



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

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.



# Anticipating pride or regret? Effects of anticipated affect focused persuasive messages on intention to get vaccinated against COVID-19

Miriam Capasso<sup>a,\*</sup>, Daniela Caso<sup>a</sup>, Mark Conner<sup>b</sup>

<sup>a</sup> Department of Humanities, University of Naples Federico II, Italy

<sup>b</sup> School of Psychology, University of Leeds, UK

## ARTICLE INFO

### Keywords:

COVID-19

COVID-19 vaccination

Intention

Attitude

Anticipated affective reactions

## ABSTRACT

Understanding the factors that increase intention to receive COVID-19 vaccines is essential to maximise the vaccination campaign effectiveness. The present experimental study evaluated the effect of exposure to messages targeting cognitive attitude plus anticipated positive (pride) or negative (regret) affective reactions on intention to get vaccinated. Participants included 484 Italian adults randomly allocated to one of four conditions: 1) cognitive attitude message; 2) cognitive attitude plus positive affect message; 3) cognitive attitude plus negative affect message; 4) control condition (no message). Results showed that participants in the second condition reported greater intention to get vaccinated against COVID-19 compared with those in the control condition. Parallel mediation analysis indicated that the effect of the second condition on intention was fully mediated by cognitive attitude and anticipated positive affect. These findings suggest that future campaigns aimed at promoting COVID-19 vaccination intention could usefully target both cognitive attitude and anticipated positive affect.

## 1. Introduction

December 2020 marked, in much of the world, the start of the vaccination campaign against COVID-19. Mass vaccination represents an essential weapon to control the pandemic. However, its success depends not only on how safe and effective the approved vaccines are but also on the intention to vaccinate and their actual uptake among the general population.

To date (31 August 2021), in Italy, 60.8% of the population (36.7 million people) have completed the vaccination course (2nd dose/single dose), in line with data of other EU countries (for example, at the time of writing, in France the percentage of fully vaccinated people is 59.7%, in Germany 60.7%, in Spain 70.3%, in the UK 64.2%; [Our World in Data, 2021](#)). However, based on the *Strategic Plan* approved by the Italian Parliament in December 2020, vaccines are expected to reach most of the population (about 80%) in the last quarter of 2021 ([Italian Ministry of Health, 2021a](#)).

Among the population not yet vaccinated, a recent survey found the majority of Italians (79%) willing to get vaccinated against COVID-19 ([Ipsos, 2021](#)). Several studies carried out before the approval of any vaccine against COVID-19 showed similar results. For example,

[Caserotti et al. \(2021\)](#) reported that Italians had strong intentions to get vaccinated in the early stages of the pandemic (February–June 2020), particularly during the lockdown phase, with 86% of the participants saying that they were willing to pay to receive the vaccine when available. However, in another study ([Graffigna et al., 2020](#)) conducted during the early days of the reopening after the first lockdown, only 59% of the respondents declared that they would accept the vaccine, whereas 15% said that they would refuse it, and the remaining 26% were hesitant. Later in the pandemic, with the approval of the first COVID vaccines (i.e., Pfizer – BioNTech and Moderna vaccines), the percentage of people who reported being uncertain about the vaccine appears to have increased. For example, in a study on a representative sample of one Italian region (Emilia Romagna), 31% of participants declared themselves hesitant to receive the COVID vaccine ([Reno et al., 2021](#)).

Overall, these data can be considered moderately encouraging in relation to the likely vaccination rates against COVID-19. Despite this, it should be noted that even a small proportion of the population with poor vaccination rates could compromise the goal of achieving herd immunity for SARS-CoV2, for which around 80% of the population is required to be vaccinated ([Italian Ministry of Health, 2021a](#)).

Therefore, there is an urgent need to understand which psychological

\* Corresponding author.

E-mail address: [miriam.capasso@unina.it](mailto:miriam.capasso@unina.it) (M. Capasso).

<https://doi.org/10.1016/j.socscimed.2021.114416>

Received 26 April 2021; Received in revised form 3 September 2021; Accepted 17 September 2021

Available online 20 September 2021

0277-9536/© 2021 Elsevier Ltd. All rights reserved.

factors can increase vaccination uptake. The current research focuses on testing the effectiveness of interventions to promote the intention to get vaccinated against COVID-19. In this regard, the literature has demonstrated the efficacy of targeting cognitive and affective responses to promote changes in health intentions and behaviours (Lawton et al., 2009; Portnoy et al., 2014; Xu and Guo, 2019). Nevertheless, to date, no studies have tested such processes in the context of COVID-19 vaccination. This study aims to fill this gap by exploring the effectiveness of persuasive messages targeting jointly cognitive attitude and anticipated affective reactions (positive or negative) in increasing intention to get vaccinated.

### 1.1. The predictive role of anticipated affective reactions on vaccination intention

Among the numerous psychological variables that influence the intention to receive the COVID-19 vaccine, several studies (Graffigna et al., 2020; Paul et al., 2021; Sherman et al., 2020) have identified attitude (i.e., overall evaluation of the behaviour) as a key factor. This is in line with previous literature demonstrating that attitude is the strongest predictor of intention to get vaccinated (e.g., Britt and Englebert, 2018; Cha and Kim, 2019; Hofman et al., 2014; Lehmann et al., 2014; Ratanasiripong et al., 2018). In particular, cognitive evaluations about the efficacy and safety of the vaccine in question represent important determinants of vaccination intention and behaviour (Xiao, 2019). The role of attitude has been widely emphasised in the context of social cognitive models of health behaviour, such as the Theory of Reasoned Action (TRA; Fishbein and Ajzen, 1975) and the Theory of Planned Behaviour (TPB; Ajzen, 1991). Although these models have proved effective in predicting several health behaviours, including vaccination (e.g., Caso et al., 2019), they are predominantly cognitive theories that ignore the role of affective processes that can affect intention and behaviour (Williams et al., 2018). Nevertheless, in recent years, a growing literature has explored and demonstrated the usefulness of including an affective component, especially in the TPB model (e.g., Conner et al., 2013; Stevens et al., 2019). In particular, it has been widely shown that adding the component of anticipated affective reactions (e.g., anticipated regret) to the TPB increases the proportion of the explained variance in intention and behaviour (Sandberg and Conner, 2008).

Anticipated affective reactions refer to people's expectations about the possible affective response they will experience after performing a given behaviour (e.g., "If I got the COVID-19 vaccine, I would feel proud"), and are centred on self-conscious emotions, such as pride and regret, rather than hedonic emotions (e.g., pleasure; Conner et al., 2013; Conner et al., 2015). In the context of research that has focused on understanding affective processes related to vaccination intention and behaviour, studies that only explored the impact of the affective component of attitude produced inconsistent results (e.g., Xiao, 2019). In contrast, the literature that shifted the focus to anticipated affective reactions yielded very promising findings (Caso et al., 2019; Christy et al., 2016; Cox et al., 2014; Pența et al., 2020; Weinstein et al., 2007; Ziarnowski et al., 2009).

