

**Note:** In view of the pandemic, [the PSA has called](#) for rapid and impactful study proposals on COVID-19, 66 proposals were submitted. Three studies have been selected and will be conducted in a global data collection effort. ZPID's PsychLab supports the PSA in the following countries: Austria, Switzerland, Sweden, Russia, Romania, Japan, South Korea, Mexico, and China. This is the pre-registration plan relating to the project [PSA COVID-19 Rapid Project 002](#) for data collection in China.

## **1) Data collection.**

Have any data been collected for this study already?

Data collection for the worldwide project began on 5/6/2020, after the first round of peer review with Nature Human Behavior. No one has looked at any of the data or done any data analysis prior to this registration. No data have been collected for the ZPID panel yet. The sample size was determined before data collection.

## **2) Hypothesis.**

**What's the main question being asked or hypothesis being tested in this study?**

We test four main hypotheses:

1. We hypothesize that the reappraisal interventions will lead to reduced negative emotional responses compared to both control conditions combined.
  - a. Reappraisal interventions (vs. control) will reduce negative emotions in response to the photos (hypothesis 1a).
  - b. Reappraisal interventions (vs. control) will reduce negative state emotions (hypothesis 1b).
  - c. Reappraisal interventions (vs. control) will reduce negative emotions about the COVID-19 situation (hypothesis 1c).
2. We hypothesize that the reappraisal interventions will lead to increased positive emotional responses.
  - a. Reappraisal interventions (vs. control) will increase positive emotions in response to the photos (hypothesis 2a)
  - b. Reappraisal interventions (vs. control) will increase positive state emotions (hypothesis 2b)
  - c. Reappraisal interventions (vs. control) will increase positive emotions about the COVID-19 situation (hypothesis 2c)
3. We hypothesize that reconstrual will lead to greater decreases in negative emotional responses than repurposing.
  - a. Reconstrual will lead to greater decreases in negative emotional responses in response to the photos than repurposing (hypothesis 3a).
  - b. Reconstrual will lead to greater decreases in negative state emotions than repurposing (hypothesis 3b).

- c. Reconstrual will lead to greater decreases in negative emotions about the COVID-19 situation than repurposing (hypothesis 3c).
- 4. We hypothesize that repurposing will lead to greater increases in positive emotional responses than reconstrual.
  - a. Repurposing will lead to greater increases in positive emotions in response to the photos than reconstrual (hypothesis 4a).
  - b. Repurposing will lead to greater increases in positive state emotions in response to the photos than reconstrual (hypothesis 4b).
  - c. Repurposing will lead to greater increases in positive emotions about the COVID-19 situation than reconstrual (hypothesis 4c).

### **3) Dependent variable.**

#### **Describe the key dependent variable(s) specifying how they will be measured.**

*Baseline emotions.* To assess baseline emotion, we will ask participants how they are feeling right now at the beginning of the session on a 5-point scale ranging from 1 (not at all) to 5 (extremely) For negative baseline emotions, we will measure five items on fear, anger, sadness, distrust, and stress from the modified Differential Emotions Scale (Fredrickson, 2013). For positive baseline emotions, we will measure five items on hope, gratitude, love, inspiration, and serenity from the modified Differential Emotions Scale. We will also measure three items on loneliness( Hughes, Waite, Hawkey, & Cacioppo, 2016) and three items on social connectedness (Lytle, Blosnich, Luca, & Brownson, 2018). These six items also will be included in the assessment of post-photo state emotions and in the assessment of anticipated emotions (at each assessment point, these six items will be used in exploratory analyses).

*Negative emotional responses.* In order to capture descriptively rich, nuanced data, we will measure negative emotional responses in four ways. The first way is to measure negative emotions in response to the photos. For each photo, we will ask participants how negative the photo made them feel using a unipolar scale ranging from 1 (not at all) to 5 (extremely). The second way is to measure negative state emotions after viewing all ten photos. We will ask participants “how you are feeling right now” with the same set of items used to measure baseline emotions, which include five negative state emotions of fear, anger, sadness, distrust, and stress. The third way is to measure negative emotions about the COVID-19 situation. We will ask participants how negative/hopeless they are feeling about the COVID-19 situation right now on a unipolar scale ranging from 1 (not at all) to 5 (extremely). The fourth way is to measure negative anticipated emotions, which will be an exploratory outcome. We will ask participants “In the next week, to what extent, if at all, do you think you will feel each of the following?” with the same set of items used to measure baseline emotions, which include five negative anticipated emotions of fear, anger, sadness, distrust, and stress.

