As long as it circulates, we've got to keep fighting: COVID-19 and the motivation to get vaccinated

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A B S T R A C T

Objective: The first purpose of this research was to explore the relationship between goal-directed motivation and vaccination behavior. The second purpose was to find ways to motivate people to get vaccinated against COVID-19 and infectious diseases in general.

Rationale: According to regulatory focus theory, goal-directed behavior is regulated by two motivational systems – prevention and promotion. Prevention-focused behavior is motivated by needs for security and safety, and it is associated with a strategic preference for vigilant means of goal-pursuit. Promotion-focused behavior is motivated by needs for self-development and growth, and it is associated with a strategic preference for eagerness means. Based on regulatory focus theory, this research examined the proposal that motivation in goal-pursuit and self-regulatory processes would play a central role in shaping vaccination intention and behavior.

Method: Two studies tested the relationship between participants' self-reported intention to get vaccinated and regulatory focus. In Study 1, regulatory focus was measured as a chronic variable. In Study 2, regulatory focus was experimentally induced.

Results: Study 1 showed that chronic prevention focus moderated the relationship between vaccine safety concerns and vaccination intention. The higher the concerns about vaccine safety, the lower was the probability of expressing an intention to get vaccinated, and the stronger the prevention focus the stronger was the effect. Moreover, vaccine safety concerns mediated the relationship between chronic promotion focus and vaccination intention. The stronger the promotion focus, the lower was the concern over vaccine safety, and thus the higher was the probability of expressing an intention to get vaccinated. In Study 2, a situationally induced regulatory focus moderated the relationship between vaccination intention and vaccine safety concerns. As concerns about vaccine safety decreased, the intention to get vaccinated increased, and the effect was stronger for prevention compared with promotion focus. Implications for public health and health communication are discussed.

1. Introduction

Mass vaccination is the best way out of the COVID-19 crisis. While vaccine availability is critical, it does not ensure that uptake will follow. Vaccination would be effective against COVID-19 only if enough people get vaccinated. Therefore, the willingness to accept a vaccine is of paramount importance for combating the COVID-19 pandemic. The problem is that despite the proven efficacy of vaccines, many people still hesitate to get vaccinated (Machingaidze and Wiysonge, 2021). This is an important issue because vaccine hesitancy could be a barrier to vaccine uptake, and thus a threat to global health. On this background, the current research aimed to explore the psychological mechanisms underlying the intention to get vaccinated against COVID-19, and more specifically, the role of goal-directed motivation and achievement

behavior in vaccination decisions. A second aim was to find ways to persuade and encourage the public to take the COVID-19 vaccine. This paper is structured as follows. It starts with a literature review on vaccine hesitancy. This is followed by an overview of regulatory focus theory, a well-established theory of motivation and goal-directed behavior (Scholer et al., 2019). Next, based on regulatory focus theory a proposal is made, according to which motivation in goal-pursuit and self-regulatory processes play a central role in shaping vaccination intention and behavior. The rationale behind this proposal is explained. In the sections that follow, two studies are reported that support this proposal. Models of vaccination intention are then presented. Finally, implications for public health and health communication are discussed.

2. To get vaccinated or not

Research (Troiano and Nardi, 2021) shows that vaccine hesitancy is driven by a complex configuration of issues including belief that the threat of COVID-19 has been exaggerated, concerns about the safety and doubts about the efficiency of the vaccines, belief to be already immunized against COVID-19, being against vaccination in general, and lack of trust in government, public health officials, and science. In the following, a selected number of recent studies on these topics are reviewed.

A study exploring public acceptance of COVID-19 vaccines in Australia found that 4.9% would refuse to get vaccinated and 9.4% were indifferent (Dodd et al., 2020). Respondents who said they would not get the vaccine (as compared with those who intended to or were indifferent) were more likely to believe the threat of COVID-19 has been overstated. Poor health literacy and lower education level were significantly related to the reluctance to get vaccinated. Another study showed that 49% of Americans planned to get vaccinated against coronavirus, but 20% said they would not, and 31% were not sure (NORC at the University of Chicago, 2020). Older Americans and those worrying that they or someone in their household could be infected with the virus were more inclined to say they would get a COVID-19 vaccine. Among the 20% of respondents who said they would not get vaccinated, concern about side effects was overwhelmingly the major reason for rejecting the vaccine (70%). Other reasons for refusal included concern about getting infected with COVID-19 from the vaccine (42%), not being worried about getting sick from COVID-19 (31%), and doubts about vaccine effectiveness (30%). In a study in Finland (Karlsson et al., 2020), it has been shown that trust in the safety of vaccines against COVID-19 was the strongest predictor of vaccination intention.

A study among medical staff and civilians found a high rate of vaccine skepticism due to concerns about the safety of a rapidly-developed vaccine (Dror et al., 2020). One of the main reasons people trust vaccines is that the process undertaken to develop them is slow and methodical, which may take up to several years before final approval. A fast-track approval of a new vaccine developed after a pandemic has already been declared may contribute to hesitancy. This hesitancy is driven by the impression that vaccines were rushed to the market and not adequately tested for safety and efficacy.

Another factor that plays a role in COVID-19 vaccination decisions is the perceived risk associated with the disease (Karlsson et al., 2020). The cognitive dimension of risk perception is related to one's estimation of the likelihood of contracting the disease (subjective probability of becoming ill with COVID-19) and to one's perception of how severe the symptoms are. The emotional dimension of perceived disease risk is related to one's level of worry (subjective fear of the virus). From the social perspective, COVID-19 perceived risk is associated with social amplification, in particular hearing about the disease in the news and social media, and also with worldviews (prosocial vs. individualistic) and trust in government and public health institutions (Dryhurst et al., 2020). There is ample evidence that perceived disease risk is positively associated with the adoption of preventative health behaviors. For example, an online survey in Australia (Faasse and Newby, 2020) found that two-thirds of respondents were at least moderately worried about COVID-19, and worry about the disease was positively related to greater engagement with health-protective behaviors and higher vaccination intentions. A study that examined the association between perceived disease risk and virus-mitigating behaviors found that fear of COVID-19 was a strong predictor of behavior change in response to the pandemic (Harper et al., 2021).