Among the possible range of anticipated affects, great space has been dedicated to the role of anticipated regret, i.e., the anticipated negative feeling experienced in relation to the possibility of implementing or not a given behaviour, with most studies focused on inaction anticipated regret (Sandberg and Conner, 2008). Anticipated regret has proven to be a key factor both in influencing the decision to get personally vaccinated (Christy et al., 2016; Weinstein et al., 2007) and vaccinate someone else (e.g., in the case of mandatory or recommended vaccinations for children and adolescents; Caso et al., 2019, 2021a; Ziarnowski et al., 2009). For example, in a recent study on the HPV and influenza vaccinations, Pența et al. (2020) found that inaction anticipated regret was the strongest predictor of intention for both types of vaccinations, over and above cognitive variables (knowledge, perceived susceptibility and

severity in relation to the disease, perceived vaccine effectiveness and safety). A very similar result was also found in a study by Christy et al. (2016), who reported that inaction anticipated regret was associated with intention to receive the HPV vaccine, beyond a series of cognitive variables (e.g., perceived risk of developing genital warts or cancer), but only among male participants. Generally, inaction anticipated regret appears to be more relevant than action anticipated regret in the context of vaccination (Brewer et al., 2016).

If the predictive role of anticipated negative affective reactions on intention to or actual vaccination has been extensively explored, less attention has been paid to the possible impact of anticipated *positive* affective reactions, such as pride and satisfaction for being vaccinated. For example, Stevens et al. (2019) tested the effect of both anticipated positive and negative positive affects on intentions to perform health-promoting and health-risk behaviours; results showed that anticipated positive affects (i.e., pride), differently from anticipated regret, did not predict intention to engage in the analysed health behaviours, including influenza vaccination. On the other hand, Radic et al. (2021) examined the factors influencing intention to get vaccinated against COVID-19 as a precondition to travel abroad. Although the study investigated a particular type of intention, the results highlighted that anticipated feelings of pride influenced the personal norm concerning vaccination (i.e., the sense of moral obligation to get vaccinated), which in turn affected intention. It should be noted that the results of these studies are insufficient to draw strong conclusions regarding the possible impact of anticipated positive affects on the intention to get vaccinated against COVID-19. That is why, in the present study, we decided to explore the role of both anticipated positive (pride) and negative (regret) affects on intention, implementing an experimental design based on the creation of persuasive messages targeting such affective responses (Conner et al., 2020).

### 1.2. Anticipated affect based interventions to change vaccination intention

Persuasive communication has shown to be effective in modifying a wide variety of health behaviours (e.g., Caso et al., 2021b; Hood et al., 2020; Lindsey, 2017), including vaccination (e.g., Abhyankar et al., 2008; Liu et al., 2019; Nan, 2012). In particular, numerous intervention and experimental studies successfully targeted anticipated affects to promote different health behaviours (see Conner et al., 2020). For example, Martinez (2014) found that persuasive messages focused on attitude plus anticipated regret, compared with messages focused on attitude only, significantly increased participants' intention to consume folic acid. Similarly, manipulating anticipated negative affects proved effective in increasing intention to drink at least 2L of water a day (Carfora et al., 2018), willingness to become an organ donor (O'Carroll et al., 2011), and cancer screening attendance (O'Carroll et al., 2015; Sandberg and Conner, 2009). Regarding vaccination behaviour, Kim (2020) demonstrated that the effect of health promotion messages on attitude and intention to receive the HPV vaccine was fully mediated by changes in inaction anticipated regret. In addition, another relevant result emerged from the study by Cox et al. (2014). These authors demonstrated that simply asking anticipated regret questions increased mothers' intention to vaccinate their daughters against human papillomavirus (HPV). Despite the fact that, in this study, the effect of the anticipated regret questions only worked in mothers who had been exposed to a graphic message about the possible consequences of HPV vaccination (compared with those exposed to a text-only message), such results emphasise the potential of targeting anticipated affects in promoting vaccination intention.

In sum, the studies described so far suggest that both cognitive (e.g., efficacy and safety evaluations) and affective processes (anticipation of affective consequences) can influence intention to get vaccinated. However, to date, no studies have tried to promote vaccination intention by targeting jointly cognitive attitude and anticipated affects.

Additionally, we found no studies that experimentally manipulated anticipated positive affects (e.g., pride) to change vaccination intentions or behaviour.

## 2. The present study

In light of the above theoretical premises, the current study aimed to test whether persuasive messages focused on cognitive attitude plus anticipated affective reactions (both positive and negative) can increase intention to get vaccinated against COVID-19.

Specifically, we focused on the following two research questions:

RQ1: Do participants exposed to messages focused on cognitive attitude with or without anticipated affective reactions (positive or negative) report higher intention to get vaccinated against COVID-19 compared to those receiving no message?

RQ2: Do cognitive attitude and anticipated affective reactions (positive or negative) mediate any effect of the experimental conditions on intention to get vaccinated against COVID-19?

## 3. Methods

### 3.1. Participants

We powered our study to detect differences between the control and each experimental condition. Using a small sized effect ( $\eta^2 = 0.04$ ),  $\alpha = .05$  and power = .80, G\*Power indicated a minimum sample size of 100 per condition with four conditions. Based on a 20% dropout due to ineligibility and minor variation in numbers per condition due to randomisation, we therefore aimed to recruit 600 into the study in order to ensure a minimum of 100 per condition.

Between November and December 2020, before the official approval of any vaccine against COVID-19, 600 Italian adults were invited to participate in a study on the factors influencing the intention to receive the future COVID-19 vaccine. The inclusion criteria for the study were to be between 18 and 75 years of age and not to suffer from medical conditions that increase the risk of developing severe illness from the virus that causes COVID-19 (Center for Disease Control and Prevention, 2021).

As shown in the Participant flow chart (Fig. 1), from the 600 recruited, a total of 484 adults met the eligibility criteria, signed the informed consent form and fully completed the questionnaire (Appendix A, Section 1), which was shared online through social networks (e.g.,

generic Facebook groups. No-vax groups were excluded). The study was implemented following receipt of ethical approval by the Ethical Committee of Psychological Research of the Department of Humanities of the University of Naples “Federico II”.

### 3.2. Study design and procedure

In the present study, we implemented a between-subjects design. Specifically, participants were randomly allocated to one of four conditions using the online redirecting tool “allocate monster”:

- 1) Cognitive attitude message: participants in this condition were exposed to a message focused on cognitive attitude only;
- 2) Cognitive attitude plus *positive* affect message: participants in this condition were exposed to a message focused on cognitive attitude plus anticipated positive affective reactions (pride);
- 3) Cognitive attitude plus *negative* affect message: participants in this condition were exposed to a message focused on cognitive attitude plus anticipated negative affective reactions (regret);
- 4) Control: participants in the control condition were not exposed to any message.

