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Mental contrasting of a negative future facilitates COVID-19 preventative behaviors: two randomized controlled trials

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ABSTRACT

Objective: The present research examined whether mentally contrasting a negative, feared future (i.e., infection with the Coronavirus) with a still positive reality can promote preventative actions in the context of the pandemic. **Design:** In two randomized controlled trials, we varied participants' mode of thought (mental contrasting of a negative future with a positive reality versus fantasizing of a negative future). Study 2 took into account the interpersonal nature of the pandemic and manipulated the mode of thought in a vicarious manner (vicarious mental contrasting versus vicarious negative fantasizing). **Main Outcome Measures:** After the manipulation, we assessed participants' intentions to learn about COVID-19 (Study 1) and attention to COVID-19 information (Study 1 and 2). Three days later, we measured the amount of physical distancing (Study 1 and 2). **Results:** Study 1 found that mental contrasting leads to more COVID-19 preventative behaviors than mere negative fantasizing. In Study 2, we observed that vicarious mental contrasting facilitates physical distancing among people who initially showed low compliance with COVID-19 preventative behaviors and thus were in most need of a boost in preventative behavior. **Conclusion:** The findings suggest that mental contrasting of negative fantasies may be an effective way to encourage COVID-19 preventative behaviors.

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KEYWORDS

Negative fantasy; mental contrasting; COVID-19 preventative behaviors; vicarious experience; thinking about the future

On March 11, 2020, the World Health Organization (WHO) declared the global pandemic for Coronavirus disease 2019 (COVID-19). The media all over the globe covered the news about the Coronavirus focusing on how fatal the virus would be and how fast it would spread. The pandemic stirred up negative thoughts and images about the upcoming future—negative fantasies—among people (Trnka & Lorencova, 2020).

Negative fantasies are often believed to be effective at triggering behavioral change (Ten Hoor et al., 2012). Indeed, health communication at an early stage of the COVID-19 pandemic frequently used fear appeals to promote preventative behaviors among the public, illustrating horrifying images (e.g., mass burials) or describing hypothetical negative future situations (Stolow et al., 2020). However, previous work on behavioral change shows different results for the effectiveness of emphasizing negative images

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of a future event (Kok et al., 2018; Ruiter et al., 2014). Interventions that focused on negative, fearful thoughts and images were found to be, at best, ineffective (Albarracín et al., 2005; Earl & Albarracín, 2007) and, at worst, to nourish unreasonable anxiety or defensive reactions (Brodersen & Oettingen, 2017; Ruiter et al., 2014).

Given that negative fantasies about COVID-19 are already widespread and reside in individuals' minds, it is critical to address a way to turn these negative fantasies into preventative actions that will inhibit the actualization of these negative fantasies. In the present paper, we propose that mental contrasting, which has its basis in fantasy realization theory (Oettingen, 2000, 2012), can be an effective way to facilitate COVID-19 preventative behaviors, such as paying attention to COVID-19 related information and practicing physical distancing.

Fantasy realization theory and mental contrasting

Fantasies about the future are free-flowing thoughts and images depicting a future event and may refer to both positively and negatively valenced future events (Oettingen, 2012; Oettingen & Mayer, 2002). The valence of a future event is independent of whether one would like to approach or avoid it. For positive future events, one might want to approach a desired positive future (e.g., approaching higher academic performance) or avoid a desired positive future (e.g., avoiding a pleasant lure). Likewise, for negative future events, one might want to avoid an undesired negative future (e.g., avoiding the infection with a virus) or approach a negative future (e.g., approaching the dentist). Fantasy realization theory proposes that mental contrasting, a self-regulatory strategy, can be used for all these four instances and motivates people to engage in approach/avoidance behaviors for positive/negative future events (Oettingen, 2012; Oettingen & Sevincer, 2018).

Mental contrasting is a mode of thought in which one first imagines a positive [negative] future and then thinks of a negative [positive] reality in the present life. To promote approach behaviors, one focuses on a reality that is standing in the way of a positive or negative future (e.g., Oettingen et al., 2001; 2005). For avoidance behaviors, reality is something that should be preserved (e.g., Oettingen et al., 2010). By forming a respective relational construct that links a future to reality, mental contrasting induces approach or avoidance behavior toward feasible goals compared to merely fantasizing about a future event that leads to no change in behaviors (Oettingen, 2012; Oettingen & Sevincer, 2018).

The prior studies on mental contrasting have largely focused on approach behaviors for a desired positive future. In those studies, one mentally contrasts a desired positive future with a negative reality that is standing in the way of the desired future. The contrast between these two components – desired future and obstacle of reality – forms a relational construct of 'desired future that is hindered by reality,' which activates a necessity to act and energizes people to be committed to feasible goals (Kappes & Oettingen, 2014; Oettingen et al., 2001; 2009). It has been demonstrated that this mental contrasting of positive fantasies facilitates behavioral change in a wide range of life domains, including health, achievement, and interpersonal relationships, not only in the short term but also in the long term (for reviews, see Oettingen, 2012; Oettingen & Sevincer, 2018).

Mental contrasting of negative fantasies

Mental contrasting of negative fantasies received much less attention than mental contrasting of positive fantasies, but it seems that mental contrasting of such negative future fantasies with a positive present reality leads to behavior change as much as does mental contrasting of positive future fantasies with a negative present reality. Oettingen et al. (2010) compared the effect of mental contrasting of positive fantasies and that of negative fantasies regarding smoking reduction. In this study, the researchers induced three different modes of thought (mental contrasting, future only, and reality only) with two future foci (positive future versus negative future) and randomly assigned participants to one of the six conditions. In the positive future mental contrasting condition, participants mentally elaborated both positive fantasies about reducing their smoking and negative realities that are standing in the way of reducing smoking, while in the negative future mental contrasting condition, participants mentally elaborated negative fantasies about the consequences of continued smoking and the still available positive aspects of the current reality that they could lose by continued smoking. The results indicated that mental contrasting leads to more immediate action toward self-identified steps for reducing smoking (measured two weeks after) than future only and reality only conditions when the expectation of success was high. Importantly, this effect was observed for the mental contrasting of negative fantasies as well as for the mental contrasting of positive fantasies.

Building on this work, the present research tested if mental contrasting of negative fantasies with a positive reality can be used to facilitate avoidance behavior in the context of COVID-19. In doing so, we adapted the manipulation used in Oettingen et al. (2010) and compared two modes of thought: mental contrasting of a negative future with a positive reality and a control group focusing on fantasies about a negative future. We expected that the mental contrasting of a negative future fantasy with a positive reality that one might lose will activate the relational construct of 'a negative future that is endangering a still positive reality,' and this will prompt a necessity to act to avoid the negative future (i.e., infection with the Coronavirus). On the other hand, merely fantasizing about a negative future will not activate this relational construct, and consequently, will hinder people from recognizing a necessity to avoid a negative future. Therefore, we hypothesized that mental contrasting would promote COVID-19 preventative actions more than the fantasizing mode of thought.

