeing subscale, WHO-5 (Vander Zee et al., 1996) which is part of the Short-Form Health Survey, SF-36 (Ware & Sherbourne, 1992). This variable was used to assess participants' general emotional state. The WHO-5 consists of five items, but due to the lockdown, one item "my daily life has been filled with things that interest me" was excluded. The four remaining items asked

<sup>1</sup>Other variables were also assessed in the same questionnaire throughout the four data collection waves. Only the study variables of interest are reported here.

**Table 1.** Sociodemographic characteristics of participants (n = 1,092).

Characteristics	<i>n</i>	%
<b>Sex</b>		
Male	555	50.8
Female	537	49.2
<b>Age cohort</b>		
18-39	329	30.1
40-64	469	42.9
65+	294	27
<b>Ethnic background</b>		
Western	1051	96.2
Non-Western	21	2.0
Missing	20	1.8
<b>Educational level</b>		
Low	251	23.0
Intermediate	432	39.5
High	409	37.5
<b>Household composition</b>		
Living alone	306	28.0
Living alone (without a partner) but with children	27	2.5
Married/living together without children at home	478	43.8
Married/living with children at home	233	21.3
Living with parent(s)/caregiver(s)	31	2.8
Others	14	1.3
Missing	3	.3
<b>Household size</b>		
1 person	304	27.8
2 persons	517	47.3
3 persons	132	12.1
4 persons	94	8.6
5 persons	30	2.7
6 persons and above	13	1.2
Missing	2	.3
<b>Total gross annual income</b>		
Minimum or below average (up to €26,500)	175	16.0
Almost average (€26,500 to €33,000)	132	12.1
Average (€33,000 to €39,500)	183	16.8
Between 1-2 times average (€39,500 to €66,000)	296	27.1
Twice average or more (€66,000 or more)	139	12.7
Missing	167	15.3

**Table 2.** Wilks' lambda of the sociodemographic variables across wave 1 to wave 4.

	Value	F(3, 1092)	p	Partial $\eta^2$
Sex	.99	1.00	.318	.001
Age cohort	1.0	4.37	.005	.01
Ethnic background	.99	1.00	.318	.01
Educational level	.99	1.00	.318	.001
Household composition	.99	2.31	.075	.01
Household number	1.0	1.40	.245	.004
Income	1.0	3.00	.072	.01

respondents how often they had felt: (1) “*very nervous*”, (2) “*calm and quiet*”, (3) “*dejected and gloomy*” and (4) “*happy*” in the last month on a 6-point scale, ranging from 1 (“*never*”) to 6 (“*always*”). Cronbach’s  $\alpha$  was higher than .81 across all four time points ( $M=4.57$ ,  $SD=.81$ ).

*Behavioral compliance* was measured via a self-constructed scale based on the preventive behaviors recommended by the RIVM. On a dichotomous scale of 0 (“*no*”) and 1 (“*yes*”) participants were asked: “In the past week, which of the following advice have you followed?” 7 items were measured, among which: “keeping 1.5 meters distance from others,” “staying at home as much as possible.” At baseline, participants complied with almost all measures ( $M=6.27$ ,  $SD=1.09$ ).

### Data Analysis

Four missing data points were identified for each of the study variables in the final dataset, and for these, mean imputation was performed. The dataset was reshaped into a long format with on every row a unique respondent–wave combination (i.e., four rows for every respondent). Thereby, we could analyze all data in one pooled model rather than analyzing the waves separately.

To test  $H_{1a}$ ,  $H_{1b}$ ,  $H_{2a}$ , and  $H_{3a}$ , random-effects model analyses were conducted using the *xtreg*-package of STATA/SE 16.1. Random-effects models allow for examination upon dynamics of change (Gujarati & Porter, 2009) and control for individual-level averages of the analyzed dependent variables *within* respondents and can therefore more precisely predict the influence of exogenous variables on changes in the outcome variables. In other words, we examined how individual-level variation *within* the dependent variable can be influenced by variation in the independent variables. In our analyses, we included measurements of the time-variant independent variables (e.g., online media consumption) of the same wave ( $t$ ) as the measurement of the dependent variable (also at  $t$ ), because the time periods between waves (i.e., 2 weeks) were too long for a media effect (on fear) or emotional effect (on wellbeing) to occur *between* survey waves. Thus, we examined the *relationship* between media exposure and emotional state on the short-term and did not expect (nor tested) an effect of independent variables at  $t-1$  on the dependent variable at  $t$ . Hence, we examined the association between theorized variables, but do *not* examine the causal ordering in the variables’ relationship. The analyses also controlled for general changes in the environment that occurred *on average* for all respondents by controlling for the time of the measurements (i.e., in which Wave the variable was measured); hence, we could also assess whether the variables significantly increased or decreased over time. Time-invariant significant background variables (e.g., social demographics of age, gender, and education) were added as control variables to all models.