From the literature review, it is clear that many factors influence the intention to accept a COVID-19 vaccine. Notable among these factors is vaccine safety concerns. The higher the concern over vaccine safety, the weaker is the intention to get vaccinated. COVID-19 perceived risk appears also to play an important role in the decision to get vaccinated. Individuals who perceive the likelihood of contracting the virus as low,

consider the symptoms of the disease as mild, and experience little worry about the disease, will show less intent to get vaccinated. By contrast, those perceiving the likelihood of getting infected with the virus as high, considering the consequences of the disease as severe, and experiencing fear or worry about contracting the disease, will show higher vaccine acquiescence. There are other factors that may impact the decision to get vaccinated, including the belief that the threat of the virus has been overblown, being against vaccines in general, mistrust in government and public health authorities, and doubts about the efficacy of the vaccines.

And yet, in my opinion, from a psychological perspective, there is something unsatisfactory about these factors. Something is missing. These factors are not enough to solve the puzzle of why so many people are reluctant to get vaccinated. To understand why some people refuse to get vaccinated and some do not, there is a need to find a link between the subjective circumstances of the individual and the objective circumstances of COVID-19. And this is where the current research comes in.

Based on regulatory focus theory (Scholer et al., 2019), a well-established theory of motivation and goal-directed behavior, this research offers a new theoretical perspective on vaccine hesitancy. According to regulatory focus theory, individuals differ in what motivates them in goal-pursuit and in which strategies they prefer in goal-pursuit. This is important because individual differences in motivation are reflected in self-regulatory processes and behaviors, and from this perspective, it is likely that motivation in goal-pursuit will have an impact on vaccination intention and uptake. In the next section, the theory of regulatory focus is presented, and the rationale behind this proposal is discussed.

3. Regulatory focus

According to regulatory focus theory, goal-directed behavior is regulated by two distinct and independently operating motivational systems – promotion and prevention (Scholer et al., 2019). The two systems differ in what motivates goal-pursuit and in which strategies are preferred in goal-pursuit. People with a promotion focus are motivated by growth and development needs, and have a strategic preference for eager means of goal attainment. People with a prevention focus are driven by safety and security needs, and have a strategic preference for vigilant means. All individuals are concerned about both, maintaining security and pursuing growth. Nevertheless, in any given moment, concerns of one type may predominate over the other due to either chronic or situational differences in accessibility, which may then affect behavior.

Individuals with a promotion focus aim high, dream big, have high expectations in life, and are ready to take risks to achieve their objectives. They are focused on advancement and progress. Maintaining the status quo is not an option. Given these goals, individuals with a strong promotion focus are primarily sensitive to gains and nongains (Idson et al., 2000). Gains reflect success whereas nongains reflect failure. The motivation is to move from 0 to +1, that is, to approach gains (and avoid nongains). These individuals prefer to use eager strategies to achieve their goals (Crowe and Higgins, 1997). Promotion-focused eagerness has been shown to be associated with various behaviors, such as a tendency to take risks (Zou et al., 2014), embracing novel solutions and being creative in problem-solving (Friedman and Förster, 2001), openness to experience (Vaughn et al., 2008), preference for change over stability (Liberman et al., 1999), generating multiple alternatives (Liberman et al., 2001), and in speed-accuracy tasks, speed is a priority over accuracy (Förster et al., 2003).

Individuals with a prevention focus are mostly concerned with maintaining security and safety, and upholding duties and obligations. Given these concerns, individuals with a strong prevention focus are predominantly sensitive to nonlosses and losses (Idson et al., 2000). Nonlosses reflect success whereas losses reflect failure. The motivation is

to not move from 0 to −1, that is, to avoid losses (and approach non-losses). These individuals prefer to use vigilant strategies to attain their goals (Crowe and Higgins, 1997). Prevention-focused vigilance has been shown to be associated with various behaviors, such as avoiding unnecessary risk (Hamstra et al., 2011), diminished creativity in problem-solving (Friedman and Förster, 2001), being less open to new experiences (Vaughn et al., 2008), preference for stability over change (Liberman et al., 1999), favoring the status-quo over reform (Boldero and Higgins, 2011), generating fewer alternatives and thoroughly vetting the possible outcomes (Liberman et al., 2001), and in tasks involving speed-accuracy trade-off, accuracy is a priority over speed (Förster et al., 2003).

According to regulatory focus theory, all people are driven by both promotion and prevention goals. Nevertheless, there are differences between individuals in chronic accessibility to these two types of goals (differences due to personality traits), and also differences in temporary accessibility (differences due to momentary situational influences). Chronic differences may be a result of different parenting styles. A parental environment in which the emphasis is on achieving aspirations would typically encourage the development of a promotion focus in children. By contrast, a parental environment in which the emphasis is on fulfillment of obligations would typically encourage the development of a prevention focus in children. Generally, supporting and bolstering parenting style (children are given a lot of attention, praise, and encouragement) is related to promotion focus, whereas controlling and punitive parenting style (children are required to follow strict rules of obedience) is related to prevention focus.

Differences in temporary accessibility may be due to different external cues. To illustrate, companies can use different types of incentives to bolster performance in work settings. Incentives may encourage eagerness to excel (promotion). For example, the best performer will be promoted. By contrast, incentives may encourage vigilance not to fail (prevention). For example, the worst performer will be fired. It is noteworthy that, according to regulatory focus theory, promotion and prevention are two independently operating motivational systems. Hence, at the chronic level, a weak prevention focus does not mean a strong promotion focus and vice versa. The important point is that in any given moment, concerns of one system may predominate (due to either chronic differences or situational influences) and shape one's behavior.

There are numerous studies on the association between regulatory focus and health behavior. A study that examined the interplay between temporal distance and regulatory focus in the context of health (Berezowska et al., 2018), found that the interaction between regulatory focus and temporal distance had a significant impact on the intention to adopt a personalized nutrition service. Adoption intention was higher for individuals with a prevention focus relative to those with a promotion focus. A longitudinal study of smoking cessation (Fuglestad et al., 2013) examined the association between regulatory focus and smokers' response to initial slips, and whether smokers were able to avoid slips after initial cessation. It was found that after slipping, smokers higher in promotion focus were more likely to quit again relative to those lower in promotion focus. The effect was particularly strong for individuals high in self-efficacy. Moreover, smokers higher in prevention focus more consistently avoided slips than those lower in prevention focus, but only if they were high in self-efficacy. A study of unhealthy eating behaviors (Shimul et al., 2021) showed that regulatory focus was associated with the intention to avoid junk food consumption. A study that explored the link between consideration of future consequences and health behavior (Joireman et al., 2012) found that regulatory focus mediated that link. Future-oriented individuals engaged in exercise and healthy eating because they adopted a promotion focus.