Fantasy realization theory and respective research elucidate the expectancy-dependent nature of mental contrasting effects, proposing and finding that mental contrasting enables people to be motivated toward feasible wishes but to disengage from unfeasible wishes (for reviews, see Oettingen, 2012; Oettingen & Sevincer, 2018). However, studies have also found main effects of mental contrasting (A. Gollwitzer et al., 2011; Brodersen & Oettingen, 2017; Johannessen et al., 2012; Kirk et al., 2011). A recent meta-analysis showed that mental contrasting has a main effect on improving health behaviors (Cross & Sheffield, 2019). Fantasy realization theory argues that the expectancy-dependent effect of mental contrasting makes the most sense in situations where one can expect surmountable obstacles or when obstacles are insurmountable but at the same time there are options to disengage in favor of engaging in more viable alternatives one can pursue instead. Clearly, there were no viable alternatives

that one could engage in (e.g., getting COVID-19 vaccines) other than avoiding the virus at the time when we conducted the study during the early pandemic. Also, the preventative behaviors in the current research (e.g., attending to relevant information and practicing physical distancing) could be easily implemented if people felt the incentive to act towards avoiding the negative future of catching the Coronavirus. For these reasons, we expected a main effect of mental contrasting rather than an expectancy-dependent effect.¹

The present research

To test our hypothesis, we conducted two randomized controlled trials in which we experimentally varied people's modes of thought (i.e., engaging in mental contrasting versus fantasizing) and measured COVID-19 preventative behaviors. In specific, we focused on two indices of preventative behaviors: paying attention to COVID-19 information and practicing physical distancing. In the early pandemic, little was known about how to best behave to avoid the virus and protect others and oneself, so keeping eyes on the new information and learning what can be done to protect others and oneself were pivotal things to do. In addition, physical distancing was the most salient behavior that has been promoted as an effective way to prevent the virus by the official voices, the CDC and the government, since the beginning of the pandemic (Pearce, 2020). Thus, we deemed these two behaviors to be essential in preventing the spreading of the virus during the early pandemic.² To measure the amount of attention paid to COVID-19 related information, we assessed participants' self-reported intentions to learn about the COVID-19 situation in the U.S. during the early pandemic (Study 1) and the actual behavioral measure of attention to COVID-19 relevant information (i.e., the time participants stayed on the information page; Study 1 and 2). The amount of physical distancing was measured three days later in a retrospective way.³

Two kinds of negative fantasies about COVID-19 were addressed: negative fantasies regarding one's own future health (Study 1) and those about the future health of one's loved ones (Study 2). The studies were approved by the local Institutional Review Board (IRB). Participants in both studies provided electronic informed consent.

Study 1: Negative fantasies about getting COVID-19

We conducted Study 1 when it was an early stage of the COVID-19 pandemic in the U.S. (May 2020). We varied participants' mode of thought (mental contrasting of a negative future versus mere fantasizing about the negative future) via a brief online exercise and measured participants' intentions to learn about COVID-19, their attention to COVID-19 related information, and the degree of physical distancing (measured three days later) as dependent variables. Based on the previous work (Oettingen et al., 2010), we predicted that compared to mere fantasizing about a negative future, mental contrasting of a negative future with a positive reality should lead to stronger intentions to learn about COVID-19, more attention to COVID-19 related information, and more physical distancing. We also assessed participants' incentive value (personal importance of avoiding the negative future) and expectancies (expectation judgment

about how likely one can avoid the negative future). Incentive value and expectancies have been studied as key determinants of goal commitment and behavior changes (Atkinson, 1957; Bandura, 1977; P. Gollwitzer, 1990; McClelland, 1985; Mischel, 1973; Vroom, 1964). Consistent with previous studies on mental contrasting (e.g., A. Gollwitzer et al., 2011; Brodersen & Oettingen, 2017), we adjusted for their effects when testing our hypothesis that the mental contrasting leads to behavioral changes in the pandemic context. In other words, we wanted to show that the effect of mental contrasting cannot be attributed to the variance due to these two variables and that our manipulation exerts its impact on future behaviors over and above the variances explained by these two key predictors.

Method

Participants and design

A recent meta-analysis on the effect of mental contrasting on health behavior change found that mental contrasting has a small to moderate-sized effect on health behavior change (Cross & Sheffield, 2019). More related to our study, Oettingen et al. (2010) manipulated mental contrasting of a negative future with a positive reality that could be lost and found a medium-sized effect on behavioral indicators of smoking reduction ($d=0.45$). Based on these previous studies, we expected a medium effect for our manipulation ($f = 0.25$, $d=0.50$). An *a priori* power analysis for two groups with two covariates revealed that at least 172 participants are required to have a power of .90 to detect a medium effect size. In case of potential losses due to dropout or failed attention checks, we aimed to recruit 260 participants. Two hundred and sixty-seven participants residing in the U.S. were recruited via Prolific (51.7% female, 45.7% male, 1.5% non-binary; 63.7% White, 16.5% Hispanic or Latino, 11.6% Asian or Pacific Islander, 3.7% Black or African American; age $M=31.39$, $SD=12.38$, range: 18 – 80).

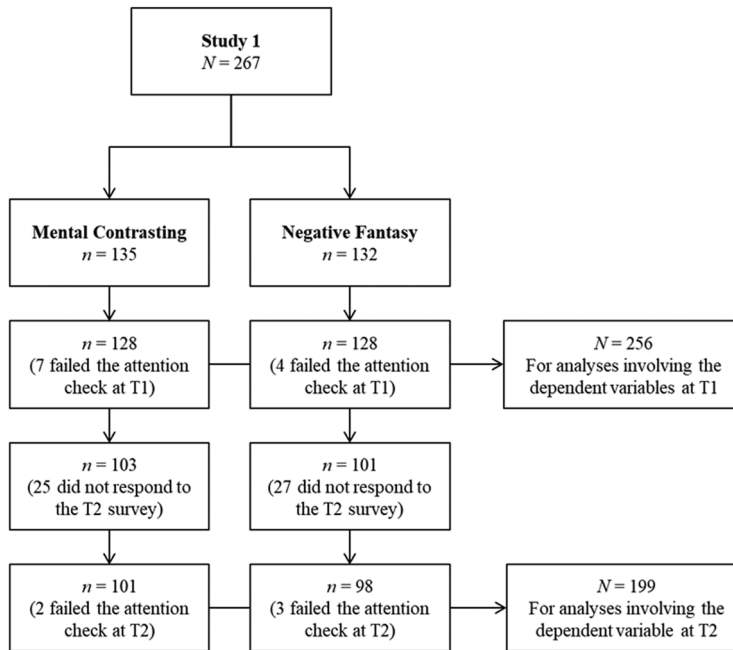
The study consisted of two parts with the second part distributed three days after the data collection of the first part. Participants were randomly assigned to either the mental contrasting ($n=135$) or the negative fantasy ($n=132$) condition (see Figure 1A for the flow of participants). Eleven participants failed the attention check at Time 1, resulting in 256 participants for analyses including Time 1 measures ($n=128$ in the mental contrasting condition, $n=128$ in the negative fantasy condition).⁴ For the follow-up survey at Time 2, 20.3% did not respond. The dropout was independent of condition, age, gender, and key variables measured at Time 1, $ps > .14$. Five participants who failed the attention check at Time 2 were excluded, leaving 199 participants in our dataset for analysis involving the dependent variable measured at Time 2 ($n=101$ in the mental contrasting condition, $n=98$ in the negative fantasy condition).