To explore further how each variable changed over time ( $H_{1c}$ ,  $H_{1d}$ ,  $H_{2b}$ ,  $H_{3b}$ ), we also ran repeated-measures ANOVAs with SPSS v.29. Similarly, time-invariant significant background variables (e.g., social demographics of age, gender, and education) were added as control variables (i.e., covariates) to all models.  $H_{1c}$  was tested using time-series cross-correlation

analysis. For the analysis, the lag difference was set at 1, and the maximum lag was set at 2, to reflect four waves. Each lag represents the time difference between each data collection wave, which was approximately 2 weeks.

## Results

### Hypothesis 1a: Online Media Consumption and Fear of COVID-19

A positive relationship emerged between online media consumption and fear of COVID-19,  $b=0.06$ ,  $SE=0.02$ ,  $p=.002$ , in the random-effects model. Full support was found for  $H_{1a}$ .

### Hypothesis 1b: Fear of COVID-19 and Mental Wellbeing

The random-effects model also showed that mental wellbeing was negatively related to online media consumption,  $b=-0.05$ ,  $SE=0.02$ ,  $p=.008$ . Full support was found for  $H_{1b}$ .

### Hypothesis 1c: Trend of Fear

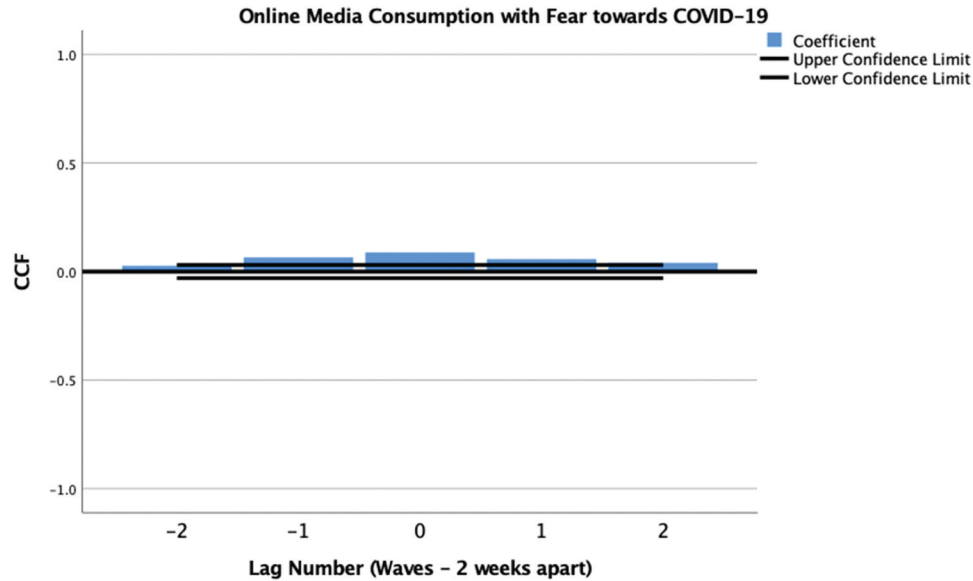
The repeated measures ANOVA revealed that participants’ fear of COVID-19 decreased significantly between time points 1 to 4, Wilks’ Lambda = .64,  $F(3, 1085)=207.13$ ,  $p<.001$ ,  $\eta^2=.36$ . The follow-up pairwise comparisons also indicated that each pairwise difference was significant,  $p<.001$ , suggesting that the level of fear of COVID-19 significantly decreased between each wave.  $H_{1c}$  was thus supported.

### Hypothesis 1d: Trend of Online Media Consumption

The repeated measures ANOVA revealed that across time points 1 to 4, participants’ online media consumption decreased significantly, Wilks’ Lambda = .89,  $F(3, 1088)=46.69$ ,  $p<.001$ ,  $\eta^2=.11$ . Follow-up comparisons indicated that each pairwise difference was significant,  $p<.01$ . Hence,  $H_{1d}$  was supported.