*Positive emotional responses.* Following a parallel procedure, we will measure positive emotional responses in four ways. The first way is to measure positive emotions in response to the photos. For each photo, we will ask participants how positive the photo made them feel using a unipolar scale ranging from 1 (not at all) to 5 (extremely). The second way is to measure positive state emotions after viewing all ten photos. We will ask participants “how you are feeling

right now” with the same set of items used to measure baseline emotions, which include five positive state emotions of hope, gratitude, love, inspiration, and serenity. The third way is to measure positive emotions about the COVID-19 situation. We will ask participants how positive/hopeful they are feeling about the COVID-19 situation right now on a unipolar scale ranging from 1 (not at all) to 5 (extremely). The fourth way is to measure positive anticipated emotions, which will be an exploratory outcome. We will ask participants “In the next week, to what extent, if at all, do you think you will feel each of the following?” with the same set of items used to measure baseline emotions, which include five positive anticipated emotions of hope, gratitude, love, inspiration, and serenity.

#### **4) Conditions**

##### **How many and which conditions will participants be assigned to?**

Participants will be randomly assigned to one of four between-subjects experimental conditions: two reappraisal intervention conditions (reconstrual and repurposing), one active control condition, and one passive control condition.

In the reconstrual condition, participants will be told that “One strategy that some people find helpful for influencing their emotions is rethinking. This strategy involves changing one’s thinking in order to change one’s emotions. This strategy is based on the insight that different ways of interpreting or thinking about any situation can lead to different emotions. This means that finding new ways of thinking about a situation can change how you feel about the situation. For example, consider someone who stays at home under lockdown due to COVID-19 and is feeling anxious, sad, or angry. In this case, rethinking might involve realizing that the situation is only temporary because dedicated people across the world are working hard to find a vaccine.” Participants will then be given four examples of how rethinking might be employed for the COVID-19 situation (Example 1: “I know from world history that keeping calm and carrying on gets us through tough times.” Example 2: “Scientists across the world are working hard to find treatment and vaccines. Throughout history, humans have been resourceful in finding solutions to new challenges.” Example 3: “Washing hands, avoiding touching my face, keeping a safe distance... There are simple and effective things I can do to protect myself and my loved ones from getting sick and to stop the spread of the virus.” Example 4: “In the past, people have overcome many challenges that seemed overwhelming at the time, and we will overcome COVID-19 related challenges too.”).

In the repurposing condition, participants will be told that “One strategy that some people find helpful for influencing their emotions is refocusing. This strategy involves changing one’s thinking in order to change one’s emotions. This strategy is based on the insight that finding something good in even the most challenging situations can lead to different emotional responses. This means that refocusing on whatever good aspects may be found in a situation can change how you feel about the situation. For example, consider someone who stays at home under lockdown due to COVID-19 and is feeling anxious, sad, or angry. In this case, refocusing might involve realizing that staying at home gives them time to do things that they may not have been able to do before, like reading, painting, and spending time with family.” Participants will then be given four examples of how refocusing might be employed for the

COVID-19 situation (Example 1: “This situation is helping us realize the importance of meaningful social connections, and helping us understand who the most important people in our lives are.” Example 2: “Medical systems are now learning to deal with amazing challenges, which will make them much more resilient in the future.” Example 3: “Even though we are physically apart, we are finding creative ways to stay connected and our hearts are more connected than ever.” Example 4: “I have been inspired by the way that frontline health care workers have responded with resilience, generosity, determination, and deep commitment.”).