Measures and manipulation

Incentive value and expectancy

Participants were first provided with a summary describing the declaration of a pandemic by the World Health Organization (see Supplement 1). We then assessed

A.



B.

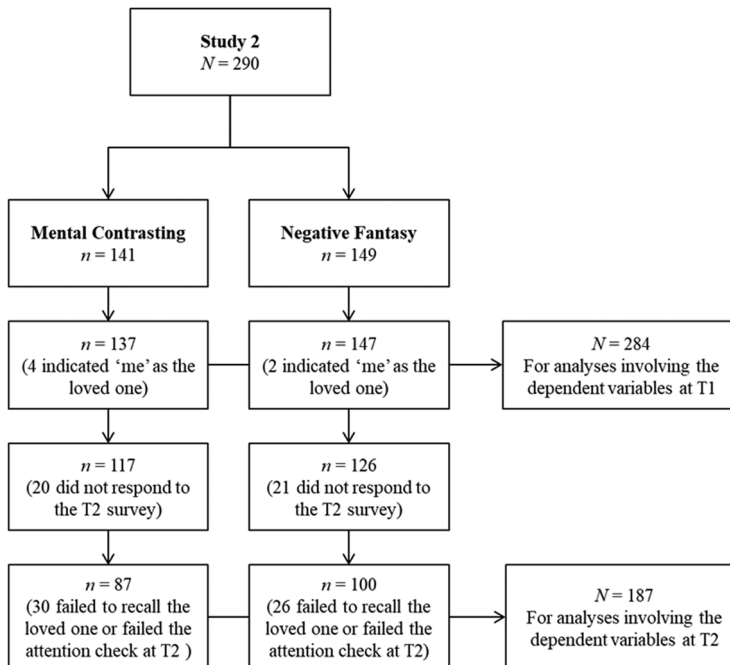


Figure 1. Participant flow diagram for Study 1 (A) and Study 2 (B).

participants' incentive value and expectancy of avoiding a COVID-19 infection by adapting the items used in the prior research (e.g., Oettingen et al., 2010). Participants rated incentive value ("How important is it for you to avoid infection with the Coronavirus?") and expectancy ("How likely do you think it is that you can avoid infection with the Coronavirus?") using a 7-point Likert scale ranging from 1 (*modestly important/not likely at all*) to 7 (*extremely important/very likely*).

Mode of thought manipulation

On the next page, participants in both conditions read the instruction that asked them to think about the most negative outcome of getting infected with the Coronavirus. They read:

Imagine, in the near future, that you are infected with the Coronavirus. What is the worst thing, the worst outcome that you associate with getting infected with the Coronavirus? What is the most negative outcome of contracting the Coronavirus? Find the most negative outcome and summarize it in 3 to 6 words.

After naming the worst outcome, participants were instructed to vividly imagine this worst outcome and write down any thoughts and images that came to mind. Then, in the negative fantasy condition, participants went through the same procedure again, this time referring to the second-worst outcome. In the mental contrasting condition, participants read instead:

Now, focus on the present moment. Think about the positive aspects in your present life that you could lose if you do not take action to avoid being infected by the Coronavirus. What is the most valuable thing in your present life that should not be taken away by the Coronavirus? Find it, and then summarize it in 3 to 6 words.

Participants were then again instructed to vividly imagine this positive aspect and write down any images and thoughts.

Intentions to learn about COVID-19

Intentions to learn about COVID-19 was measured by asking participants to indicate how well each of three statements (e.g., "I would like to learn more about the current situation of COVID-19 in the United States", $r = .82$) represents their thinking right now using a Likert scale ranging from 1 (*not at all*) to 7 (*very much*).

Attention to COVID-19 information

To measure the amount of attention participants paid to COVID-19 related information, we presented an information page explaining five important facts about COVID-19 and ways to keep oneself away from getting COVID-19 (see Supplement 2 for the full text). There were no other explicit instructions on this page, and we measured how many sec participants stayed on this page.

Physical distancing

Three days after completing the first part of the study, participants were invited to the follow-up survey and responded to a question measuring the amount of

physical distancing (“During the past three days, how hard did you try to avoid close contact with people?”) using a 7-point Likert scale ranging from 1 (*not at all*) to 7 (*very hard*).

Results

Incentive value and expectancy

Mean scores of incentive value ($M = 5.88$, $SD = 1.31$) and expectancy of avoiding the Coronavirus infection ($M = 4.50$, $SD = 1.49$) were above the scale midpoint, $t(255) = 22.84$, $p < .001$, Cohen’s $d = 1.43$, 95% $CI = [1.71, 2.04]$ for incentive value, and $t(255) = 5.39$, $p < .001$, Cohen’s $d = 0.34$, 95% $CI = [0.32, 0.68]$ for expectancy. The subsequent independent samples t -tests indicated that there are no significant differences between the mental contrasting condition and the negative fantasy condition in both incentive value and expectancy, $ps > .64$. See Table 1 for descriptive statistics for all variables.

Intentions to learn about COVID-19

We conducted a series of multiple linear regression analyses entering incentive value, expectancy, and condition as predictors (see Supplement 3 for a summary of results for all dependent variables). Incentive value and expectancy were mean-centered and the condition was effect-coded (mental contrasting = 0.5, negative fantasy = -0.5). For intentions to learn about COVID-19, we found the expected effect of the manipulation to be significant, $b = 0.27$, $SE = 0.13$, $t(252) = 2.17$, $p = .031$, 95% $CI = [0.03, 0.52]$. Participants who engaged in mental contrasting had a stronger intention to learn about COVID-19 ($M_{adjusted} = 6.11$, $SE = 0.09$) than those who only fantasized about a negative future ($M_{adjusted} = 5.84$, $SE = 0.09$). Incentive value also significantly predicted intentions to learn about COVID-19, $b = 0.49$, $SE = 0.05$, $t(252) = 10.08$, $p < .001$, 95% $CI = [0.39, 0.58]$, but the effect of expectancy did not reach significance, $p = .19$.