Before being exposed to the messages, the participants completed a series of pre-manipulation measures to verify that the groups did not differ in relation to important variables that the literature has shown to influence the general attitude toward vaccination, i.e., trust in science (Lehmann et al., 2014), religiosity (Rutjens et al., 2018) and past vaccination behaviour (Caso et al., 2019) - in addition to socio-demographic characteristics. Indeed, past vaccination behaviour and high trust in science have been associated with a positive attitude toward vaccines and vaccinations (Caso et al., 2021a), whereas hesitant attitudes toward vaccines have been related to a strong religious morality (Rutjens et al., 2018).

After completing the pre-manipulation measures, participants in the experimental groups were exposed to a specific persuasive message according to the assigned condition. The messages are presented in Appendix A (Section 4).

It is worth noting that all the messages were presented in the form of graphic posters that took up the format of the images usually shared on the official Facebook page of the Italian Ministry of Health. Furthermore, all posters featured the logo of the Italian Ministry of Health in order to strengthen the persuasive impact of the message through the

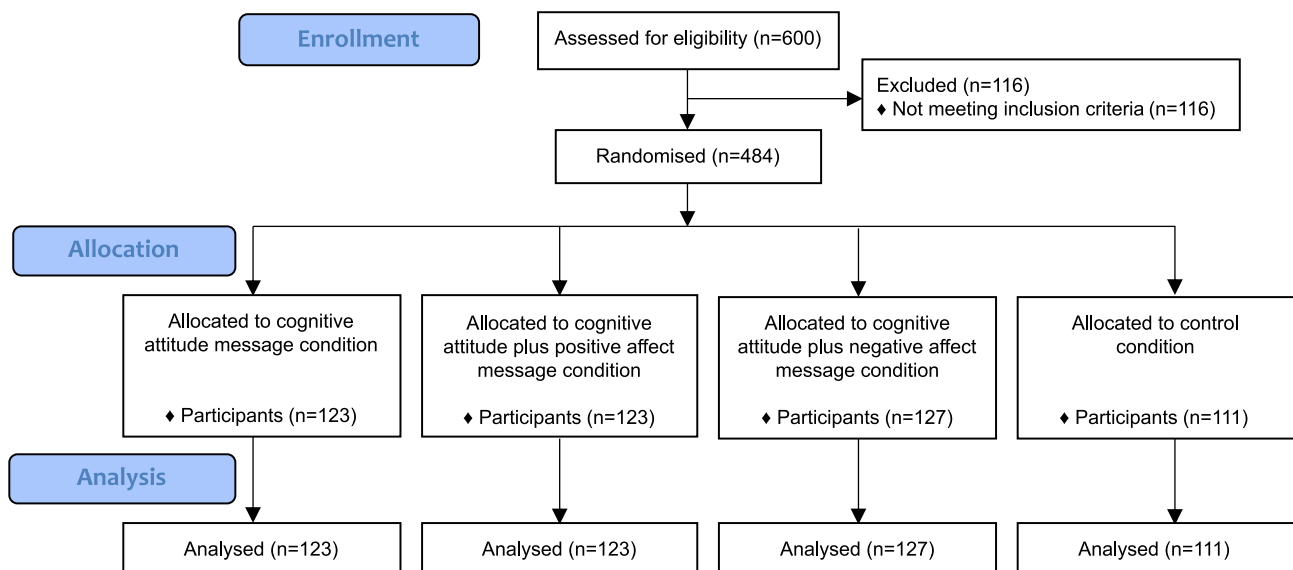


Fig. 1. Participant flow chart.

use of an expert source (Hopfer, 2012). Finally, since past research showed that prosocial motives could reinforce the decision to get vaccinated (Betsch et al., 2013; Quadri-Sheriff et al., 2012), we also included a prosocial component in the messages (i.e., "... protect yourself and others").

After being exposed to the posters, participants in all conditions completed the post-manipulation measures (intention to get vaccinated against COVID-19, cognitive attitude toward COVID-19 vaccination, anticipated positive and negative affective reactions). At the end of the questionnaire, the participants were informed that the poster was not real but built for research purposes only. Therefore, they were asked again for informed consent, in line with the ethical code of the Italian Association of Psychology (AIP, 2015) on the use of deception in psychological research.

## 4. Measures

### 4.1. Pre-manipulation measures

**Demographic information.** The first section of the questionnaire included questions about the sample's socio-demographic characteristics, i.e., age, gender, education (response scale: compulsory education, high school diploma, degree, post-degree training), socioeconomic status (response scale: extremely low, low, middle, high, extremely high), marital status (response scale: single, married, in a romantic relationship, separated, divorced, widow/widower, cohabitant), political orientation (response scale: left-wing, right-wing, centre, apolitical, other orientation) and religious orientation (response scale: practising Catholic, non-practising Catholic, atheist, other orientation). Participants were also asked if they knew someone infected with COVID-19 and if they ever tested positive for the virus.

**Past behaviour about vaccination.** In order to understand participants' past choices regarding vaccinations, they were asked to indicate ("yes", "no", or "I do not remember") whether they received the mandatory vaccinations, influenza vaccine in the last year, and the past influenza seasons, and other vaccinations recommended by the Italian Ministry of Health (e.g., HPV, hepatitis A, pneumococcus).

**Religiosity** was assessed using the *Duke University Religion Index* (DUREL; Koenig and Büssing, 2010). The DUREL is a 5-item measure considering three aspects of religiosity: organisational religious activity (1 item: "How often do you attend church or other religious meetings?", evaluated on a 6-point scale from "never" to "more than once/week"), non-organisational religious activity (1 item: "How often do you spend time in private religious activities, such as prayer, meditation or Bible study?", measured on a 6-point scale from "rarely or never" to "more than once a day") and intrinsic religiosity (3 items, e.g., "My religious beliefs are what really lie behind my whole approach to life", evaluated on a 5-point scale from "definitely not true" to "definitely true"). Intrinsic religiosity subscale Cronbach's  $\alpha = 0.92$ .

**Trust in science** was assessed with the 10-item *Belief in science scale* (Farias et al., 2013). The scale was developed to measure a general belief in science and acceptance of the scientific method. Participants were asked to indicate their degree of agreement with the items on a Likert scale from "strongly disagree" (1) to "strongly agree" (6). A sample item is "The only real kind of knowledge we can have is scientific knowledge". Cronbach's  $\alpha = 0.91$ .

### 4.2. Post-manipulation measures

**Intention to get vaccinated against COVID-19** was measured by 3 items on a Likert scale from "completely disagree" (1) to "completely agree" (5) (e.g., "I intend to get vaccinated against COVID-19"; adapted from Askelson et al., 2010). Cronbach's  $\alpha = 0.98$ .

**Cognitive attitude toward vaccinating against COVID-19** was assessed with 9 items on a semantic differential scale ranging from 1 to 5 ("Getting the COVID-19 vaccine will be ... harmful-beneficial,

disadvantageous-advantageous, useless-useful, dangerous-safe, bad-good, worthless-worthwhile, unhealthy-healthy, irresponsible-responsible, not important-important"). Cronbach's  $\alpha = 0.97$ .

**Anticipated positive affective reactions** were assessed with 3 items on a Likert scale from "completely disagree" (1) to "completely agree" (5) (e.g., "If I got the COVID-19 vaccine, I would be proud of myself"; adapted from Conner et al., 2013). Cronbach's  $\alpha = 0.91$ .