In the active control condition, participants will be asked to reflect on their emotions as they unfold. This condition is inspired by the literature on expressive writing and experimental disclosure, which shows that asking people to reflect about their very deepest thoughts and feelings can improve psychological health (Frattaroli, 2006; Pennebaker, & Smyth, 2016). By having an active control condition, which is likely to lead to some benefit to participants, we can make stronger inferences regarding the impact of reappraisal interventions relative to a potentially useful strategy designed to equate demand characteristics and expectancies. In the instructions, participants will be told that (emphasis in original) “One strategy that some people find helpful for influencing their emotions is reflecting. This strategy involves allowing oneself to freely experience and reflect on one’s thoughts and feelings. This strategy is based on the insight that reflecting on your thoughts and feelings about any situation can lead to different emotional responses. This means that exploring your thoughts and emotions can change how you feel about the situation. For example, consider someone who stays at home under lockdown due to COVID-19 and is feeling anxious, sad, or angry. In this case, reflecting might involve allowing oneself to experience these feelings and be fully immersed in the lockdown experience, reflecting on the meaning this situation has for the person and their loved ones.” Participants will then be given four examples of how reflecting might be employed for the COVID-19 situation (Example 1: “This situation is changing so fast, and I don’t know how the future will develop.” Example 2: “People are struggling to cope with these unprecedented and overwhelming challenges.” Example 3: “Someone I love might get sick and there might not even be ventilators to help them.” Example 4: “I really wish we could find a vaccine soon.”).

To reinforce what they have learned, participants in the two reappraisal conditions and the active control condition will then be asked to summarize, in 1-2 sentences, the strategy they have just learned. This text response is collected only for exploratory purposes and will not be used in confirmatory analysis.

In the passive control condition, participants will receive the following instructions: “In this study, we will show you photographs related to COVID-19 from various news sources. Our goal is to better understand how people respond to such photos, which may include feelings of fear, anger, and sadness. As you view these photographs, please respond as you naturally would.” Having a passive control condition will allow us to have clear interpretations in the case that we find no significant difference in our contrast between both the reappraisal conditions combined and both the control conditions combined. If this is the case, we will compare each reappraisal condition against the passive control condition and compare the active control condition against the passive control condition in the exploratory analysis to determine whether each strategy has a non-zero impact relative to individuals’ natural responses.

## **5) Analyses**

## Analytic plan for hypotheses

Since negative emotional responses and positive emotional responses are separable (Kreibig & Gross, 2017; Larsen & McGraw, 2011) we will examine negative emotional responses and positive emotional responses separately. To control family-wise error rates in multiple comparisons, we will use the Holm-Bonferroni method within each of the four hypotheses separately. For all analyses testing negative emotional responses (hypothesis 1 and hypothesis 3), we plan to control for the participants' negative baseline emotions. As originally intended by the scale (Fredrickson, 2013), we plan to create an overall negative baseline emotion score by averaging the five negative emotions (fear, anger, sadness, distrust, and stress). For all analyses testing positive emotional responses (hypothesis 2 and hypothesis 4), we plan to control for the participants' positive baseline emotions. As originally intended by the scale, we plan to create an overall positive baseline emotion score by averaging the five positive emotions (hope, gratitude, love, inspiration, and serenity). To account for the nested structure in our data (e.g., participant nested by country), we will fit multilevel models with the condition using the contrast in Table 1, random by-country slopes, and random by-country intercepts. If a model fails to converge, we plan to explore other reasonable models and report results of all explored models in an appendix.

**Table 1. Contrast structure of testing hypotheses 1 - 4 (with unit-weighting).**

|                                | Active Control | Passive Control | Reconstrual | Repurposing |
|--------------------------------|----------------|-----------------|-------------|-------------|
| Contrast 1<br>(hypotheses 1-2) | 1/2            | 1/2             | -1/2        | -1/2        |
| Contrast 2<br>(hypotheses 3-4) | 0              | 0               | 1/2         | -1/2        |

Although we use the frequentist approach for confirmatory analyses, we will also report Bayes factors (BF) for every result to gain information about the strength of evidence provided by the data comparing the null and alternative hypotheses (Dienes, 2014). If we get non-significant results from the frequentist approach, we will use BF to help us interpret non-significant results and differentiate between insensitive results and those that reveal good enough evidence supporting the null-hypothesis. We will set these evidence thresholds to  $BF_{10}$  to  $> 10$  for  $H_1$  and  $< 1/10$  for  $H_0$ . If BFs do not cross the evidence thresholds, we think our sample size is sufficiently large that inconclusive results at this sample size would be an important message for the field. We will use informed priors for the alternative model: a one-tailed Cauchy distribution with a mode of zero and a scale  $r = 0.18$  (hypotheses 1 and 2),  $r =$