There are also studies on the relationship between regulatory focus and vaccination intentions against contagious diseases. For example, a study of self-regulation and protective health behavior investigated the association between vaccination behavior, motivational orientations, and anticipated regret (Leder et al., 2015). This study found that prevention focus was positively associated with the probability of getting vaccinated against the flu, and this effect was in part a result of anticipated regret for not accepting the vaccine. A study in Singapore (Kim et al., 2020) explored the relationship between the way a narrative is framed (gain vs. loss) and vaccination intention against Human Papillomavirus (HPV). It was found that a loss-frame was more effective than a gain-frame in producing transportation and self-referent emotions, which in turn increased the intention to get vaccinated. This effect was positively related to both prevention focus and promotion focus with self-referent emotions being the main mediator transferring the effect to the intention to take the vaccine.

However, none of these studies examined the relationship between regulatory focus and the intention to get vaccinated in the context of COVID-19. The current research is the first to do so, and in so doing it contributes to the literature on vaccination behavior. Based on regulatory focus theory, it is proposed that vaccination intentions are associated with the two regulatory focus motivational systems. Promotion-focused and prevention-focused individuals differ in what motivates them (growth for promotion vs. safety and security for prevention) and in which strategies they prefer to use to achieve their goals (eagerness for promotion vs. vigilance for prevention). As discussed earlier, these differences have implications for a wide range of behaviors, including risk taking, judgment and decision making, and openness to new experiences. It is expected therefore that regulatory focus differences will have implications also for vaccination behavior. Two studies are reported next that tested this proposal. In these studies, the participants' regulatory focus was either measured as a chronic variable (Study 1) or experimentally manipulated (Study 2), after which they were asked about their intention to get vaccinated against COVID-19.

4. Study 1

The aim of Study 1 was threefold: First, to examine the relationship between vaccination intention and regulatory focus; second, to explore the role of COVID-19 perceived risk and vaccine safety concerns in this relationship; and third, to develop a model of vaccination intention. A series of hypotheses were developed. The hypotheses and the rationale behind them are discussed in the following.

Hypothesis 1. Prevention focus is positively associated with vaccination intention. First, individuals with a prevention focus are motivated by security needs. For them, the vaccine is a shield against COVID-19, and as such it provides a sense of security they so desperately need during the COVID-19 pandemic. Second, prevention-focused individuals try to avoid risk, and the vaccine helps them to do so by minimizing the risk of getting infected with COVID-19. Third, these individuals typically generate fewer solutions to problems, in which case, vaccination allows them to stop looking for other responses to COVID-19. Fourth, a decision not to listen to false and unsubstantiated claims about COVID-19 vaccines reflects a strategy of correctly ignoring background noises. People in a state of prevention-focused vigilance are motivated to ensure correct rejections, and therefore, are less likely to endorse conspiracy theories about COVID-19 vaccines. Based on all this, it was hypothesized that, the stronger the prevention focus, the stronger would be the intention to accept the vaccine.

Hypothesis 2. Promotion focus is positively associated with vaccination intention. First, individuals with a promotion focus are motivated by growth needs. Vaccines protect against COVID-19, and as such are a source of optimism and enthusiasm. This allows promotion-focused individuals to go on with their lives and focus on their aspirations. Second, people with a promotion focus take risks, and as such, they are expected to take the risk of a new vaccine. They are expected to do it because this means moving forward from the status quo (high uncertainty and high threat) to a better position (lower uncertainty and lower vulnerability). Third, these individuals are open to experience and are motivated to

seek new solutions to challenging situations. The implication is a greater acceptance of newly developed COVID-19 vaccines. Fourth, it is an error to miss the opportunity to get vaccinated because of fear of side effects. The vaccines have been tested and the results are encouraging in terms of both safety and effectiveness. To choose not to get vaccinated involves an error of omission, in other words, refusing to get the vaccine for no reason. People in a state of promotion-focused eagerness are not likely to make this error. Based on all this, it was hypothesized that the stronger the promotion focus, the stronger would be the intention to get vaccinated.

Hypothesis 3. Vaccination intention is positively associated with COVID-19 perceived risk. Vaccines protect against the disease, and may thus be perceived as a means of reducing the threat. Therefore, the higher the perceived disease risk, the stronger should be the intention to get vaccinated.

Hypothesis 4. Vaccination intention is negatively associated with vaccine safety concerns. Concern about side effects and concern about vaccines being developed at pandemic speed are barriers to vaccine uptake. Therefore, the higher the concern over vaccine safety, the weaker should be the intention to get vaccinated.

Hypothesis 5. Prevention focus moderates the relationship between vaccination intention and vaccine safety concerns. The higher the concerns over vaccine safety, the lower the intention to get vaccinated, and the stronger the prevention focus the stronger the effect. This hypothesis builds on the negative relationship between the willingness to get vaccinated and concerns over vaccine safety, and also on the notion that prevention-focused behavior is primarily motivated by safety and security needs.

Hypothesis 6. Vaccine safety concerns mediate the relationship between promotion focus and vaccination intention. The stronger the promotion focus, the lower the concerns about vaccine safety, and thus the stronger the intention to get vaccinated. This hypothesis builds on the notion that the promotion system is associated with using eager means to approach a new task goal. Promotion-focused eagerness is reflected in openness to experience and readiness and willingness to adopt new initiatives to achieve strategic goals. Therefore, persons with a strong promotion focus are expected to accept a newly developed COVID-19 vaccine despite safety concerns. For persons with a promotion focus, maintaining the status quo (being vulnerable to COVID-19) is not an option. They are focused on advancement. The goal is to become immune to the virus, and the vaccine is a means to achieve this goal. Therefore, the stronger the promotion focus, the lower the concern over vaccine safety, and thus, the stronger the intention to get vaccinated.