**Anticipated negative affective reactions** were assessed with 3 items on a Likert scale from "completely disagree" (1) to "completely agree" (5) (e.g., "If I did not get the COVID-19 vaccine, I would regret it"; adapted from Conner et al., 2013). Cronbach's  $\alpha = 0.92$ .

The questionnaire required a mandatory answer to each item, so no respondents had missing values.

## 5. Analyses

Statistical analyses were conducted using SPSS 26. Descriptive statistics were examined for all study variables. In preliminary analyses, we conducted a multivariate analysis of variance (MANOVA) and a Chi-squared test on pre-manipulation measures in order to verify the success of the randomisation. In the main analyses, we used univariate analyses of variance (ANOVA) to examine the differences between conditions in relation to intention (our primary outcome), plus cognitive attitude, anticipated positive and negative affective reactions (our secondary outcomes). These were followed up by post-hoc comparisons (Bonferroni) between each experimental condition and the control condition in order to test RQ1. Where differences between an experimental and control condition were significant, we used parallel mediation analyses to test RQ2. This was performed using the PROCESS macro for SPSS (Hayes, 2012) and tested the mediating effect of cognitive attitude and anticipated affective reactions (positive or negative as appropriate to the experimental condition examined) in the relationship between condition and intention. Bootstrapping was used for coefficient and indirect estimation. Indirect effects were considered statistically significant if the 95% confidence intervals (CIs) did not include zero.

## 6. Results

### 6.1. Sample characteristics

Respondents (60.3% women) were aged between 18 and 71 years ( $M = 36.4$ ,  $SD = 13.9$ ). Most reported having a middle socioeconomic status (71.5%) and being married or in a romantic relationship (59.7%). Regarding education, 43% had a high school diploma, 36.6% had a degree, while 8.7% only completed compulsory education. Concerning the political orientation, 35.3% declared themselves to be left-wing, 34.5% apolitical, 12.8% right-wing, while the remaining 17.4% declared a different orientation from the previous ones. With regard to religious orientation, the majority of participants (66.3%) defined themselves as Catholic (46.1% not practising and 20.2% practising). As for the experience with COVID-19, 89.5% declared to know someone infected with the virus, whereas only 5.8% reported having been personally tested positive.

Regarding participants' past behaviour about vaccination, most participants (95%) remembered having received all mandatory vaccinations; 19.4% had the influenza vaccine in the past year and 29.1% in past seasons, whereas 34.7% received recommended vaccinations. Full Profile of Respondents is reported in Appendix A, Section 2.

Descriptive statistics for the total sample (Table 1) showed that participants reported very high levels of intention to get vaccinated, cognitive attitude and anticipated affective reactions (both positive and negative), high trust in science, moderate levels of intrinsic religiosity, and low levels of organisational and non-organisational religious activities.



**Table 1**  
Descriptive statistics.

	Condition 1 M (SD)	Condition 2 M (SD)	Condition 3 M (SD)	Control condition M (SD)	Total sample M (SD)
<i>Pre-manipulation measures</i>					
Organisational religious activity	2.42 (1.34)	2.55 (1.50)	2.29 (1.18)	2.63 (1.35)	2.47 (1.35)
Non-organisational religious activity	1.91 (1.43)	2.01 (1.53)	1.81 (1.38)	2.37 (1.76)	2.01 (1.54)
Intrinsic religiosity	2.54 (1.33)	2.63 (1.38)	2.28 (1.26)	2.74 (1.33)	2.54 (1.33)
Trust in science	4.33 (0.98)	4.04 (1.08)	4.31 (0.98)	3.98 (1.13)	4.17 (1.05)
<i>Post-manipulation measures</i>					
Intention	3.89 (1.14)	4.06 (1.12)	3.92 (1.19)	3.56 (1.33)	3.87 (1.20)
Cognitive attitude	4.06 (0.89)	4.24 (0.92)	4.11 (0.97)	3.87 (1.10)	4.07 (0.98)
Anticipated positive affective reactions	3.55 (1.15)	3.77 (1.05)	3.61 (1.13)	3.43 (1.24)	3.59 (1.15)
Anticipated negative affective reactions	3.58 (1.12)	3.83 (1.04)	3.58 (1.13)	3.43 (1.20)	3.61 (1.13)

Note. Condition 1 = cognitive attitude message; Condition 2 = cognitive attitude plus positive affect message; Condition 3 = cognitive attitude plus negative affect message.

## 6.2. Preliminary analyses

Preliminary analyses were conducted to verify the success of the randomisation. First, a multivariate analysis of variance (MANOVA) was carried out on all psychological pre-manipulation variables (organisational religious activity, non-organisational religious activity, intrinsic religiosity, and trust in science) plus age, showing no significant effect of the condition on such variables ( $F_{(15,1434)} = 1.47$ ;  $p = .11$ ,  $\eta^2 = 0.02$ ). In addition, the Chi-square test showed no significant differences among the conditions in relation to socio-demographic characteristics, experience with COVID-19, and past behaviour about vaccination (all  $ps > .12$ ). This supports the success of randomisation.

## 6.3. Main analyses

Analysing differences in intention (primary outcome variable), ANOVA pointed to a small but significant sized effect of condition on intention to get vaccinated ( $F_{(3,480)} = 3.73$ ;  $p < .05$ ,  $\eta^2 = 0.02$ ). Post-hoc comparisons between message conditions (cognitive attitude message, cognitive attitude plus positive affect message, cognitive attitude plus negative affect message) and the control group showed that intention was significantly higher ( $p < .01$ ,  $\eta^2 = 0.04$ ) in the cognitive attitude plus positive affect message condition ( $M = 4.06$ ;  $SD = 1.12$ ) compared to the control group ( $M = 3.56$ ;  $SD = 1.33$ ). In contrast, no significant differences were found between cognitive attitude message ( $p = .20$ ,  $\eta^2 = 0.02$ ) or cognitive attitude plus negative affect message ( $p = .11$ ,  $\eta^2 = 0.02$ ) and control conditions.

Considering differences in other post-manipulation variables (secondary outcome variables), ANOVAs showed that condition significantly affected cognitive attitude ( $F_{(3,480)} = 2.94$ ;  $p < .05$ ,  $\eta^2 = 0.02$ ), but not anticipated positive affective reactions ( $F_{(3,480)} = 1.76$ ;  $p = .15$ ,  $\eta^2 = 0.01$ ) or anticipated negative affective reactions ( $F_{(3,480)} = 2.54$ ;  $p = .06$ ,  $\eta^2 = 0.02$ ). Post-hoc comparisons between message conditions and control group in relation to cognitive attitude showed that cognitive attitude was significantly higher ( $p < .05$ ,  $\eta^2 = 0.03$ ) in the cognitive attitude plus positive affect message condition ( $M = 4.24$ ;  $SD = 0.92$ ) compared to the control group ( $M = 3.87$ ;  $SD = 1.10$ ), whereas no significant differences were found between cognitive attitude message ( $p = .74$ ,  $\eta^2 = 0.01$ ) or cognitive attitude plus negative affect message ( $p = .31$ ,  $\eta^2 = 0.01$ ) and control conditions.