### Hypothesis 1e: Online Media Consumption and Fear of COVID-19 Over Time

The cross-correlation function (see Figure 2) showed that the strongest correlation between online media consumption and fear of COVID-19 occurred at lag  $t_0$ , but the correlation itself was weak and non-significant, 0.09. This shows that online media consumption and fear of COVID-19 were insignificantly contemporaneously correlated. At lag  $t_{+1}$ , the figure showed a non-significant positive correlation, suggesting that higher-than-average levels of online media consumption in one wave are unrelated to higher-than-average levels of fear of COVID-19 experienced one wave later. At lag  $t_{-1}$  and lag  $t_{-2}$ , Figure 2 also showed non-significant positive cross-correlations, indicating that when individuals experienced above-average fear of COVID-19, they reported above-average levels of online media consumption one and two waves earlier. Thus, the longitudinal results showed that the variables fear of COVID-19 and online media consumption both responded to time synchronously and



**Figure 2.** Times series cross-correlation function of online media consumption and fear of COVID-19.

positively, but correlations remained insignificant. The results also showed that their correlation is strongest within the same wave and not between waves. Therefore,  $H_{1e}$  was rejected.

#### **Hypothesis 2a:** Fear and Compliance

The random-effects model showed that fear of COVID-19 was positively to behavioral compliance,  $b = 0.21$ ,  $SE = 0.03$ ,  $p < .001$ . Thus,  $H_{2a}$  was supported.

#### **Hypothesis 2b:** Trend of Compliance

The repeated measures ANOVA revealed a significant effect of time on behavioral compliance with the COVID-19 measures, Wilks' Lambda = .32,  $F(3, 1086) = 775.76$ ,  $p < .001$ ,  $\eta^2 = .68$ . The follow-up pair comparison showed no significant difference in behavioral compliance from Wave 1 to Wave 2,  $p = .787$ , but from Wave 2 to Wave 4, behavioral compliance decreased significantly,  $p < .001$ . Thus,  $H_{2b}$  was rejected; behavioral compliance decreased as time proceeded, whereas this was predicted to remain stable.

#### **Hypothesis 3a:** Compliance and Mental Wellbeing

The random-effects model showed that behavioral compliance was positively related to mental wellbeing,  $b = 0.05$ ,  $SE = 0.01$ ,  $p < .001$ .  $H_{3a}$  was rejected; compliance with COVID-19 measures is *not* negatively—but positively—related to mental wellbeing.

#### **Hypothesis 3b:** Trend of Mental Wellbeing

The repeated measures ANOVA revealed that participants experienced the lowest mental wellbeing at Wave 1 of the survey. Wellbeing increased over time, Wilks' Lambda = .92,  $F(3, 1085) = 33.39$ ,  $p < .001$ ,  $\eta^2 = .09$ . Follow-up pairwise comparison indicated that each pairwise difference was also significant,  $p < .05$ , indicating that participants' mental wellbeing recovered significantly from the first to last wave. Thus, support was found for  $H_{3b}$ . Table 3 shows the mean scores of variables across Wave 1 to Wave 4.

## **Discussion**

Our results show a positive relationship between online media use and fear of COVID-19. The online information processed

**Table 3.** Mean scores of study variables across wave 1 to wave 4.

Study variable	<i>n</i>	Means (SD)			
		Baseline	T1	T2	T3
Online media consumption	1091	3.18 (1.06)	3.10 (.99)	3.01 (.95)	2.97 (.95)
Fear of COVID-19	1088	2.83 (1.14)	2.63 (1.14)	2.40 (1.10)	2.22 (1.04)
Mental wellbeing	1092	4.57 (.81)	4.63 (.82)	4.70 (.70)	4.74 (.82)
Behavioural compliance	1089	6.25 (1.11)	6.29 (1.06)	6.05 (1.27)	4.81 (1.29)



may have used risk-enhancing frames; thereby possibly influencing threat appraisals and exacerbating fear of COVID-19 (Bendau et al., 2020; Choi et al., 2017; Garfin et al., 2020). Simultaneously, negative affect can play a considerable role in motivating online information-seeking behavior (Holmes et al., 2020; Kuhlthau, 1991; Myrick, 2017). This relationship may be due to *ruminatio*n, an avoidant coping mechanism, that may be facilitated by habitual smartphone-checking behaviors to combat negative emotions (Billieux et al., 2015; Brand et al., 2014; Gross, 1998). Our participants reported using mobile applications the most, which aligns with the notion that individuals with poor emotional regulation skills may have engaged in more frequent smartphone checking, contributing to the observed positive correlation between online media consumption and fear of COVID-19.

As expected, fear of COVID-19 was negatively related to mental wellbeing. This finding is aligned with previous studies that found significant associations between negative emotions, such as fear, and lower levels of mental wellbeing (e.g., Lisitsa et al., 2020; Liu et al., 2021; Steinert, 2021). Furthermore, in El-Zoghby and colleagues' (2020) study, a significant correlation was observed between respondents who shared their fears toward COVID-19 with others and emotional contagion. Given that fear is a contagious emotion, this may partly explain the negative relationship found between fear of COVID-19 and mental wellbeing.