Attention to COVID-19 information

Attention to COVID-19, measured by seconds participants stayed on the information page, was highly skewed. Thus we did a log transformation and conducted a multiple

Table 1. Means, standard deviations, and correlations among variables (Study 1).

Variables	<i>M</i>	<i>SD</i>	Correlations						
			1	2	3	4	5	6	
1. Mode of thought	–	–	–						
2. Incentive value	5.88	1.31	-.03	–					
3. Expectancy	4.50	1.49	-.01	.11	–				
4. Intention to learn about COVID-19	5.98	1.19	.10	.53**	-.02	–			
5. Attention to COVID-19 information	55.61	71.75	.14*	.07	-.08	.09	–		
6. Physical distancing	5.60	1.56	.15*	.20**	-.03	.28**	.13	–	

Note. Mean and standard deviation of attention to COVID-19 information are based on the original value before log-transformation. Correlations between attention to COVID-19 information and other variables are based on the log-transformed value. ** $p < .01$, * $p < .05$.

linear regression with the transformed scores. For ease of interpretation, we report the adjusted means and standard errors of the original scores. In line with our hypothesis, the results revealed a significant effect of mode of thought, $b=0.36$, $SE=0.15$, $t(252) = 2.34$, $p = .020$, $95\% CI = [0.06, 0.66]$. Participants in the mental contrasting condition stayed longer on the information page ($M_{adjusted} = 60.24$, $SE=6.35$) than those in the negative fantasy condition ($M_{adjusted} = 50.99$, $SE=6.35$). This result suggests that engaging in mental contrasting led people to pay more attention to the COVID-19 related information than merely fantasizing about the negative future. None of the other predictors were significant, $ps > .17$.

Physical distancing

To test whether the mode of thought manipulation exerted an impact on physical distancing behaviors during the three days thereafter, we again conducted a multiple linear regression analysis on physical distancing. Incentive value was a significant predictor for physical distancing, $b=0.24$, $SE=0.08$, $t(195) = 2.99$, $p = .003$, $95\% CI = [0.08, 0.40]$; expectancy did not significantly predict physical distancing, $p = .47$. More importantly, people who engaged in mental contrasting ($M_{adjusted} = 5.83$, $SE=0.15$) reported significantly higher level of physical distancing than those who were in the negative fantasy condition ($M_{adjusted} = 5.36$, $SE=0.15$), $b=0.46$, $SE=0.22$, $t(195) = 2.15$, $p = .033$, $95\% CI = [0.04, 0.89]$, suggesting that our manipulation made a difference during the days after it.

Discussion

Study 1 tested our hypothesis that mental contrasting of negative fantasies will elicit more COVID-19 preventative behaviors compared to fantasizing of a negative future. We found evidence supporting our hypothesis. People who engaged in mental contrasting, relative to those who only imagined the negative, feared future, reported higher intentions to learn about COVID-19, stayed longer on the information page, and reported more physical distancing three days after. Hence, Study 1 found support for the effectiveness of mental contrasting of a negative future on three indices of COVID-19 preventative behaviors.

One possible alternative explanation for the findings is that the differences between conditions are due to demand characteristics (Orne, 1962). In the mental contrasting condition, we asked people to think of something in their present life that they could lose if they fell ill with COVID-19. This procedure might have given participants a clue that researchers will check whether they will take relevant actions or not. However, one might also argue that participants in the negative fantasy condition might have thought that the researcher would want them to react to imagining the threatening future. In addition, we found the expected effect with respect to attention to COVID-19 related information, which was measured without explicitly asking participants for reporting their own intentions. Nevertheless, it is still possible that participants were aware of the real purpose of the information page (i.e., measuring their amount of attention), so we explored the demand characteristics hypothesis in Study 2.

Study 2: Negative fantasy about a significant other's infection with the Coronavirus

Having established that mental contrasting of a negative future facilitates COVID-19 preventative behaviors, we turned our attention to fantasies that arise from the concerns about a significant other. Attending to relevant information and practicing physical distancing are not only important for protecting oneself from getting the virus but also for preventing the spread of it to loved ones. In Study 2, we examined if mental contrasting of negative fantasies about the infection of one's loved one promotes COVID-19 preventative actions. In doing so, we examined another possible way to engage in mental contrasting: the mental contrasting taking perspective of others (i.e., *vicarious mental contrasting*). Past studies have demonstrated that people can vicariously experience responses to various situations that other people find themselves in (e.g., guilt and shame, Lickel et al., 2005; traumatic experience, McCann & Pearlman, 1990; cognitive dissonance, Norton et al., 2003; anxiety, Shu et al., 2017). Vicarious experiences occur especially when people feel psychologically connected to the target person (Blackman et al., 2016; Gunia et al., 2009). In Study 2, we explored the possibility that mental contrasting of a negative future works in a vicarious way such that thinking about a negative future and the positive reality both in the life of a significant other facilitates the regulation of one's own behaviors for the sake of the significant other. Consistent with Study 1, we hypothesized that such vicarious mental contrasting should lead to increased attention to COVID-19 information and physical distancing than the vicarious negative fantasy condition. Study 2 was pre-registered (see <https://osf.io/j5b7z>).

While Study 1 was conducted in March 2020, Study 2 was run in August 2020. Compared to Study 1 which was conducted at the beginning of the global crisis when there was not much societal consensus about what can be done to stop the transmission of the virus, Study 2 was conducted when people were more aware of the seriousness of the situation and mask-wearing became an essential part of everyday life due to new governmental policies.⁵ Thus, we designed Study 2 expecting relatively little variance and a strong floor effect in people's attention to COVID-19 information and a ceiling effect in physical distancing. Nevertheless, we ran the study to examine the extent to which protective behavior can be improved with mental contrasting if there is still room for change.