For the sake of brevity and coherently with RQ1, we report only comparisons between experimental conditions and the control group. However, complete post-hoc comparisons on all post-manipulation measures are presented in Appendix A (Section 3).

## 6.4. Mediation analysis

The results of the analyses described above showed that participants in the cognitive attitude plus positive affect message condition (condition 2) reported higher intention to get vaccinated against COVID-19

compared with those in the control group. Accordingly, we evaluated whether the effect of condition 2 versus control on intention was mediated by changes in cognitive attitude and anticipated positive affective reactions. Results of the parallel mediation analysis indicated that the effect of condition 2 versus control on intention (*Direct effect* = 0.10; 95% CI [-0.04, 0.25]; *Total effect* = 0.51; 95% CI [0.19, 0.82]) was totally mediated by cognitive attitude (*Indirect effect* = 0.26; 95% bootstrapped CI [0.07, 0.50]) and anticipated positive affective reactions (*Indirect effect* = 0.14; 95% bootstrapped CI [0.02, 0.29]). In addition, indirect effect contrasts showed no significant difference between the indirect effects of cognitive attitude and anticipated positive affective reactions (*Effect* = 0.12; 95% bootstrapped CI [-0.08, 0.37]). Unstandardised path coefficients are displayed in Fig. 2. Additional mediation analyses contrasting conditions 1 or 3 and the control condition are reported in Appendix A (Section 3).

## 7. Discussion and conclusion

Since the outbreak of the COVID-19 pandemic, the development of a safe and effective vaccine has represented the key weapon on which all the great world powers have invested to finally put an end to the global health and economic emergency. Unfortunately, although in Italy the majority of unvaccinated people intend to get vaccinated, this percentage dropped by 6 points from February to May (from 85% to 79%), according to the last data by the Ipsos company (2021). For this reason, it is important to identify the most effective strategies for promoting intention and actual uptake of the COVID-19 vaccine.

This study aimed to test the effect of persuasive messages focused on both cognitive attitude and anticipated (positive or negative) affective reactions in order to provide new insights into the psychological variables to be targeted in future campaigns aimed at promoting vaccination against COVID-19. In response to RQ1, the results showed that only participants in the cognitive attitude plus positive affect message condition reported significantly higher intentions to get vaccinated against COVID-19 compared with participants in the control group. This highlights that cognitive attitude and anticipated pride could play a crucial role in the decision-making process related to COVID-19 vaccination. Instead, in contrast with studies (e.g., Cox et al., 2014; Ziarnowski et al., 2009) that showed the effectiveness of manipulating anticipated regret to increase vaccination intention, participants exposed to the message focused on cognitive attitude plus anticipated negative affect (regret) did not report higher levels of intention compared with those in the control condition. These findings can have more than one explanation. As Chou and Budenz (2020) suggested, on the one hand, negative emotional appeals tend to be effective in piquing the interest of people who are emotionally disengaged about the promoted behaviour, whereas, on the other hand, they could even be counterproductive when negative emotions are already pervasive in the target population (which may be likely during a global pandemic). In such a context, activating positive affects in relation to the possibility of being vaccinated could be

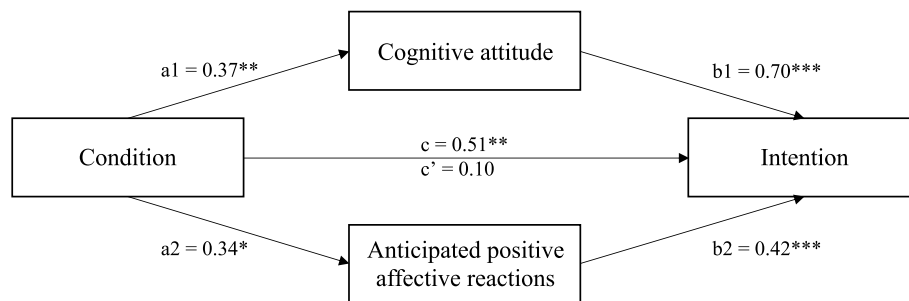


Fig. 2. Parallel mediation model via cognitive attitude and anticipated positive affective reactions - Condition 2 vs Control Condition.

a good strategy to increase intention and counterbalance the possible negative affects aroused by the pandemic and fear of vaccines. Another possible explanation for this result is that positive affects can represent a drive for action to the extent that a person expects to experience them immediately after putting in place the behaviour (Stevens et al., 2019). In the case of COVID-19 vaccination, targeting regret about a future negative outcome (e.g., getting sick or infecting loved ones) that is not necessarily going to occur may not be enough to increase the intention to get vaccinated. Conversely, emphasising pride that one might feel immediately after engaging in the recommended behaviour can be a more salient factor in influencing vaccination-related decision-making.

Moreover, in response to RQ2, our results showed that both cognitive attitude and anticipated positive affective reactions fully mediated the effect of the experimental condition (targeting cognitive attitude and anticipated positive affect) on intention to get vaccinated. Although the message targeting only cognitive attitude did not prove sufficient in modifying intention, these findings instead show the usefulness of working jointly on cognitive and positive affective aspects in promoting vaccination intention. Of course, enormous efforts must be devoted to improving people's attitudes toward the vaccine, with particular emphasis on its safety and efficacy aspects, and appealing to affects could represent that extra step that makes the persuasive message really effective. Promoting a more positive approach with respect to vaccination behaviour should take into consideration the process that leads to the intention to vaccinate in its complexity, which includes, without doubt, the role of affective variables.

This study is not without limitations. First of all, data collection started about a month before any COVID-19 vaccine was officially approved, that is, in a period in which accurate information was not available on the characteristics of the candidate vaccines, in particular about their efficacy, safety, and the possible side effects. With the start of the vaccination campaign, the intention to get vaccinated may likely have changed in light of the clearer information about the vaccines, the experiences of people who have already received them, and, not less importantly, government decisions and the daily news broadcast by the media. As specified above, the data on the time course of the vaccination campaign in Italy are in line with those of the neighbouring countries of the EU (around 60% of fully vaccinated people). However, the percentage of people still hesitant about the vaccine should not be underestimated, particularly in the older age groups (e.g., over 60s and 70s), where there is currently the lowest adhesion to vaccines (Italian Ministry of Health, 2021b). For this reason, further studies are needed to verify whether the type of persuasive message that we have identified as the most effective in promoting intention to receive the *future* COVID-19 vaccine also works in increasing intention to get the *currently approved* vaccines and the consequent behaviour and its impact on different socio-demographic groups. Secondly, since we used a convenience sample recruited by advertising the study through various online channels (e.g., Facebook groups), we cannot conclude that our results are generalisable to the general population and, above all, that participants did not already have high levels of vaccination intention. However, the heterogeneity of participants in terms of socio-demographic