Our results, also in alignment with previous findings, indicated that fear of COVID-19 was related to the performance of protective behaviors, thereby safeguarding individuals' physical wellbeing (Pakpour & Griffiths, 2020; Wise et al., 2020). In concordance with the EPPM, these results suggest that using fear may stimulate behavioral compliance (Biana & Joaquin, 2020; Demirtaş-Madran, 2021; Tannenbaum et al., 2015). However, stress, anxiety, and depression increased amongst the general population during the pandemic (Salari et al., 2020), and psychologically unwell individuals tend to have low self-efficacy (Hastings et al., 2004). Using fear appeals may thus be associated with negative consequences on vulnerable populations' mental health (Ali et al., 2019; Pfefferbaum et al., 2014; Vasterman & Ruigrok, 2013). To counteract this negative outcome, combining fear appeals with hope appeals to encourage behavioral compliance in pandemics may be a better alternative. Convincing hope appeals can generate feelings of hope and are associated with behavioral confidence and control over the situation (Nabi & Myrick, 2019). A previous study indeed showed that when fear appeals were used in combination with hope appeals, individuals showed both stronger understanding and compliance with COVID-19 measures compared to just using fear appeals (Petersen et al., 2022).

When examining behavioral compliance over time, contrary to our expectations, compliance dropped. First, this may be because individuals were subject to optimism bias by complying with several hygiene-related behaviors (Sharot, 2011; S. Taylor, 2019; Taylor et al., 2020). When individuals believe that they have complied with sufficient preventive behaviors to combat the risk of contracting the virus, they may feel more in control of the situation (Gilles et al., 2011; Ji et al., 2004) and

downplay their perceived susceptibility of contracting COVID-19, giving them reasons to stop following the more difficult-to-comply quarantine measures (Brewer et al., 2007). Second, according to *Protection Motivation Theory* (PMT, see Rogers & Prentice-Dunn, 1997), individuals do not only appraise protective behaviors based on efficacies and threats but also on perceived costs and existing knowledge (Bish & Michie, 2010; Teasdale et al., 2012). When individuals cannot comply with the social distancing measures due to unavoidable duties (e.g., employment) or do not comprehend its rationale (Smith et al., 2020), they may overlook quarantine measures. Given that more than half of the items measuring behavioral compliance in this study were quarantine-related measures, this could explain why behavioral compliance levels decreased quickly instead of remaining unchanged.

There was a positive relationship between behavioral compliance and individuals' mental wellbeing, corroborating findings from Nazione and colleagues (2021). Due to the easy implementation of certain behaviors (e.g., handwashing, etc.), individuals may have opted to adopt the approach-coping mechanism to handle the pandemic (Folkman & Lazarus, 1980). By exercising the recommended behaviors, individuals may have felt a sense of control over the pandemic, thus safeguarding their mental wellbeing (Jahangiry et al., 2020; Wise et al., 2020).

### Study Limitations and Future Research

Several limitations must be considered. Following PMT (Rogers & Prentice-Dunn, 1997), future research should consider including additional variables to gain more insight into the lack of behavioral compliance during public health crises; e.g., preexisting knowledge or perceived response costs (i.e., the successfulness of implementing a behavior), which may contribute to (lack of) behavioral compliance with quarantine measures. Second, the type of panel survey data employed in this study does not allow for causality assumptions and cannot exclude the possibility of collider bias. Although having a time-structure with four different waves, the time-lag (4 weeks) was too long to expect an effect of media consumption at time<sub>t</sub> on the dependent variables at time<sub>t+1</sub>. Future studies should use a survey design with waves that follow shortly after each other. Alternatively, experimental research designs could be used to test for causal relationships between study variables, though these lack the strength of the current study that they cannot measure real-world behaviors (i.e., external validity). Finally, the current study employed the WHO-5 (Vander Zee et al., 1996) to measure individuals' mental wellbeing. The items on this scale only capture a small subset of experiences. Future research should consider using other scales, such as the Warwick-Edinburgh Mental Wellbeing Scale (Tennant et al., 2007), which items are formulated positively,<sup>2</sup> thereby helping to avoid ceiling effects and capturing individuals' mental wellbeing more fully.

<sup>2</sup>For instance, "I've been dealing with problems well", "I've been feeling optimistic about the future", "I've been feeling cheerful".