There were several changes compared to Study 1. First, we recruited people living with a loved one who belongs to a high-risk group (i.e., people 65 years or older and/or having an underlying medical condition) to study the fantasy that regards a significant other. This sample was different from that of Study 1 in that participants had an interpersonal reason to practice COVID-19 preventative behaviors (i.e., to protect their loved ones). We also modified our instructions for the manipulation task to study vicarious mental contrasting that we deemed suitable for motivating participants who had reasons to protect their loved ones from getting the virus. Second, in addition to incentive value and expectancy, we assessed the instrumentality of preventative behaviors for protecting a loved one from the virus. People may differ in the perceived instrumentality of their behavior and this instrumentality perception might be another key variable in predicting preventative behaviors (McClelland, 1985). We examined if

the possible effect of the manipulation would remain after adjusting for instrumentality perception as well as for incentive value and expectancy. Third, we dropped the measure of intentions to learn about COVID-19 because we expected a strong floor effect on this variable given that the study was conducted when people had a relatively clear sense of the COVID-19 development in the U.S. Fourth, we supplemented items assessing physical distancing to better capture the behavioral aspects of physical distancing at the time of the study. To do so, we borrowed a list of behaviors recommended by the Centers for Disease Control and Prevention [CDC] and constructed six items measuring physical distancing behaviors. Also, we measured the baseline of physical distancing before the manipulation to adjust for the influence of baseline physical distancing when testing our hypothesis. Finally, we asked participants about their felt desire to satisfy the researchers' interests; this was done to examine the experimenter demand hypothesis that might be raised with respect to the results in Study 1.

Method

Participants and design

We recruited Prolific users residing in the U.S. who indicated that they were living with a loved one belonging to a high-risk group. As in Study 1, we again aimed to gather at least 172 responses at Time 2 to detect the assumed medium effect ($f = 0.25$, $d=0.50$) with a power of .90. We recruited 290 participants in case of potential losses due to dropout or failed attention checks (52.1% male, 46.6% female, 1.4% non-binary; 64.1% White, 12.4% Asian or Pacific Islander, 12.1% Black or African American, 7.6% Hispanic or Latino; age $M=32.39$, $SD=11.99$, range: 18 – 74).

Participants were randomly assigned to either the mental contrasting ($n=141$) or the negative fantasy ($n=149$) condition (see [Figure 1B](#)). Six participants indicated that the loved one is themselves; we had to exclude them because they did not meet our purpose of investigating the vicarious form of mental contrasting. As a result, we had 284 respondents at Time 1 ($n=137$ in the mental contrasting condition, $n=147$ in the negative fantasy condition). Forty-one out of 284 participants (14.4%) did not respond to the Time 2 survey. The dropout was independent of condition, age, gender, and key variables of the study, $ps > .11$. Following the pre-registered exclusion criteria, we excluded 56 participants (23.0%) who either failed to recall the initials of the loved one they had indicated at Time 1 ($n=28$ in the mental contrasting condition, $n=25$ in the negative fantasy condition) or failed an attention check at Time 2 ($n=2$ in the mental contrasting condition, $n=1$ in the negative fantasy condition). This left 187 participants in our dataset for the statistical analysis involving the Time 2 measure ($n=87$ in the mental contrasting condition, $n=100$ in the negative fantasy condition).

Measures and manipulation

Identification of a significant other

We first showed participants a graph of daily new cases in the U.S. (see Supplement 4). We then asked participants to think of a loved one living in their household who

belongs to a high-risk group, and to write down the initials of the person and indicate their relationship to the person. The initials they provided were used whenever we referred to the loved one in the following questions.

Baseline physical distancing

We then measured how much people had been recently practicing physical distancing using six items (e.g., During the past week... “how frequently were you in public with other people without a mask or a cloth covering your mouth and nose?”, “how often did you go closer than 6 feet to other people when you were outside?”, $r = .85$), ranging from 1 (*never*), 4 (*sometimes*), to 7 (*very frequently/all the time*). The items were reverse coded and averaged to a composite score such that a higher score indicates a higher degree of baseline physical distancing.

Incentive value, expectancy, and instrumentality

Participants rated the incentive value of their loved one not catching the Coronavirus, (“How important is it for you that [the loved one] does not get infected with the Coronavirus?”), the expectancy of practicing preventative actions (“How likely is it that you can take action that will help prevent [the loved one] from getting infected with the Coronavirus?”), and instrumentality of taking action for protecting the loved one (“How likely is it that, if you do not take action that helps prevent the spread of the virus, [the loved one] will get infected?”). The questions used a 7-point Likert scale ranging from 1 (*modestly important/not likely at all*) to 7 (*extremely important/very likely*).

Mode of thought manipulation

Participants in both conditions first read the instruction below with the initials of the loved one piped in.

Imagine, in the near future, that [the loved one] is infected with the Coronavirus. What would be the worst thing for [the loved one], the worst outcome that is associated with him/her getting infected with the Coronavirus? What is the most negative outcome for [the loved one] to contract the virus? Find the most negative outcome for [the loved one] and summarize it in 3 to 6 words.

For example, participants indicated “It could make her hospital-bound” or “Having to suffer and endure pain” as the most negative outcome for the loved one. Participants were then instructed to imagine the outcome as vividly as possible and write down thoughts and images that come to mind when imagining it. Then in the negative fantasy condition, participants went through the same procedure again referring to the second-worst outcome for the loved one. In contrast, participants in the mental contrasting condition read:

Now, focus on the present moment. Think about a positive aspect in the present life of [the loved one] that he/she could lose if he/she got infected with the Coronavirus. What is the most valuable thing in the present life of [the loved one] that should not be taken away from him/her by getting infected with the Coronavirus? Find it and summarize it in 3 to 6 words.

Participants named, for example, “Her health and freedom” or “His family and friends.” After naming it, they vividly imagined the positive reality and typed their thoughts and images that came to mind.

Attention to COVID-19 information

Attention to COVID-19 information was assessed in the same manner as in Study 1. However, the content of the information was changed so that it includes information useful for people who want to know how to prevent the spread of COVID-19 to other people (see Supplement 5). Assuming that there would be not much variance in this variable at the time of Study 2, we intentionally contained more texts on the information page than in Study 1. We hoped to get more variance in the amount of attention paid to this page. The time participants stayed on that page was measured in sec.

Physical distancing

Three days later, participants responded to questions that asked how much they had enacted physical distancing during the past three days. We presented the same six items that were used for assessing baseline physical distancing at Time 1. The items showed good reliability ($\alpha = .83$), so we reverse coded and averaged them.

Demand characteristics

At the end of the survey, participants answered a question measuring demand characteristics (“I felt a need to answer the questions in a way that I please the researcher.”) using a 7-point Likert scale ranging from 1 (*not at all*) to 7 (*very much*).

Results

Identification of a significant other

When asked to think of a loved one in their household who belongs to a high-risk group, the majority of participants thought of their parents (45.8%), grandparents (23.6%), or a romantic partner (14.8). The others indicated that the loved one was their friend (5.3%), child (4.2%), sibling (3.5%), or other (2.8%).