4.1. Method

4.1.1. Participants

Two thousand seven hundred and forty people took part in the study. Participants were from all walks of life and all age groups (1820 females, 920 males, mean age 29.39 years, range 18–81). Recruitment was done with the help of undergraduate students. Each student had a link to an online questionnaire that they sent to people they knew. Participation was voluntary and no payment was offered. Anonymity was assured. The study was conducted in Israel during a two-month period from January to February 2021. Vaccines against COVID-19 were already available to the public at the time of the study.

4.1.2. Procedure

Participants filled out a-20 item online questionnaire (supplementary material). The first 11 items (Q1-Q11) were taken from the regulatory focus questionnaire (RFQ), a tool designed to measure regulatory focus as a chronic disposition (Higgins et al., 2001). The next three items (Q12-Q14) assessed COVID-19 perceived risk. Three additional items

(Q15-Q17) assessed vaccine safety concerns. One item (Q18) asked participants about their intention to get vaccinated. Age (Q19) and gender (Q20) were also collected.

The online questionnaire relies on the RFQ. The rationale behind the RFQ is that a new task elicits a sense of achievement pride in people with a subjective history of success with similar tasks in the past (Higgins et al., 2001). Individuals have either promotion pride or prevention pride (or both). Those with a history of success in promotion-focused self-regulation have promotion pride. This promotion pride encourages the use of eager means to attain the new goal. Those with a history of success in prevention-focused self-regulation have prevention pride. This prevention pride encourages the use of vigilant means to attain the new goal. The RFQ was developed to measure these two constructs – promotion pride and prevention pride. The questionnaire includes 11 items in two subscales, a 6-item promotion subscale and a 5-item prevention subscale, designed to assess subjective history of success in promotion-focused and prevention-focused goal-pursuit, respectively. Items in the RFQ ask participants how frequently specific events have occurred in their lives, with the rationale that individual differences in accessible past histories should reflect differences in chronic regulatory focus. Promotion-focused items ask, for example, 'Do you often do well at different things that you try?' (1-never or seldom to 5-very often). Prevention-focused items ask, for example, 'How often did you obey rules and regulations that were established by your parents?' (1-never or seldom to 5-always). In order to place scores for both orientations on the same scale, promotion sums for each respondent are divided by 6, and prevention sums are divided by 5. Thus, the questionnaire produces for each respondent two independent scores one for promotion and one for prevention.

COVID-19 perceived risk was assessed with three measures: perceived severity of the disease, 'Is COVID-19 a dangerous disease?' (0-no, 1-yes); perceived likelihood of contracting the disease, 'What are the odds that you will contract COVID-19?' (0-low, 1-high); and disease-related worry, 'Are you worried about contracting COVID-19?' (0-no, 1-yes). A combined measure of perceived disease risk was calculated using the average of the three values. The rationale here is that, by implication, for COVID-19 to be perceived as a threat to the self, one has to believe that it is a dangerous disease with potentially severe consequences, and that one's likelihood of contracting the disease is high. In addition, one should be worried about contracting the disease. Vaccine safety concerns were assessed with three measures: concerns about adverse effects 'Are you concerned about side effects associated with the COVID-19 vaccine?' (0-no, 1-yes); fear that, due to pandemic pressures, vaccines were rushed to the market without adequate testing 'Are you concerned about the safety of a rapidly-developed COVID-19 vaccine?' (0-no, 1-yes); and trust in health professionals 'Do you trust public health officials to provide accurate information about the safety of COVID-19 vaccines?' (0-yes, 1-no). A combined measure of vaccine safety concerns was calculated using the average of the three measures. By implication, for COVID-19 vaccine to be perceived as safe, one should not be concerned about side effects, nor should one be concerned about the safety of a rapidly-developed vaccine. In addition, one should trust public health officials regarding the safety of the vaccine.

Analysis of the data was based on logistic regression models. The independent variables were promotion scores, prevention scores, perceived disease risk, vaccine safety concerns, age (continuously measured variables), and gender (0-female, 1-male). The dependent variable was the participants' self-reported intention to take the vaccine, 'Do you intend to get vaccinated against COVID-19?' (0-no, 1-yes). To reduce multicollinearity, all continuous independent variables were mean centered prior to analysis.

4.2. Results

It was hypothesized that vaccination intention would be positively related to both prevention focus (H1) and promotion focus (H2). To test

these hypotheses, the participants' self-reported intention to get vaccinated was logistically regressed on promotion scores and prevention scores. Age and gender were added as control variables to assess potential differences across age and gender groups. As expected, vaccination intention was positively associated with prevention scores ($b = 0.188$, $p < 0.001$) and promotion scores ($b = 0.234$, $p = 0.001$). These results indicate that, according to participants' self-report, the probability of getting vaccinated increases with increasing strength of both prevention focus and promotion focus. Vaccination intention was also positively associated with age ($b = 0.029$, $p < 0.001$) and gender ($b = 0.808$, $p < 0.001$). The effect of age indicates that the probability of getting vaccinated increases with age. The effect of gender is indicative of a stronger intention to get vaccinated among men relative to women. See Table 1.

It was further hypothesized that vaccination intention would be positively related to perceived disease risk (H3) and negatively related to concerns about vaccine safety (H4). To test these hypotheses, vaccination intention was logistically regressed on COVID-19 perceived risk and vaccine safety concerns. Age and gender were added as control. As expected, there was a positive relationship between vaccination intention and COVID-19 perceived risk ($b = 2.679$, $p < 0.001$) and negative relationship between vaccination intention and vaccine safety concerns ($b = -3.519$, $p < 0.001$). This was an indication that the probability of getting vaccinated increased with increasing perceived disease risk but decreased with increasing concerns over vaccine safety. See Table 2. Taken together, the results in Tables 1-2 support the first four hypotheses.