characteristics may have partially reduced this bias. Thirdly, although in the literature there is no convincing evidence that affective attitude – unlike anticipated affective reactions – can predict vaccination intention, future studies with larger samples could simultaneously manipulate both components of the attitude (cognitive vs affective) plus anticipated affective reactions to clarify better if and how these processes are mutually exclusive in the context of the decision-making process related to COVID-19 vaccination. In addition, it should be noted that we have not focused on all the variables of the TPB model but only on attitude and intention. Future studies should also consider, for example, the possible effect of subjective norms on the intention to get vaccinated against COVID, since the literature shows that subjective norms, after attitude, are the strongest predictors of vaccination intentions (e.g., Askelson et al., 2010). Injunctive norms, i.e. what significant others (family, friends) think the person should do (to get vaccinated or not), and descriptive norms, i.e. what they do themselves (they intend to get vaccinated or not), are both aspects that could have a substantial impact on the decision to get vaccinated, especially in consideration of the context of uncertainty (e.g., doubts about the safety and efficacy of the vaccines) in which this decision is taken. Furthermore, considering that many countries are starting to vaccinate or consider vaccinating children and young people, studying the impact of social influences is even more relevant. Indeed, younger people's attitudes toward vaccines appear to be heavily influenced by social norms (Rambout et al., 2014); in this perspective, learning that most people significant to them (e.g., parents or friends) get vaccinated can represent, for the youngest, an important motivational factor.

Finally, we are aware that our results should be interpreted with caution as they indicate a small sized effect. Since changing vaccination intentions presumably requires more than exposure to a single message, it would be unrealistic to expect larger effects. Nevertheless, as Funder and Ozer (2019) highlighted, small effects can matter in the long run, particularly when analysing psychological processes that influence the behaviour of many individuals simultaneously. This is especially true when it comes to vaccination, since increasing the intentions to get vaccinated of even a few people can have huge practical consequences, as vaccinated people protect not only themselves but also people around them. Also, the result that the exposure to a *single* persuasive message has produced a small but significant effect on intentions appears to us somewhat encouraging, as it suggests that a more structured intervention (e.g., daily exposure to persuasive messages) in larger populations could have a stronger effect.

Despite these limitations, the results of this study demonstrate that persuasive messages targeting cognitive attitude plus anticipated affective reactions could be an effective strategy in increasing the intention to get vaccinated against COVID-19. Surprisingly, most studies that have tested the effectiveness of persuasive messages in the context of vaccination behaviour focused only on the classic distinction between gain-framed and loss-framed messages (e.g., Abhyankar et al., 2008), leaving aside the possible role of the affective components. As far as we know, ours is the first study in which the combined effect of affective and cognitive variables is examined. Even though further studies are

needed to confirm the efficacy of persuasive messages targeting cognitive attitude plus anticipated positive affective reactions, our results emphasise the need for future COVID-19 (and not only) vaccination promotion campaigns to take into account the role of affective processes in the design and implementation of more effective communication strategies to promote vaccination intention and behaviour. More generally, interventions to increase trust in vaccines, while not directly increasing vaccine uptake, could act indirectly by strengthening the effectiveness of public health policies on vaccination (Brewer et al., 2017). These efforts need to be even more focused when planning to increase COVID-19 vaccination rates, as the development of a new vaccine is always accompanied by fear, indecision, and misinformation, all of which could jeopardise the success of the vaccination campaign and, consequently, the battle against the pandemic.

### Credit author statement

Miriam Capasso: Conceptualization, Methodology, Data curation, Formal analysis, Writing – original draft, Writing – review & editing. Daniela Caso: Conceptualization, Methodology, Writing – review & editing, Supervision. Mark Conner: Conceptualization, Methodology, Writing – review & editing, Supervision.

### Declarations

#### Funding

No funding involved.

### Declaration of interests

None.

#### Ethical approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the Ethical Committee of Psychological Research of the Department of Humanities of the University of Naples Federico II and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

### Informed consent

Informed consent was obtained from all individual participants included in the study.

### Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.socscimed.2021.114416>.