## Conclusion

This study made several contributions to the literature. By using a longitudinal design and repeated measures that allowed us to examine within-person variation, we found that online media consumption, fear of COVID-19, and behavioral compliance decreased as the pandemic progressed. We also found that online media use was positively related to fear of COVID-19, and fear of COVID-19 was negatively related to mental well-being. Contrary to our expectations, behavioral compliance was *positively* associated with mental wellbeing. Without speculating about the causal ordering in these variables' relationships, these insights provide a crucial foundation for future research to explore this into more depth. Moreover, the findings of this study may encourage policymakers to use fear appeals in combination with other types of appeals (i.e. hope appeals) to ensure behavioral compliance during pandemics while maintaining people's mental well-being when faced with life-threatening public health crises.

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## APPENDICES

**Appendix A**

Items used from Online Questionnaire distributed by I&O Research (translated into English)

1. Please indicate which age group you belong to:
  1. 18-39
  2. 40-64
  3. 65+
2. Your gender:
  1. Male
  2. Woman
3. Please indicate your highest level of education:
  1. Low
  2. Middle
  3. High
4. What is the composition of your household?
  1. I live alone
  2. I live alone (without a partner) with children
  3. I am married/living together without children living at home
  4. I am married/cohabiting with children living at home
  5. I live with me parent(s)/caregiver(s)
  6. Otherwise
  7. Don't know/don't want to say
5. How many people does your household consist of (including yourself?)
  1. 1 (only myself)
  2. 2
  3. 3
  4. 4
  5. 5
  6. 6
  7. 7
  8. 8
  9. 9
  10. 10
  11. 11
  12. 12
  13. 13
  14. 14
  15. 15 or more
6. Please indicate your occupation:
  1. Entrepreneur with staff
  2. Self-employed person/freelancer
  3. Employed (business)
  4. Employed by the government
  5. Employed in semi-government (education, healthcare, police, etc.)
  6. Incapacitated for work
  7. Unemployed / job seeking / welfare
  8. Retired or on early retirement
  9. Studying/schooling
  10. Housewife/husband
  11. Other

7. Please indicate your income:
1. Minimum and below average (up to €26,500)
  2. Almost average (€26,500 to €33,000)
  3. Average (€33,000 to €39,500)
  4. Between 1 and 2 times average (€ 39500 to € 66000)
  5. Double the average or more (€66,000 or more)
  6. No answer
8. Thinking about the past week, how often did you use the following websites or apps?
1. nos.nl
  2. rtlnieuws.nl
  3. nu.nl
  4. rivm.nl
  5. huisarts.nl
  6. Facebook
  7. Twitter
  8. Instagram
  9. WhatsApp
  10. Zoom, Skype, or similar media
  11. Search engines such as Google
9. Which of the following advice have you followed in the past week? Multiple answers are possible.
1. Wash hands regularly for 20 seconds
  2. Coughing/sneezing into the inside of your elbow
  3. Do not shake hands
  4. Not going to crowded places
  5. Keep a distance from others (1.5 metres)
  6. Not forming a group in public spaces
  7. Stay at home as much as possible
  8. None of the above
10. The next question is about how you feel about the coronavirus. For each statement, can you indicate the extent to which you agree or disagree?
1. It is uncomfortable for me to think about the coronavirus
  2. My hands get clammy when I think about the coronavirus
  3. I am afraid of dying from the coronavirus
  4. I get nervous or anxious when watching news about the coronavirus
  5. I cannot sleep because I am worried about the corona virus
  6. I am afraid of being infected with corona myself
  7. I am afraid that a relative or friend of mine will be infected
  8. I am afraid that many more people in the Netherlands will be infected
11. How often during the past 4 weeks did you feel
1. ... very nervous?
  2. ... calm and quiet?
  3. ... dejected and gloomy?
  4. ... happy?

## Appendix B

The data were collected in the following time periods. First, from April 10th 2020 to April 17th 2020 when the Netherlands was in full lockdown. The second wave was from April 30th 2020 to May 11th 2020 during which full lockdown measures continued; during this period the Dutch cabinet published its plans for relaxation as part of their 'intelligent lockdown'. During the third wave, from May 25th 2020 to June 3rd 2020, testing capacity increased, lockdown was eased for contact professions and catering opened again. Finally, the last wave was from June 29th 2020 to July 7th 2020. Most lockdown measures were eased, but public spaces (e.g., restaurants, pubs, theatres, and museums) re-opened with limited capacity. Individuals were still advised to stay 1.5 m apart. A detailed timeline of the lockdown in the Netherlands from the Ministry of Health, Welfare, and Sport (RIVM) can be found here.