0.17 (hypothesis 3), and  $r = 0.25$  (hypothesis 4) on the standardized effect size using the BayesFactor package in R for the analysis (Morey & Rouder, 2018). These priors are based on the lowest available estimates of effect sizes in past research (See the “Sampling plan” section for more information from the registered report). To model variance, the package will use a non-informative prior, which should not influence the value of the BF due to being represented equally in H0 and H1. To probe the robustness of our conclusions, we will report Robustness Regions for each Bayes factor, which can specify the range of expected effect sizes used when in the alternative model that would support the same conclusion. Robustness Regions will be notated as RR[min, max], where min indicates the smallest scaling factor and max indicates the largest scaling factor that would lead us to the same conclusion as the originally chosen scaling factor (Dienes, 2019).

### ***Tests for hypotheses 1 and 3***

Overall, we expect that reappraisal interventions (vs. control) will reduce negative emotional responses (hypothesis 1), and that reconstrual will lead to greater decreases in negative emotional responses than repurposing (hypothesis 3). We will test hypothesis 1 and hypothesis 3 using two orthogonal contrasts (Table 1). The first contrast is between both reappraisal conditions combined and both control conditions combined for hypothesis 1. The second contrast is between the reconstrual condition and the repurposing condition for hypothesis 3. Negative emotional responses are measured in four ways (negative emotions in response to the photos, negative state emotions after viewing the photos, negative emotions about the COVID-19 situation, and negative anticipated emotions). We have confirmatory hypotheses regarding the first three outcomes and will examine negative anticipated emotions in the exploratory analysis. Therefore, hypothesis 1 can be subdivided into hypotheses 1a to 1c, and hypothesis 3 can be subdivided into hypotheses 3a to 3c. We will consider a hypothesis to be supported if at least 1 of the 3 sub-hypotheses is significant after Holm-Bonferroni correction (controlling for 3 comparisons within each hypothesis). If we find non-significant results for any sub-hypothesis, we will compare each reappraisal condition against the passive control condition and compare the active control condition against the passive control condition in the exploratory analysis to determine whether each strategy has a non-zero impact relative to individuals' natural responses.

*Testing effects on negative emotions in response to the photos:* We expect that reappraisal interventions (vs. control) will reduce negative emotions in response to the photos (hypothesis 1a), and reconstrual will lead to greater decreases in negative emotional responses in response to the photos than repurposing (hypothesis 3a). We will model ratings of negativity in response to each photo in the experimental trials as a function of the fixed effects of condition using our contrast. We will include by-participant random intercepts, by-country random intercepts, as well as by-country random slopes for each contrast.

*Testing effects on negative state emotions:* We expect that reappraisal interventions (vs. control) will reduce negative state emotions (hypothesis 1b), and reconstrual will lead to greater decreases in negative state emotions than repurposing (hypothesis 3b). Similar to creating the overall negative baseline emotion score, we plan to create an overall negative state emotion score by averaging the five negative emotions (fear, anger, sadness, distrust, and stress). We

will model the overall negative state emotion score as a function of the fixed effects of condition using our contrast. We will include by-country random intercepts, as well as by-country random slopes for each contrast.

*Testing effects on negative emotions about the COVID-19 situation:* We expect that reappraisal interventions (vs. control) will reduce negative emotions about the COVID-19 situation (hypothesis 1c), and reconstrual will lead to greater decreases in negative emotions about the COVID-19 situation than repurposing (hypothesis 3c). We will model negative emotions about the COVID-19 situation as a function of the fixed effects of condition using our contrast. We will include by-country random intercepts, as well as by-country random slopes for each contrast.

### ***Tests for hypotheses 2 and 4***

Overall, we expect that reappraisal interventions (vs. control) will increase positive emotional responses (hypothesis 2), and repurposing will lead to greater increases in positive emotional responses than reconstrual (hypothesis 4). We will test hypothesis 2 and hypothesis 4 using two orthogonal contrasts (Table 1). The first contrast is between both reappraisal conditions combined and both control conditions combined for hypothesis 2. The second contrast is between the reconstrual condition and the repurposing condition for hypothesis 4. Positive emotional responses are measured in four ways (positive emotions in response to the photos, positive state emotions after viewing the photos, positive emotions about the COVID-19 situation, and positive anticipated emotions). We have confirmatory hypotheses regarding the first three outcomes and will examine positive anticipated emotions in an exploratory analysis. Therefore, hypothesis 2 can be subdivided into hypotheses 2a to 2c, and hypothesis 4 can be subdivided into hypotheses 4a to 4c. We will consider a hypothesis to be supported if at least 1 of the 3 sub-hypotheses is significant after Holm-Bonferroni correction (controlling for 3 comparisons within each hypothesis). If we find non-significant results for any sub-hypothesis, we will compare each reappraisal condition against the passive control condition and compare the active control condition against the passive control condition in the exploratory analysis to determine whether each strategy has a non-zero impact relative to individuals' natural responses.