Incentive value, expectancy, and instrumentality

Mean scores of incentive value ($M = 6.59$, $SD = 0.93$), expectancy ($M = 6.02$, $SD = 1.33$), and instrumentality ($M = 4.79$, $SD = 1.69$) were above the scale midpoint, $t(283) = 46.78$, $p < .001$, Cohen's $d = 2.78$, 95% $CI = [2.48, 2.70]$ for incentive value, $t(283) = 25.51$, $p < .001$, Cohen's $d = 1.51$, 95% $CI = [1.86, 2.17]$ for expectancy, and $t(283) = 7.87$, $p < .001$, Cohen's $d = 0.47$, 95% $CI = [0.59, 0.99]$ for instrumentality. The independent samples t -tests investigating conditional differences in incentive value, expectancy, and instrumentality revealed that there are no significant differences between the mental contrasting condition and the negative fantasy condition in all these measures, $ps > .54$.

As pre-registered we included these variables as covariates in all the analyses described below. See Table 2 for the descriptive statistics for all variables.

Attention to COVID-19 information

We again did a log transformation of attention to COVID-19 information as it was measured by seconds and was highly skewed. We regressed log-transformed scores on incentive value, expectancy, instrumentality, and condition (see Supplement 6 for a summary of results). Incentive value, expectancy, and instrumentality were mean-centered and the condition was effect-coded (mental contrasting = 0.5, negative fantasy = -0.5). Inconsistent with our prediction, we did not find a difference between the two conditions, $p = .20$. The only significant predictor was incentive value, $b = 0.29$, $SE = 0.09$, $t(279) = 3.08$, $p = .002$, 95% $CI = [0.10, 0.47]$, indicating that the more participants thought it is important that the loved one does not get infected, the longer participants stayed on the information page.

Physical distancing

We regressed physical distancing at Time 2 on incentive value, expectancy, instrumentality, baseline physical distancing, and mode of thought. Incentive value, expectancy, instrumentality, and baseline physical distancing were mean-centered and mode of thought was effect-coded (mental contrasting = 0.5, negative fantasy = -0.5). Baseline physical distancing was a significant and strong predictor, $b = 0.73$, $SE = 0.05$, $t(181) = 15.49$, $p < .001$, 95% $CI = [0.64, 0.83]$, and the effects of incentive value and expectancy were marginally significant, $b = -0.12$, $SE = 0.06$, $t(181) = -1.82$, $p = .071$, 95% $CI = [-0.24, 0.01]$ for incentive value, and $b = 0.07$, $SE = 0.04$, $t(181) = 1.73$, $p = .085$, 95% $CI = [-0.01, 0.14]$ for expectancy. However, there was neither a significant effect of mode of thought nor of instrumentality, $ps > .38$.

Although we expected a main effect of our manipulation, we suspected that the effect is hidden by a strong ceiling effect. Indeed, participants across conditions were already exerting physical distancing above the scale mid-point at baseline ($M = 5.54$, $SD = 1.00$), $t(186) = 21.09$, $p < .001$, Cohen's $d = 1.54$, 95% $CI = [1.40, 1.69]$. To probe the possibility that the effect of mental contrasting evinces for people

Table 2. Means, standard deviations, and correlations among variables (Study 2).

Variables	<i>M</i>	<i>SD</i>	Correlations						
			1	2	3	4	5	6	7
1. Mode of thought	—	—	—						
2. Baseline physical distancing (T1)	5.54	1.00	-.01	—					
3. Incentive value	6.59	0.93	.05	.06	—				
4. Expectancy	6.02	1.33	.08	.07	.43**	—			
5. Instrumentality	4.79	1.69	.08	.01	.09	.15*	—		
6. Attention to COVID-19 information	47.51	75.32	-.07	.04	.19**	.07	-.01	—	
7. Physical distancing (T2)	5.75	0.98	.04	.75**	-.02	.10	-.03	.07	—

Note. Mean and standard deviation of attention to COVID-19 information are based on the original value before log-transformation. Correlations between attention to COVID-19 information and other variables are based on the log-transformed value. ** $p < .01$, * $p < .05$.

who were doing less physical distancing at baseline, hence have the potential for improving it, we did an exploratory test by additionally considering the interaction between baseline physical distancing and condition. The interaction term significantly predicted physical distancing measured at Time 2 over and above the strong effect of baseline physical distancing, $b = -0.19$, $SE = 0.09$, $t(180) = -2.03$, $p = .044$, $95\% CI = [-0.38, -0.01]$.

The pattern of results supported our suspicion that we ran into a ceiling effect (see Figure 2). For people who showed a high level (+1 SD) of baseline physical distancing at Time 1, there was no significant difference between the mental contrasting and fantasizing conditions, $p = .40$. They were doing physical distancing at the mean level of 6.54 at Time 1 and remained practicing physical distancing of about the same amount regardless of condition ($M_{adjusted} = 6.43$, $SE = 0.10$ in the mental contrasting condition, $M_{adjusted} = 6.54$, $SE = 0.09$ in the negative fantasy condition). However, for people with low levels (-1 SD) of physical distancing at Time 1, we found a significant difference between conditions, $b = 0.27$, $SE = 0.13$, $t(180) = 2.03$, $p = .044$, $95\% CI = [0.01, 0.53]$. Among people who were doing physical distancing at the mean level of 4.54 (-1 SD) at Time 1, those who engaged in mental contrasting showed more physical distancing three days later ($M_{adjusted} = 5.16$, $SE = 0.10$) than those in the negative fantasy condition ($M_{adjusted} = 4.88$, $SE = 0.09$). Thus, we found that vicarious mental contrasting promotes physical distancing more than mere negative fantasizing – given that people showed relatively little physical distancing at baseline.

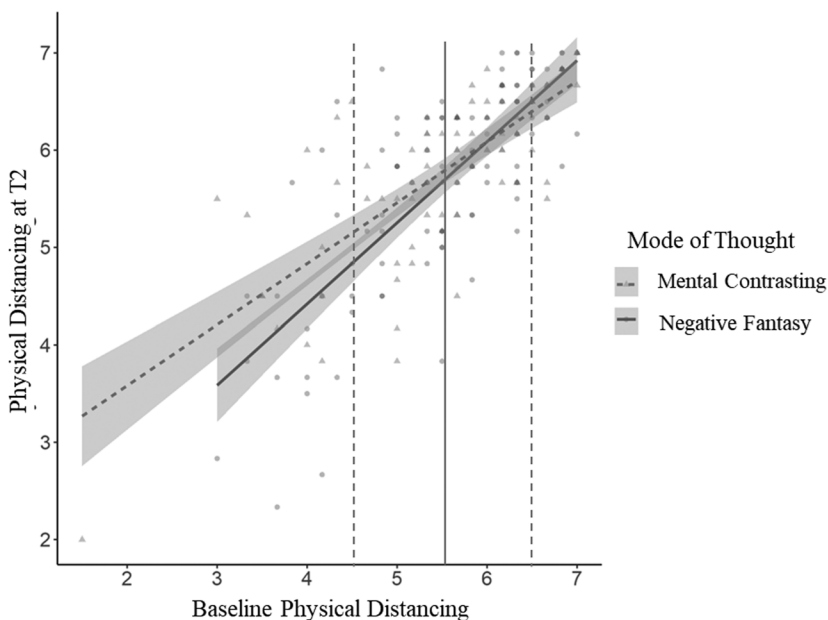


Figure 2. Physical distancing at Time 2 as a function of mode of thought and baseline physical distancing (Study 2). Note. Shaded areas represent ± 1 SD margin. The solid vertical line represents the mean of baseline physical distancing and the dotted vertical lines represent 1 SD below and above the mean.