The next step was to test more complex hypotheses incorporating moderation and mediation. According to the moderation hypothesis (H5), the intention to get vaccinated decreases with increasing concerns over vaccine safety, and the stronger the prevention focus the stronger is the effect. To test this hypothesis, vaccination intention was logistically regressed on promotion scores, prevention scores, COVID-19 perceived risk, vaccine safety concerns, age, and gender, and in addition, on the interaction between prevention scores and vaccine safety concerns. This
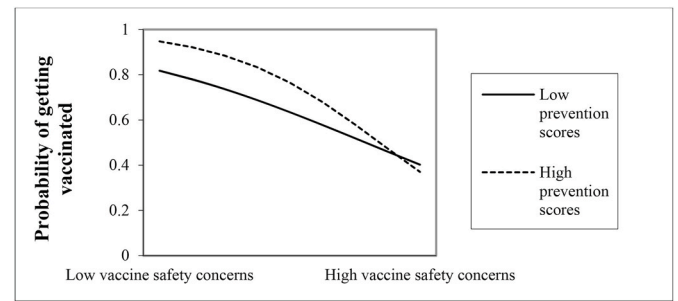

Fig. 1. As concerns about vaccine safety decrease, the probability of getting vaccinated increases, and the higher the prevention scores the stronger is the effect.

interaction reached statistical significance ($b = -0.497$, $p = 0.005$). See Table 3.

This was an indication that prevention focus moderated the relationship between vaccine safety concerns and vaccination intention. The higher the concerns over vaccine safety, the lower was the probability of expressing an intention to get vaccinated, and the stronger the prevention focus the stronger was the effect. See Fig. 1.

To know more about the specific relationship between the independent variable (vaccine safety concerns) and the dependent variable (the probability of getting vaccinated) at particular levels of the moderator (prevention scores), it is essential to perform simple slope tests. It can be seen in Fig. 1 that for both high and low prevention scores, the probability of getting vaccinated is high when vaccine safety concerns are low and it is low when vaccine safety concerns are high. Simple slope tests show that this effect is significant in both cases, although it is more pronounced for high prevention scores ($b = -4.236$, $p < 0.001$) than for low prevention scores ($b = -2.873$, $p < 0.001$). The significant interaction term ($b = -0.497$, $p = 0.005$) is an indication that the slopes of the lines are significantly different from each other.

Table 1
Logistic regression: vaccination intention 0-no 1-yes (4 variables, n = 2740).

Variable	Coefficient	Std.Err.	z-statistic	P-value	Lower95%	Upper95%	VIF	Std. Coeff.
Constant	0.445	0.049	9.005	0.000	0.348	0.541		
Promotion	0.234	0.069	3.415	0.001	0.100	0.368	1.030	0.079
Prevention	0.188	0.046	4.049	0.000	0.097	0.279	1.048	0.095
Age	0.029	0.004	7.115	0.000	0.021	0.037	1.025	0.192
Gender	0.808	0.094	8.640	0.000	0.625	0.992	1.012	0.211

Table 2
Logistic regression: vaccination intention 0-no 1-yes (4 variables, n = 2740).

Variable	Coefficient	Std.Err.	z-statistic	P-value	Lower95%	Upper95%	VIF	Std. Coeff.
Constant	0.885	0.066	13.464	0.000	0.756	1.013		
perceived disease risk	2.679	0.178	15.025	0.000	2.330	3.029	1.008	0.440
vaccine safety concerns	−3.519	0.167	−21.078	0.000	−3.846	−3.192	1.084	−0.744
Age	0.027	0.005	5.362	0.000	0.017	0.036	1.026	0.177
Gender	0.497	0.112	4.424	0.000	0.277	0.717	1.050	0.129

Table 3
Logistic regression: vaccination intention 0-no 1-yes (7 variables, n = 2740).

Variable	Coefficient	Std.Err.	z-statistic	P-value	Lower95%	Upper95%	VIF	Std. Coeff.
Constant	0.895	0.067	13.391	0.000	0.764	1.026		
Promotion	0.171	0.083	2.060	0.039	0.008	0.334	1.036	0.058
Prevention	0.157	0.063	2.505	0.012	0.034	0.279	1.058	0.079
perceived disease risk	2.647	0.178	14.838	0.000	2.298	2.997	1.015	0.434
vaccine safety concerns	−3.555	0.171	−20.804	0.000	−3.890	−3.220	1.095	−0.752
Age	0.025	0.005	4.948	0.000	0.015	0.035	1.050	0.166
Gender	0.512	0.113	4.531	0.000	0.291	0.734	1.064	0.133
preventionXvaccine safety concerns	−0.497	0.177	−2.801	0.005	−0.845	−0.149	1.005	−0.097

According to the mediation hypothesis (H6), there is an indirect path from promotion focus through vaccine safety concerns to vaccination intention. The stronger the promotion focus, the lower the concerns about vaccine safety, and thus the higher the intention to accept the vaccine. This hypothesis was tested in three steps. In Step 1, vaccine safety concerns (mediator) were linearly regressed on promotion scores and prevention scores (independent variables) and on age and gender (control). In Step 2, vaccination intention (dependent variable) was logistically regressed on the independent and control variables. In Step 3, the dependent variable was logistically regressed on the independent and control variables and on the mediator. Table 4 shows that in Step 1, promotion scores were negatively related to vaccine safety concerns ($b = -0.046$, $p < 0.001$). Table 5 shows that in Step 2, promotion scores were positively related to vaccination intention ($b = 0.234$, $p = 0.001$). Table 6 shows that in Step 3, vaccine safety concerns were negatively related to vaccination intention ($b = -3.396$, $p < 0.001$).

All the effects were in the expected direction. Furthermore, the relationship between promotion scores and vaccination intention was significant in Step 2 (see Table 5) when the mediator (vaccine safety concerns) was not controlled for ($b = 0.234$, $p = 0.001$), but not significant in Step 3 (see Table 6) when the mediator was controlled ($b = 0.148$, $p = 0.058$). These results support a mediation model according to which the path from promotion focus to vaccination intention goes through vaccine safety concerns. The stronger the promotion focus, the lower the concerns about vaccine safety, and thus the higher the probability of getting vaccinated.

A sensitivity power analysis with an anticipated effect size (f^2) of 0.15, desired statistical power level 0.8, number of predictors 7, and significance level 0.05 indicated that the minimum required sample size was 103 (<2740). It is noteworthy that the minimum required sample size was first calculated and only then the online questionnaire was sent to potential respondents. The guiding rule was that actual sample size should be larger than the minimum required. All measures, conditions, and data were reported, and there were no exclusions.