*Testing effects on positive emotions in response to the photos:* We expect that reappraisal interventions (vs. control) will increase positive emotions in response to the photos (hypothesis 2a), and repurposing will lead to greater increases in positive emotions in response to the photos than reconstrual (hypothesis 4a). We will model ratings of positivity in response to each photo in the experimental trials as a function of the fixed effects of condition using our contrast. We will include by-participant random intercepts, by-country random intercepts, as well as by-country random slopes for each contrast.

*Testing effects on positive state emotions:* We expect that reappraisal interventions (vs. control) will increase positive state emotions (hypothesis 2b), and repurposing will lead to greater increases in positive state emotions in response to the photos than reconstrual (hypothesis 4b). Similar to creating the overall positive baseline emotion score, we plan to create an overall positive state emotion score by averaging the five positive emotions (hope,

gratitude, love, inspiration, and serenity). We will model the overall positive state emotion score as a function of the fixed effects of condition using our contrast. We will include by-country random intercepts, as well as by-country random slopes for each contrast.

*Testing effects on positive emotions about the COVID-19 situation:* We expect that reappraisal interventions (vs. control) will increase positive emotions about the COVID-19 situation (hypothesis 2c), and repurposing will lead to greater increases in positive emotions about the COVID-19 situation than reconstrual (hypothesis 4c). We will model positive emotions about the COVID-19 situation as a function of the fixed effects of condition using our contrast. We will include by-country random intercepts, as well as by-country random slopes for each contrast.

## **6) Outliers and Exclusions**

*Exclusion.* We plan to exclude (1) participants who answer both multiple choice manipulation check questions incorrectly, and (2) participants who complete fewer than 50% of the questions in the study.

*Reliability of measures.* For items from the modified Differential Emotions Scale<sup>92</sup>, we plan to create overall negative emotion scores at each time point by averaging the five negative emotions (fear, anger, sadness, distrust, and stress) and overall positive emotion scores at each time point by averaging the five positive emotions (hope, gratitude, love, inspiration, and serenity) if the average inter-item correlation is above .40 for negative emotions and for positive emotions, respectively. If the average inter-item correlation is below .40, we will conduct an exploratory factor analysis with oblique rotation and maintain factors with an eigenvalue above 1.00. If no factors have an eigenvalue above 1, we will report results by item rather than as a composite.

*Missing data.* We will drop incomplete cases on an analysis-by-analysis basis. Given our sampling plan described below, we should have power of 0.95 or above.

*Outliers.* In order to be maximally conservative, we will not define or identify outliers.

## **7) Sample Size**

Participants will be recruited by the PSA network. At the time of Stage 1 submission, 194 research groups from 55 countries speaking 42 languages have signed up to recruit 25,448 participants to complete the current study (not counting participants for the other two studies in the PSA COVID-19 Rapid Project), and 4,050 of them will be recruited through semi-representative paneling (based on sex, age, and sometimes ethnicity) from the following countries: Egypt, Kenya, Nigeria, South Africa, Mexico, United States, Austria, Romania, Russia, Sweden, Switzerland, United Kingdom, China, Japan, and South Korea (270 participants per country). The remaining participants will be recruited through the research groups by convenience sampling. Each research group will obtain approval from their local Ethics Committee or IRB to conduct the study, will explicitly indicate that their institution does



not require approval for the researchers to conduct this type of task, or will explicitly indicate that the current study is covered by a pre-existing approval. Although the specifics of the consent procedure will differ across research groups, all participants will provide informed consent. At the time of Stage 1 submission, 135 research groups from 41 countries have ethics approval to collect data from 15,997 participants. Other research groups are currently seeking ethics approval. The style and the amount of compensation vary with local conventions (a common practice in PSA). More information regarding participant compensation and final sample size will be updated via the pre-print (<https://psyarxiv.com/x976j/>).