### References

- Abhyankar, P., O'Connor, D.B., Lawton, R., 2008. The role of message framing in promoting MMR vaccination: evidence of a loss-frame advantage. *Psychol. Health Med.* 13 (1), 1–16. <https://doi.org/10.1080/13548500701235732>.
- Ajzen, I., 1991. The theory of planned behavior. *Organ. Behav. Hum. Decis. Process.* 50 (2), 179–211. [https://doi.org/10.1016/0749-5978\(91\)90020-T](https://doi.org/10.1016/0749-5978(91)90020-T).
- Askelsen, N.M., Campo, S., Lowe, J.B., Smith, S., Dennis, L.K., Andsager, J., 2010. Using the theory of planned behavior to predict mothers' intentions to vaccinate their daughters against HPV. *J. Sch. Nurs.* 26 (3), 194–202. <https://doi.org/10.1177/1059840510366022>.
- Betsch, C., Böhm, R., Korn, L., 2013. Inviting free-riders or appealing to prosocial behavior? game-theoretical reflections on communicating herd immunity in vaccine advocacy. *Health Psychol.* 32 (9), 978. <https://doi.org/10.1037/a0031590>.
- Brewer, N.T., Chapman, G.B., Rothman, A.J., Leask, J., Kempe, A., 2017. Increasing vaccination: putting psychological science into action. *Psychol. Sci. Publ. Interest* 18 (3), 149–207. <https://doi.org/10.1177/1529100618760521>.
- Brewer, N.T., DeFrank, J.T., Gilkey, M.B., 2016. Anticipated regret and health behavior: a meta-analysis. *Health Psychol.* 35 (11), 1264. <https://doi.org/10.1037/hea0000294>.
- Britt, R.K., Englebert, A.M., 2018. Behavioral determinants for vaccine acceptability among rurally located college students. *Health Psychology and Behavioral Medicine* 6 (1), 262–276. <https://doi.org/10.1080/21642850.2018.1505519>.
- Carfora, V., Caso, D., Palumbo, F., Conner, M., 2018. Promoting water intake. The persuasiveness of a messaging intervention based on anticipated negative affective reactions and self-monitoring. *Appetite* 130, 236–246. <https://doi.org/10.1016/j.appet.2018.08.017>.
- Caserotti, M., Girardi, P., Rubaltelli, E., Tasso, A., Lotto, L., Gavaruzzi, T., 2021. Associations of COVID-19 risk perception with vaccine hesitancy over time for Italian residents. *Soc. Sci. Med.* 113688. <https://doi.org/10.1016/j.socscimed.2021.113688>.
- Caso, D., Capasso, M., Fabbriatore, R., Conner, M., 2021a. Understanding the psychosocial determinants of Italian parents' intentions not to vaccinate their children: an extended Theory of Planned Behaviour model. *Psychol. Health* 1–21. <https://doi.org/10.1080/08870446.2021.1936522>.
- Caso, D., Carfora, V., Capasso, M., Oliano, D., Conner, M., 2021b. Using messages targeting psychological versus physical health benefits to promote walking behaviour: a randomised controlled trial. *Appl. Psychol.: Health Well-Being* 13 (1), 152–173. <https://doi.org/10.1111/aphw.12224>.
- Caso, D., Carfora, V., Starace, C., Conner, M., 2019. Key factors influencing Italian mothers' intention to vaccinate sons against HPV: the influence of trust in health authorities, anticipated regret and past behaviour. *Sustainability* 11 (23), 6879. <https://doi.org/10.3390/su11236879>.
- Center for Disease Control and Prevention, 2021. People at increased risk and other people who need to take extra precautions. Available at: <https://www.cdc.gov/coronavirus/2019-ncov/need-extra-precautions/index.html>. (Accessed 1 October 2020).
- Cha, K.S., Kim, K.M., 2019. The factors related to mothers' intention to vaccinate against hepatitis A: applying the theory of planned behavior. *Child Health Nurs. Res.* 25 (1), 1–8. <https://doi.org/10.4094/chnr.2019.25.1.1>.
- Chou, W.Y.S., Budenz, A., 2020. Considering Emotion in COVID-19 vaccine communication: addressing vaccine hesitancy and fostering vaccine confidence. *Health Commun.* 35 (14), 1718–1722. <https://doi.org/10.1080/10410236.2020.1838096>.
- Christy, S.M., Winger, J.G., Raffanello, E.W., Halpern, L.F., Danoff-Burg, S., Mosher, C.E., 2016. The role of anticipated regret and health beliefs in HPV vaccination intentions among young adults. *J. Behav. Med.* 39 (3), 429–440. <https://doi.org/10.1007/s10865-016-9716-z>.
- Conner, M., Godin, G., Sheeran, P., Germain, M., 2013. Some feelings are more important: cognitive attitudes, affective attitudes, anticipated affect, and blood donation. *Health Psychol.* 32 (3), 264. <https://doi.org/10.1037/a0028500>.
- Conner, M., McEachan, R., Taylor, N., O'Hara, J., Lawton, R., 2015. Role of affective attitudes and anticipated affective reactions in predicting health behaviors. *Health Psychol.* 34 (6), 642. <https://doi.org/10.1037/hea0000143>.
- Conner, M., Williams, D., Rhodes, R., 2020. Affect-based interventions. In: Hagger, M., Cameron, L., Hamilton, K., Hankonen, N., Lintunen, T. (Eds.), *The Handbook of Behavior Change* (Cambridge Handbooks in Psychology). Cambridge University Press, Cambridge, pp. 495–509. <https://doi.org/10.1017/9781108677318.034>.
- Cox, D., Sturm, L., Cox, A.D., 2014. Effectiveness of asking anticipated regret in increasing HPV vaccination intention in mothers. *Health Psychol.* 33 (9), 1074–1083. <https://doi.org/10.1037/hea0000071>.
- Farias, M., Newheiser, A.K., Kahane, G., de Toledo, Z., 2013. Scientific faith: belief in science increases in the face of stress and existential anxiety. *J. Exp. Soc. Psychol.* 49 (6), 1210–1213. <https://doi.org/10.1016/j.jesp.2013.05.008>.
- Fishbein, M., Ajzen, I., 1975. *Belief, Attitude, Intention, and Behavior: an Introduction to Theory and Research*. Addison-Wesley, Reading, MA.
- Funder, D.C., Ozer, D.J., 2019. Evaluating effect size in psychological research: sense and nonsense. *Adv. Method. Pract. Psychol. Sci.* 2 (2), 156–168. <https://doi.org/10.1177/2515245919847202>.
- Graffigna, G., Palamenghi, L., Boccia, S., Barelli, S., 2020. Relationship between citizens' health engagement and intention to take the covid-19 vaccine in Italy: a mediation analysis. *Vaccines* 8 (4), 576. <https://doi.org/10.3390/vaccines8040576>.
- Hayes, A.F., 2012. PROCESS: A Versatile Computational Tool for Observed Variable Mediation moderation, and conditional process modeling [White paper]. Retrieved from: <http://www.afhayes.com/public/process2012.pdf>.
- Hofman, R., van Empelen, P., Richardus, J.H., de Kok, I.M., De Koning, H.J., van Ballegooijen, M., Korff, L.J., 2014. Predictors of HPV vaccination uptake: a longitudinal study among parents. *Health Educ. Res.* 29 (1), 83–96. <https://doi.org/10.1093/her/cyt092>.
- Hood, K.B., Shook, N.J., Dunn, C.E., Belgrave, F.Z., 2020. The effect of affective versus cognitive persuasive messages on African American women's attitudes toward condom use. *Psychol. Health* 1–21. <https://doi.org/10.1080/08870446.2020.1776284>.
- Hopfer, S., 2012. Effects of a narrative HPV vaccination intervention aimed at reaching college women: a randomized controlled trial. *Prev. Sci.* 13 (2), 173–182. <https://doi.org/10.1007/s11211-011-0254-1>.
- Ipsos, 2021. Majorities of unvaccinated adults in most of 15 countries would get a vaccine if they could. Available at: (Accessed on 10 June 2021). <https://www.ipsos.com/en/majorities-unvaccinated-adults-most-15-countries-would-get-vaccine-if-they-could>.
- Italian Association of Psychology, 2015. Codice etico. Available at: <http://www.aipass.org/node/11560>.