5. Study 2

Using a questionnaire to measure the participants' regulatory focus is a limitation. This method does not allow ruling out alternative explanations of the observed effects, nor does it allow concluding about a causal relationship between regulatory focus and vaccination intention. In order to obtain more direct evidence for the role of regulatory focus in vaccination decisions, it is essential to experimentally manipulate the regulatory focus and show that this affects the intention to get vaccinated. This was the goal of Study 2.

5.1. Method

5.1.1. Participants

Eight hundred and fifty-seven people from all walks of life and all age groups were enrolled in the study (516 females, 341 males, mean age 28.73 years, range 18–81). Undergraduate students helped with the recruitment. Participation was voluntary and anonymity was guaranteed. The study was carried out in Israel during January and February 2021. Vaccines against COVID-19 were available to the public at that time.

5.1.2. Procedure

Participants were randomly assigned to one of two experimental priming conditions: promotion and prevention. In both conditions, participants completed a three-part online questionnaire (supplementary material). Part 1 (identical for both conditions) asked three questions about the perceived risk of COVID-19 (Q1-Q3) and three questions about concerns over the safety of COVID-19 vaccines (Q4-Q6). The items were similar to those used in Study 1. Part 2 (Q7-Q9) included the experimental manipulation of the participants' regulatory focus. In Part

Table 4
Regression: vaccine safety concerns (4 variables, n = 2740).

Variable	Coefficient	Std.Err.	t-statistic	P-value	Lower95%	Upper95%	VIF	Std. Coeff.
Constant	0.059	0.009	6.880	0.000	0.043	0.076	0.000	0.000
promotion	−0.046	0.012	−3.987	0.000	−0.069	−0.024	1.030	−0.074
prevention	−0.025	0.008	−3.221	0.001	−0.041	−0.010	1.048	−0.060
Age	−0.004	0.001	−7.556	0.000	−0.006	−0.003	1.025	−0.140
Gender	−0.177	0.015	−11.828	0.000	−0.207	−0.148	1.012	−0.218

Table 5
Logistic regression: vaccination intention 0-no 1-yes (4 variables, n = 2740).

Variable	Coefficient	Std.Err.	z-statistic	P-value	Lower95%	Upper95%	VIF	Std. Coeff.
Constant	0.445	0.049	9.005	0.000	0.348	0.541		
Promotion	0.234	0.069	3.415	0.001	0.100	0.368	1.030	0.079
Prevention	0.188	0.046	4.049	0.000	0.097	0.279	1.048	0.095
Age	0.029	0.004	7.115	0.000	0.021	0.037	1.025	0.192
Gender	0.808	0.094	8.640	0.000	0.625	0.992	1.012	0.211

Table 6
Logistic regression: vaccination intention 0-no 1-yes (5 variables, n = 2740).

Variable	Coefficient	Std.Err.	z-statistic	P-value	Lower95%	Upper95%	VIF	Std. Coeff.
Constant	0.854	0.063	13.585	0.000	0.730	0.977		
Promotion	0.148	0.078	1.895	0.058	−0.005	0.301	1.036	0.050
Prevention	0.149	0.053	2.831	0.005	0.046	0.252	1.052	0.075
vaccine safety concerns	−3.396	0.159	−21.370	0.000	−3.708	−3.085	1.087	−0.718
Age	0.023	0.005	4.908	0.000	0.014	0.032	1.047	0.154
Gender	0.436	0.107	4.082	0.000	0.226	0.645	1.063	0.113

3 (identical for both conditions), participants indicated whether they intended to get vaccinated or not (Q10). Demographics were also collected (Q11-Q12).

Here is an overview of the experimental setup. Following the guidelines recommended by Higgins and his colleagues (Higgins et al., 2001), participants in the promotion condition were instructed to write about a time in the past when (a) they felt they made progress toward being successful in life; (b) compared to most people they were able to get what they wanted out of life; and (c) trying to achieve something important to them, they performed as well as they ideally would have liked to. In the prevention condition, participants were instructed to write about a time in the past when (a) being careful enough avoided getting them into trouble; (b) they stopped themselves from acting in a way that their parents would have considered objectionable; and (c) they were careful not to get on their parents' nerves.

The rationale for this methodology is derived from the conceptualization of promotion pride and prevention pride as orientations to new task goals (Higgins et al., 2001). These orientations emerge from a sense of success in achieving promotion goals and prevention goals in the past. The sense of success is subjective and the pride is an orientation to a new goal. Thus, it is possible to experimentally manipulate both the sense of success and the orientation. This is usually done using priming methods. Priming is a technique aimed at increasing the level of cognitive activation of past memories. In studies of regulatory focus, the priming is applied to alter the accessibility of specific past histories of regulatory success. The aim is to generate momentary differences between participants in the sense of history that typically reflect chronic differences in accessible past histories.

For this methodology to succeed, several technical requirements need to be fulfilled. Researchers are instructed to randomly assign half of participants to each condition. All participants should be blind to which condition they are in. Within each condition, participants are asked to complete a, b, and c. If a participant does not complete the three steps, they are excluded from the study. Finally, it is recommended that participants be instructed to write at least one sentence of around 15 words in each paragraph of the text. No time limitation is imposed. For more detail, see Higgins Lab (https://cuhigginslab.com/). This procedure has been widely used in regulatory focus studies, and has been proven to be very effective in manipulating the participants' regulatory focus (Ross, 2021, 2022). The experimental manipulation in Study 2 was based on these principles.

One of the main findings in Study 1 was that chronic prevention focus moderated the relationship between vaccination intention and vaccine safety concerns. The higher the concern over vaccine safety, the lower was the probability of reporting an intention to get vaccinated, and the stronger the prevention focus the stronger was the effect. Based on this, the following hypothesis was derived.

Hypothesis 7. Regulatory focus moderates the relationship between vaccine safety concerns and vaccination intention. The higher the concerns about vaccine safety, the lower the intention to get vaccinated, and the effect is stronger for a situationally induced prevention focus compared with an induced promotion focus.