**8) Other. Anything else you would like to pre-register? (e.g., secondary analyses, variables collected for exploratory purposes, unusual analyses planned?)**

**Variables collected for exploratory purposes:**

*Behavioural intentions.* In addition to the emotional responses that are central to our four confirmatory hypotheses in this study, we will also examine exploratory outcomes concerning behavioural intentions. Such intentions matter because they have been shown to predict actual behaviours (Ajzen & Madden, 1986; Webb & Sheeran, 2006). Following protocols from Fishbein and Ajzen (2011), we will ask participants to indicate on a 7-point scale ranging from 1 (extremely unlikely) to 7 (extremely likely) their intentions to engage in each of 10 different behaviours within the next week. Five of the items concern potentially harmful behaviour, which we chose based on documented links between negative emotions and substance use, aggressive behaviour, and excessive information seeking (Dorison, et al., 2020; Birkley & Eckhardt, 2015; Thompson, Jones, Holman, & Silver, 2019). Items include: drinking too much alcohol, using too much tobacco (e.g., smoking/vaping) or other recreational drugs, yelling at someone, taking anger out online, and spending too much time on media. The other five items concern beneficial behaviour, which we chose based on evidence that positive emotions contribute to more health behaviours (Fredrickson & Joiner, 2018). Items include: eating healthy food, getting enough physical activity, practicing healthy sleep habits (for example, going to bed and waking at regular hours), washing hands regularly for at least 20 seconds, and following a stay-at-home order stringently (if there isn't an order in your region now, assume that one is imposed).

*Motivation/beliefs.* We will measure both the motivation to use the emotion regulatory strategy and the belief in the effectiveness of the emotion regulatory strategy as exploratory moderators (Tamir, Halperin, Porat, Bigman, & Hasson, 2019; Bigman, Mauss, Gross, & Tamir, 2016). We will ask "Recall the instructions we gave you for viewing the photos. To what extent, if at all, do you agree or disagree with the following statements?" Motivation to use the emotion regulatory strategy will be measured with the item: "I tried my hardest to follow the instructions I was given while viewing the photos." Belief in the effectiveness of the emotion regulatory strategy employed by participants will be measured with the item "I believed that following the instructions would influence my emotions." Participants will rate their answers using a 7-point scale ranging from 1 (strongly disagree) to 7 (strongly agree).

*Manipulation check.* We plan to evaluate participants' attention to our instructions and photos using two multiple-choice questions. The first question will ask participants to choose the

instructions they had at the beginning of the survey from among four options. The second question will ask participants to choose the photo that was not shown to them in the survey from among three options.

For exploratory purposes, we will also ask how often participants actually used each approach when viewing the photographs and their global change of emotions compared to the beginning of the study. Participants will be asked, “When viewing the ten photographs related to COVID-19 earlier, how often did you use each of the following approaches?” and rate four approaches: “responding as I naturally would,” “reflecting on my thoughts and feelings,” “interpreting the situation in a new way,” and “focusing on any good I could find in the situation.” Participants will rate their answers using a 5-point scale ranging from 1 (never) to 5 (always). To measure global change of emotion, participants will be asked, “Overall, compared to the beginning of this study, how negative do you feel right now?” using a 5-point scale ranging from 1 (much more negative) to 5 (much less negative) and “Overall, compared to the beginning of this study, how positive do you feel right now?” using a 5-point scale ranging from 1 (much more positive) to 5 (much less positive).

### **Secondary analyses:**

We will conduct a series of exploratory analyses to address supplemental questions regarding our hypotheses, including, but not limited to: (1) Are there any differences in other pairwise comparisons in testing hypotheses 1 - 2? (2) Are there emotion-specific effects of reappraisal? (3) Are the effects on emotions subjectively detectable by participants? Do the effects of strategy use vary by (4) motivation to use the strategy; (5) beliefs in the strategy’s effectiveness; or (6) the participant’s country of residence?

We will investigate the impacts of strategy use on other outcomes, including, but not limited to: (1) positive and negative anticipated emotions; (2) intentions to enact potentially harmful versus beneficial behaviours; and (3) loneliness and social connectedness.

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