Demand characteristics

To test whether the experimenter demand hypothesis can alternatively explain the results, we first compared the means of self-reported demand characteristics of the two conditions. If mental contrasting heightened experimenter demand and this, in turn, led to more COVID-19 preventative behaviors, the mental contrasting condition should show a higher mean on experimenter demand. However, the results showed that this was not the case. Rather, people in the mental contrasting condition reported a less felt need to please the researchers ($M=1.83$, $SD=1.81$) than people in the negative fantasy condition ($M=2.46$, $SD=2.22$), $t(184.26) = 2.14$, $p = .033$, Cohen's $d=0.28$, $95\% CI = [0.05, 1.22]$. Moreover, the correlations between experimenter demand and the two dependent variables were not significant, $ps > .17$, and the results observed in the main analyses remained the same after adjusting for the experimenter demand.⁶

Discussion

Study 2 investigated the effect of mental contrasting concerning negative future fantasies about a significant other's infection. Specifically, we tested the hypothesis that vicarious mental contrasting will lead to more COVID-19 preventative behaviors than merely fantasizing about the infection of a significant other. The results suggest that mental contrasting of a negative future, even when engaged vicariously, leads to more physical distancing than mere negative fantasies among people who had room for change. The examination of the alternative hypothesis (i.e., experimenter demand) revealed that the results cannot be attributed to heightened demand in the mental contrasting condition.

However, we did not observe the hypothesized effect on attention to COVID-19 information. In hindsight, we speculate that the null effect of our manipulation on this measure is related to the timing of the study and the nature of the sample. Recall that the study was conducted in August 2020 when most people were better aware of the pandemic and had received more than enough information about COVID-19. Although we added information that is particularly useful for protecting a high-risk group, it is likely that the sample in Study 2, who had a good reason to know that information, were already familiar with the information presented. Supporting this speculation, participants in Study 2 stayed on the information page shorter than those in Study 1 ($M=55.64$, $SD=75.75$ in Study 1; $M=47.51$, $SD=75.32$ in Study 2) even though the information provided in Study 2 contained more text (see Supplements 2 and 5).

General discussion

The present study aimed to introduce an effective self-regulatory strategy that could help to stop the spread of COVID-19. In Study 1, we conceptually replicated the previous work on mental contrasting of a negative future (Oettingen et al., 2010) and found that mental contrasting of a negative future with a still positive reality leads to more COVID-19 preventative behaviors than fantasizing about a negative future.

In Study 2, in which we induced mental contrasting in a vicarious way, we found evidence supporting that mental contrasting of a negative future can work vicariously to facilitate behavioral change among people who were in particular need of help: Those doing relatively little physical distancing at baseline.

The roles of incentive value, expectancy, and instrumentality for COVID-19 preventative behaviors are also noteworthy. The results of the multiple regressions indicated that incentive value is relevant to performing COVID-19 preventative behaviors. Incentive value positively predicted the intentions to learn about COVID-19 and physical distancing in Study 1, and attention to COVID-19 information in Study 2. These findings suggest that the more people feel it is important to avoid the virus or to protect a loved one from getting the virus, the more likely they are to engage in COVID-19 preventative behaviors. The findings are consistent with the existing literature that has highlighted incentive value as a key predictor of future behaviors (McClelland, 1985; Mischel, 1973; Vroom, 1964). However, the roles of expectancy and instrumentality were, at least at first sight, inconsistent with the existing literature. The lack of the effect of expectancy as well as that of the interaction between condition and expectancy seems to contradict previous studies that have found the main effect of expectancy and the expectancy-dependent effect of mental contrasting on behavioral change (e.g., Oettingen et al., 2010; Schrage et al., 2020; see Oettingen, 2012; Oettingen & Sevincer, 2018). We argue that the null effect of expectancy and of expectancy-dependency might have been observed because the expectancy judgment in the early pandemic was not based on valid grounds. Expectations are informed by past experiences and that is why expectation strongly predicts future behaviors (Bandura, 1977; Mischel, 1973; Oettingen, 2012; Oettingen & Mayer, 2002). In this vein, the expectancy of whether one would be able to avoid the virus was not based on past experiences as the pandemic at the time was an unprecedented experience for most people and the virus is unpredictable by nature. Thus, expectancy may have not been a valid source on which people could rely. This might have been also true for the instrumentality perception toward preventative behaviors as people could not tell from their past experience if their preventative behaviors will help protect their loved ones or themselves.

Theoretical and practical implications

Previous work has shown the effectiveness of mental contrasting mostly with regard to a desired positive future (meta-analysis by Cross & Sheffield, 2019; Oettingen & Sevincer, 2018). The present research focused on mental contrasting of a feared, negative future. This kind of mental contrasting, which has been studied comparatively less, demonstrated its effectiveness in the recent COVID-19 context. The findings imply that there is self-regulatory help even for people in whom negative fantasies prevail and who may have difficulty imagining a positive future (Oettingen, 2012). Despite its potential applicability to various research contexts (e.g., unhealthy eating, language learning, relationships, etc.), mental contrasting of a negative, feared future has received scarce attention from researchers. Future studies that explore the effectiveness of mental contrasting for avoiding a negative future in other life domains will enrich the literature on mental contrasting in specific and the literature on self-regulation in general.

It is also of great importance to explore the mechanisms underlying the effect of mental contrasting of a negative future. There have been studies that investigated the mechanisms of mental contrasting of a desired, positive future (Kappes et al., 2012; 2013; Kappes & Oettingen, 2014; Oettingen et al., 2009; Sevincer & Oettingen, 2013), but there is a lack of research on the underlying mechanism of mental contrasting of a negative future. It might be that the mechanisms that are underlying the effects of mental contrasting of a positive future work in similar ways for mental contrasting of a negative future (e.g., energization, Oettingen et al., 2009; Sevincer & Oettingen, 2013; or cognitive association between future and reality, Kappes & Oettingen, 2014), but it may also be that other psychological mechanisms are contributing to the effects of mental contrasting of a negative future. For example, loss aversion (Kahneman & Tversky, 2013) might play a key role in mental contrasting spurring people to engage in preventative behaviors. Future studies examining the psychological processes underlying the mental contrasting of a negative future will inform us of the emergence of avoidance goals and the role of mental contrasting herein.