5.2. Results

To test the study hypothesis, a logistic regression was performed with regulatory focus (0-prevention, 1-promotion) being the main independent variable of interest. The other independent variables were COVID-19 perceived risk and vaccine safety concerns (measured as in Study 1). Age and gender were added as controls. The dependent variable was the participants' self-reported intention to get vaccinated (0-no, 1-yes). The dependent variable was logistically regressed on the independent and control variables and on the interaction between regulatory focus and vaccine safety concerns. In Table 7, it can be seen that as expected, the interaction was significant ($b = 1.594$, $p = 0.011$).

According to participants' self-report, the probability of getting vaccinated decreased with increasing concerns over vaccine safety, and the effect was stronger for a situationally induced prevention focus compared to promotion focus. See Fig. 2.

Simple effect tests were performed to learn more about the specific association between the independent variable (vaccine safety concerns) and the dependent variable (the probability of getting vaccinated) at different levels of the moderator (regulatory focus). These tests show that under low vaccine safety concerns, the probability of getting vaccinated is higher for an induced prevention focus relative to an induced promotion focus ($b = -1.087$, $p = 0.026$). The effect is reversed under high vaccine safety concerns. In this case, the probability of getting vaccinated is higher for an induced promotion focus relative to an induced prevention focus ($b = 0.737$, $p = 0.025$). The significant interaction term ($b = 1.594$, $p = 0.011$) indicates that the two simple effects are significantly different from each other. Note that in this analysis, the coefficients do not represent simple slopes but rather simple effects. The first simple effect reflects the difference in the probabilities of getting vaccinated between promotion focus and prevention focus under low vaccine safety concerns. The second reflects the difference in these probabilities under high vaccine safety concerns. The negative sign of the coefficient in the former case indicates that the probability of getting vaccinated is higher under prevention (vs. promotion) focus, whereas the positive sign of the coefficient in the latter indicates that the probability of getting vaccinated is higher under promotion (vs. prevention) focus.

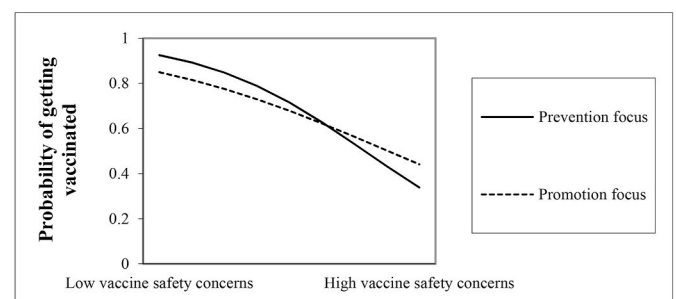This is additional support for the notion that regulatory focus

Fig. 2. As concerns about vaccine safety decrease, the probability of getting vaccinated increases, and the effect is stronger for an induced prevention (vs. promotion) focus.

Table 7
Logistic regression: vaccination intention 0-no 1-yes (6 variables, n = 857).

Variable	Coefficient	Std.Err.	z-statistic	P-value	Lower95%	Upper95%	VIF	Std. Coeff.
Constant	0.923	0.172	5.375	0.000	0.586	1.259		
regulatory focus	−0.175	0.211	−0.827	0.408	−0.589	0.240	1.005	−0.048
COVID-19 perceived risk	3.624	0.328	11.035	0.000	2.980	4.267	1.026	0.638
vaccine safety concerns	−4.172	0.513	−8.129	0.000	−5.177	−3.166	2.353	−0.878
Age	0.027	0.010	2.715	0.007	0.007	0.046	1.024	0.159
Gender	0.706	0.203	3.473	0.001	0.307	1.104	1.058	0.191
regulatory focusXvaccine safety concerns	1.594	0.625	2.551	0.011	0.369	2.818	2.245	0.249

moderates the relationship between vaccination intention and vaccine safety concerns. This result is in line with previous findings, and further validates them. Unlike Study 1, however, Study 2 supports a causal relationship between regulatory focus and vaccination intention rather than a mere association. The observed effect cannot be reinterpreted in terms of an alternative causal direction because regulatory focus was experimentally manipulated.

A sensitivity power analysis with an effect size (f^2) of 0.15, statistical power 0.8, number of predictors 6, and significance level 0.05 showed that the minimum requirement for sample size was 97. Actual sample size was 857. As in Study 1, the required sample size was calculated prior to sending the questionnaire to potential respondents. The guiding principle was that actual sample size should be larger than the minimum required. All measures, conditions, and data were reported (no exclusions).

6. General discussion

The two studies reported in this paper suggest that there is a relationship between regulatory focus and the intention to get vaccinated against COVID-19. Study 1 supports a mediation model, according to which there is a path from promotion focus to vaccination intention through vaccine safety concerns. The stronger the promotion focus, the lower the concerns about vaccine safety, and thus the higher the probability of getting vaccinated. See Fig. 3. Study 1 also shows that prevention focus moderates the relationship between vaccination intention and vaccine safety concerns. The higher the concerns about vaccine safety, the lower the probability of getting vaccinated, and the stronger the prevention focus the stronger the effect. See Fig. 4.

Study 2 provides additional support for the moderating role of regulatory focus in the relationship between vaccination intention and vaccine safety concerns. Using priming to manipulate the participants' regulatory focus, the study shows that the probability of getting vaccinated increases with decreasing concerns about vaccine safety, and the effect is stronger for prevention focus compared to promotion focus.