- Italian Ministry of Health, 2021a. Piano vaccinale anticovid. Available at: [http://www.governo.it/sites/governo.it/files/210313\\_Piano\\_Vaccinale\\_marzo\\_2021.pdf](http://www.governo.it/sites/governo.it/files/210313_Piano_Vaccinale_marzo_2021.pdf). (Accessed 19 March 2021).
- Italian Ministry of Health, 2021b. Report vaccini anti COVID-19. Available at: <https://www.governo.it/it/cscovid19/report-vaccini/>. (Accessed 31 August 2021).
- Kim, J., 2020. The impact of narrative strategy on promoting HPV vaccination among college students in Korea: the role of anticipated regret. *Vaccines* 8 (2), 176. <https://doi.org/10.3390/vaccines8020176>.
- Koenig, H.G., Büssing, A., 2010. The Duke University Religion Index (DUREL): a five-item measure for use in epidemiological studies. *Religions* 1 (1), 78–85. <https://doi.org/10.3390/rel1010078>.
- Lawton, R., Conner, M., McEachan, R., 2009. Desire or reason: predicting health behaviors from affective and cognitive attitudes. *Health Psychol.* 28 (1), 56. <https://doi.org/10.1037/a0013424>.
- Lehmann, B.A., Ruiter, R.A., Chapman, G., Kok, G., 2014. The intention to get vaccinated against influenza and actual vaccination uptake of Dutch healthcare personnel. *Vaccine* 32 (51), 6986–6991. <https://doi.org/10.1016/j.vaccine.2014.10.034>.
- Lindsey, L.L.M., 2017. The influence of persuasive messages on healthy eating habits: a test of the Theory of Reasoned Action when attitudes and subjective norm are targeted for change. *J. Appl. Biobehav. Res.* 22 (4), e12106 <https://doi.org/10.1111/jabr.12106>.
- Liu, S., Yang, J.Z., Chu, H., 2019. When we increase fear, do we dampen hope? Using narrative persuasion to promote human papillomavirus vaccination in China. *J. Health Psychol.*, 1359105319894626 <https://doi.org/10.1177/1359105319894626>.
- Martinez, L.S., 2014. Explaining the effects of anticipated regret messages on young women's intention to consume folic acid: a moderated-mediation model. *J. Health Commun.* 19 (1), 115–132. <https://doi.org/10.1080/10810730.2013.798382>.
- Nan, X., 2012. Relative persuasiveness of gain-versus loss-framed human papillomavirus vaccination messages for the present-and future-minded. *Hum. Commun. Res.* 38 (1), 72–94. <https://doi.org/10.1111/j.1468-2958.2011.01419.x>.
- O'Carroll, R.E., Chambers, J.A., Brownlee, L., Libby, G., Steele, R.J., 2015. Anticipated regret to increase uptake of colorectal cancer screening (ARTICS): a randomised controlled trial. *Soc. Sci. Med.* 142, 118–127. <https://doi.org/10.1016/j.socscimed.2015.07.026>.
- O'Carroll, R.E., Foster, C., McGeehan, G., Sandford, K., Ferguson, E., 2011. The “ick” factor, anticipated regret, and willingness to become an organ donor. *Health Psychol.* 30 (2), 236. <https://psycnet.apa.org/doi/10.1037/a0022379>.
- Our World in Data, 2021. Coronavirus (COVID-19) vaccinations. Available at: [https://ourworldindata.org/covid-vaccinations?country=OWID\\_WRL](https://ourworldindata.org/covid-vaccinations?country=OWID_WRL). (Accessed 31 August 2021).
- Paul, E., Steptoe, A., Fancourt, D., 2021. Attitudes towards vaccines and intention to vaccinate against COVID-19: implications for public health communications. *Lancet Region. Health-Europe* 1, 100012. <https://doi.org/10.1016/j.lanepe.2020.100012>.
- Pența, M.A., Crăciun, I.C., Băban, A., 2020. The power of anticipated regret: predictors of HPV vaccination and seasonal influenza vaccination acceptability among young Romanians. *Vaccine* 38 (6), 1572–1578. <https://doi.org/10.1016/j.vaccine.2019.11.042>.
- Portnoy, D.B., Ferrer, R.A., Bergman, H.E., Klein, W.M., 2014. Changing deliberative and affective responses to health risk: a meta-analysis. *Health Psychol. Rev.* 8 (3), 296–318. <https://doi.org/10.1080/17437199.2013.798829>.
- Quadri-Sheriff, M., Hendrix, K.S., Downs, S.M., Sturm, L.A., Zimet, G.D., Finnell, S.M.E., 2012. The role of herd immunity in parents' decision to vaccinate children: a systematic review. *Pediatrics* 130 (3), 522–530. <https://doi.org/10.1542/peds.2012-0140>.
- Radic, A., Koo, B., Gil-Cordero, E., Cabrera-Sánchez, J.P., Han, H., 2021. Intention to take COVID-19 vaccine as a precondition for international travel: application of extended norm-activation model. *Int. J. Environ. Res. Publ. Health* 18 (6), 3104. <https://doi.org/10.3390/ijerph18063104>.
- Rambout, L., Tashkandi, M., Hopkins, L., Tricco, A.C., 2014. Self-reported barriers and facilitators to preventive human papillomavirus vaccination among adolescent girls and young women: a systematic review. *Prev. Med.* 58, 22–32. <https://doi.org/10.1016/j.ypmed.2013.10.009>.
- Ratanasiripong, N.T., Sri-Umporn, S., Kathalae, D., Hanklang, S., Ratanasiripong, P., 2018. Human papillomavirus (HPV) vaccination and factors related to intention to obtain the vaccine among young college women in Thailand. *J. Health Res.* <https://doi.org/10.1108/JHR-01-2018-018>.
- Reno, C., Maietti, E., Fantini, M.P., Savoia, E., Manzoli, L., Montalti, M., Gori, D., 2021. Enhancing COVID-19 vaccines acceptance: results from a survey on vaccine hesitancy in northern Italy. *Vaccines* 9 (4), 378. <https://doi.org/10.3390/vaccines9040378>.
- Rutjens, B.T., Sutton, R.M., van der Lee, R., 2018. Not all skepticism is equal: exploring the ideological antecedents of science acceptance and rejection. *Pers. Soc. Psychol. Bull.* 44 (3), 384–405. <https://doi.org/10.1177/0146167217741314>.
- Sandberg, T., Conner, M., 2008. Anticipated regret as an additional predictor in the theory of planned behaviour: a meta-analysis. *Br. J. Soc. Psychol.* 47 (4), 589–606. <https://doi.org/10.1348/014466607X258704>.
- Sandberg, T., Conner, M., 2009. A mere measurement effect for anticipated regret: impacts on cervical screening attendance. *Br. J. Soc. Psychol.* 48 (2), 221–236. <https://doi.org/10.1348/014466608X347001>.
- Sherman, S.M., Smith, L.E., Sim, J., Amlôt, R., Cutts, M., Dasch, H., Rubin, G.J., Sevdalis, N., 2020. COVID-19 vaccination intention in the UK: results from the COVID-19 vaccination acceptability study (CoVAccS), a nationally representative cross-sectional survey. *Human vaccines & immunotherapeutics*, pp. 1–10. <https://doi.org/10.1080/21645515.2020.1846397>.
- Stevens, C.J., Gillman, A.S., Gardiner, C.K., Montanaro, E.A., Bryan, A.D., Conner, M., 2019. Feel good now or regret it later? The respective roles of affective attitudes and anticipated affective reactions for explaining health-promoting and health risk behavioral intentions. *J. Appl. Soc. Psychol.* 49 (6), 331–348. <https://doi.org/10.1111/jasp.12584>.
- Weinstein, N.D., Kwitel, A., McCaul, K.D., Magnan, R.E., Gerrard, M., Gibbons, F.X., 2007. Risk perceptions: assessment and relationship to influenza vaccination. *Health Psychol.* 26 (2), 146–151. <https://doi.org/10.1037/0278-6133.26.2.146>.
- Williams, D.M., Rhodes, R.E., Conner, M.T., 2018. *Affective Determinants of Health-Related Behavior*. Oxford University Press, New York.
- Xiao, X., 2019. Follow the heart or the mind? Examining cognitive and affective attitude on HPV vaccination intention. *Atl. J. Commun.* 1–13. <https://doi.org/10.1080/15456870.2019.1708743>.
- Xu, Z., Guo, H., 2019. Advantages of anticipated emotions over anticipatory emotions and cognitions in health decisions: a meta-analysis. *Health Commun.* 34 (7), 774–781. <https://doi.org/10.1080/10410236.2018.1434738>.
- Ziarnowski, K.L., Brewer, N.T., Weber, B., 2009. Present choices, future outcomes: anticipated regret and HPV vaccination. *Prev. Med.* 48 (5), 411–414. <https://doi.org/10.1016/j.ypmed.2008.10.006>.