In addition, we found that mental contrasting of a negative future is effective even when people take the perspective of a significant other (i.e., vicarious mental contrasting). People often vicariously experience other people's responses to a certain situation as if they are in that situation (Blackman et al., 2016; Lickel et al., 2005; McCann & Pearlman, 1990; Norton et al., 2003; Shu et al., 2017). The current research is one first step to examine if people can engage in mental contrasting in a vicarious way. Our findings show that this vicarious form of mental contrasting motivates people who were low on health-preventative behaviors towards significant others to finally act in the interest of their loved ones. The possibility of vicarious mental contrasting should be helpful especially in the current pandemic as people without strong fearful fantasies about a future for themselves can still change their behavior to protect their loved ones. Also, the investigation of vicarious mental contrasting is theoretically important in that it sheds light on another possible route through which mental contrasting affects behavioral change and alludes to the potentially broader applicability of mental contrasting. While the current research proposes such possibilities, future studies that replicate the effect of vicarious mental contrasting in other research contexts (e.g., prosocial behaviors, negotiation, etc.) are needed before we can make a firm conclusion on its effectiveness.

The findings from the present research may discourage media, policy-makers, and practitioners from the use of sheer fear-eliciting health communication. Fear appeals may only make people live in their fearful fantasies which likely will not elicit behavioral change (Albarracín et al., 2005; Earl & Albarracín, 2007; Stolorow et al., 2020). Instead, the current study proposes that health communication may benefit from containing both negative fantasies and endangered positive realities in their communication message. For example, the CDC website might suggest the feared negative consequences contrasted with the positive realities to be preserved followed by useful information about what can be done to stop the spread, instead of providing pieces of information separately or in a different order. The government may also generate a brochure, app, or other forms of information that contain both negative consequences of catching the virus together with positive realities that should not be taken away by the virus to promote preventative behaviors among the public. This strategy

may help people turn their fearful fantasies into actions and prevent their loved ones and themselves from being infected with the Coronavirus. The present findings suggest that mental contrasting of a negative future just like mental contrasting of a positive future can be an effective and efficient way for motivating people to take action given the simplicity of inducing it (see also Oettingen et al., 2010).

Limitations and future directions

While previous studies on mental contrasting often contained a positive reality only condition (e.g., Oettingen et al., 2010), in the current research, we compared only the two modes of thought: mental contrasting of a negative future and thoughts about a negative future only. The reason we decided not to include a positive reality only condition was that negative, fearful thoughts about the future of the pandemic have been promoted by media and health communication since the early stage of the COVID-19 pandemic (Stolow et al., 2020). In fact, it was almost impossible to make people refrain from thinking those negative fantasies. Thus, the primary aim of the current research was to test if mental contrasting can turn those negative fantasies in people's minds into beneficial behavior change. Still, it will be fruitful if future research compares the effect of mental contrasting of a negative future to other control conditions such as a positive reality only condition or a no treatment control condition without prior thought inducement.

Another limitation of the present research pertains to the rather narrow focus on two behavioral indices of COVID-19 preventative behaviors: attention to relevant information and physical distancing. As mentioned earlier, we studied these two behaviors because those were the most critical and salient ones during the early pandemic. However, as the situation developed, there were new behavioral protocols recommended to prevent the spread of the virus. Good examples are getting regular COVID-19 tests (especially before or after traveling or visiting family or friends) and getting the COVID-19 vaccines or booster shots. Additional studies that examine the effectiveness of mental contrasting on those newly recommended behaviors would be helpful for better understanding the generalizability of mental contrasting of a negative future. Also, although we had a behavioral measure of attention to COVID-19 information, physical distancing was measured using self-report. Future research will gain more insights by employing objective behavioral measures of physical distancing and other newly available COVID-19 preventative behaviors.

Conclusion

The present research demonstrates that mental contrasting of a negative future with a positive reality that might be lost turns negative future fantasies into acting in the context of the global COVID-19 pandemic. Importantly, such mental contrasting both in terms of one's own life and of a significant other's life was found to facilitate behavior change in the service of preventing the spread of the virus. Further examination on mental contrasting of a negative future using objective behavioral measures of a diversity of COVID-19 preventative behaviors and study replicating the effect of vicarious mental contrasting in other contexts remain priorities for future research.

Data availability

All materials and data are openly available at the Open Science Framework at <https://osf.io/kxt4e/>.

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Notes

1. Although expectancy-dependent effects were not assumed in the current research, we tested if there was any interaction between condition and expectancy on our dependent variables. None of the interactions reached the significance level, $p_s > .17$. Thus, we did not report the interaction effects in the main text for conciseness.
2. We also measured the frequency of washing hands in both Study 1 and Study 2. We found the pattern of results consistent with that of physical distancing but the effect on hand-washing was rather weak and did not reach significance level. Whereas physical distancing was a new behavioral protocol that was developed mainly for dealing with the pandemic, hand-washing was a habitualized routine for many people even before the pandemic. Thus, the stronger effect of mental contrasting on physical distancing compared to that on hand-washing might be because physical distancing is more salient as COVID-19 preventative behavior and less routinized than hand-washing. We did not report the results on hand-washing in the main text for conciseness but reported them in Supplement 7.
3. In Study 1, we decided to not include mask-wearing as a dependent variable because scientific evidence was lacking during the early pandemic (March 2020) on whether mask-wearing would help prevent the spread of the virus. In addition, it was recommended at that moment not to buy medical masks as it may cause a shortage of supplies for health workers. Thus, we did not measure mask-wearing in Study 1. In Study 2, one item measuring the frequency of mask-wearing in public was included in the six items measuring physical distancing ("how frequently were you in public with other people without a mask or a cloth covering your mouth and nose?"). The list of items measuring physical distancing was pre-registered and showed good reliability ($\alpha = .83 - .85$), so we combined all six items into a single index.
4. There was one attention check item ("It is important that you pay attention to this study. Please tick '1'"). Participants who clicked numbers other than 1 were excluded. We used the same item for the Time 2 attention check and for Study 2.
5. There was a sharp increase in the number of new cases in the U.S. between the two studies. The 7-day moving average of the number of new cases in the United States when Study 1 was conducted (March 16th) was 511, while it was 52,514 when Study 2 was conducted (August 10th). As a result of this rapid spread of the Coronavirus, 35 states made mask-wearing mandatory state-wise during this period (April 10th – August 4th).
6. The regression model that includes demand characteristics is reported in Supplement 8.

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