6.1. Implications

This research has implications for public health. But before discussing the implications, it is important to address an interesting review of
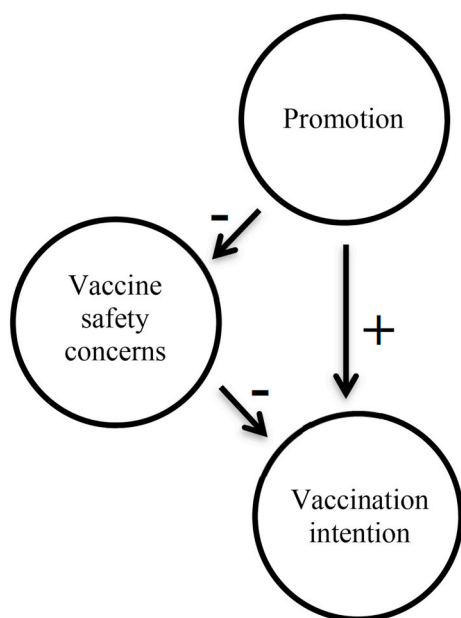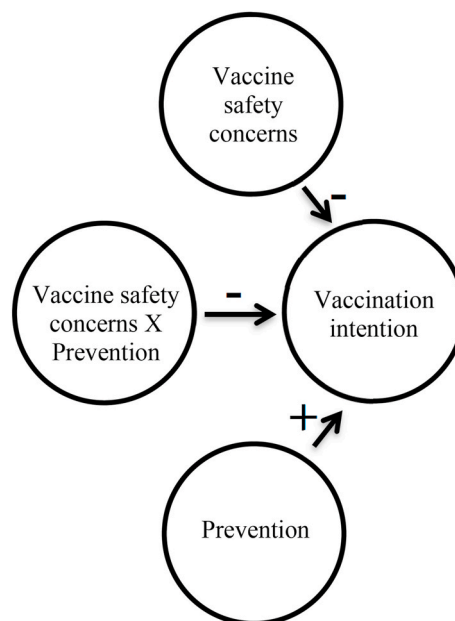

Fig. 4. Moderator model: prevention focus moderates the relationship between vaccination intention and vaccine safety concerns.

the literature on regulatory fit and its impact on the effectiveness of health communication (Ludolph and Schulz, 2015). In this review, most studies confirmed that regulatory fit improved the effectiveness of health messages across various health domains. When an individual adopts goal-pursuit strategies (eagerness vs. vigilance) that match their regulatory focus (promotion focus vs. prevention focus, respectively), they experience a regulatory fit (Higgins, 2000). By implication, when a promotion-focused individual is exposed to promotion-focused messages (e.g., health messages emphasizing the benefits of getting vaccinated), they experience a regulatory fit (promotion orientation-promotion messaging). Likewise, when a prevention-focused individual is exposed to prevention-focused messages (e.g., health messages emphasizing the potential cost of not getting vaccinated), they also experience a regulatory fit (prevention orientation-prevention messaging). This regulatory fit increases the persuasiveness of health messages (Ludolph and Schulz, 2015).

The data in the present research suggest that as concerns about vaccine safety decrease, the intention to get vaccinated increases, and the stronger the prevention focus the stronger the effect. Moreover, the probability of getting vaccinated increases with decreasing concerns about vaccine safety, and the effect is stronger for an induced prevention focus relative to promotion focus. Based on this, public health authorities are advised to use priming to have people engage in prevention-focused self-regulation, and then use prevention-focused messages to encourage vaccination. By using regulatory fit (prevention-focused self-regulation and prevention-focused messages), this strategy will likely increase the motivation of the public to get vaccinated. Here is an example:

- There were times in the past when being careful enough avoided getting you into trouble. Now is the time to be careful again. Get vaccinated. The vaccine will protect you. And it's safe.

The first part ("There were times in the past when being careful …") is the priming component. It elicits a sense of history of past success in prevention-focused goal attainment, which in turn is likely to have people engage in prevention-focused self-regulation to attain a new goal. The next part ("Now is the time to be careful again") facilitates the effect of the priming. The individual is urged to be careful right here, right

Fig. 3. Mediator model: vaccine safety concerns mediate the relationship between promotion focus and vaccination intention.

now. Then comes the main message ("Get vaccinated"). The individual is instructed to take the vaccine. This is followed by presenting a prevention-focused rationale ("The vaccine will protect you"). Prevention-focused self-regulation is motivated by safety and security needs, and protecting the self from danger is a top priority. The final part ("And it's safe") is aimed at reducing concerns about vaccine safety.

The current research further suggests that as the strength of promotion focus increases, concerns about vaccine safety decrease, and thus, the intention to get vaccinated increases. Based on this, public health authorities are advised to use priming to have people engage in promotion-focused self-regulation, and then use promotion-focused messages to encourage vaccination. By using regulatory fit (promotion-focused self-regulation and promotion-focused messages), this strategy will likely strengthen the intention of the public to be inoculated. Here is an example:

- There were times in the past when trying to achieve something important to you, you performed as well as you ideally would have liked to. Now is the time to do it again. Get vaccinated. That's the only way you'll beat the virus.

The first part ("There were times in the past …") is the priming component. It elicits a sense of history of past success in promotion-focused goal attainment, which in turn is likely to have people engage in promotion-focused self-regulation to attain a new goal. The next part ("Now is the time to do it again") facilitates the effect of the priming. The individual is urged to act right here, right now. Then comes the message ("Get vaccinated"). The individual is instructed to take the vaccine, followed by presenting a promotion-focused rationale ("That's the only way you'll beat the virus"). Promotion-focused self-regulation is motivated by the need to win, in which case beating the virus is a top priority.

6.2. Limitations

The research reported in this paper has several limitations. Firstly, recruitment of participants was done with the help of undergraduate students. Each student had a link to an online questionnaire that they sent to people they knew (friends, family, and the like). Doing so may result in a sample that is not representative of the population, which might pose a challenge to the generalization of the findings. Secondly, data were based on participants' self-report, and therefore could be subject to social desirability bias. The use of this methodology relies on the assumption that people have no reason to mask their behavior. Nevertheless, this may raise questions about the validity of the methodology and generalizability of the results. Future studies will need to address these limitations.

As a final point, note that in Study 1 regulatory focus was measured with a questionnaire. The cross-sectional nature of the design of the study leaves open the possibility of alternative explanations of the current findings. Moreover, it precludes conclusions about causality. This limitation was addressed in Study 2 by experimentally manipulating the participants' regulatory focus and showing that it affected participants' intentions to get vaccinated.

7. Concluding remarks

This research provides insights into the psychological mechanisms underlying the intention to get vaccinated against COVID-19. By so doing, this work helps not only in the battle against COVID-19 but also against future pandemics. Furthermore, by introducing the theory of regulatory focus, this work offers a new framework in which to progress the science of public health, and experts in the field can use it as a springboard for future research.

CRediT author statement

I am the only author of this paper.

Data availability

Data will be made available on request.

Supplementary material

Supplementary material to this article can be found online at https://doi.org/10.1016/j.socscimed.2022.115475.

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