Moral appeals reduce simulated panic buying behaviour

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Abstract

We report the results of an online experiment with a representative sample of Australians. After seeing a hypothetical scenario where a new COVID-19 outbreak has been announced and the government has imposed some restrictions, participants received one of three intervention messages (or a no-message control) designed to reduce panic buying. They were then asked about their intentions to buy more than they needed (i.e., panic buy). Participants were also given a simulated behaviour task, modelled on the prisoner's dilemma, where they could elect to 'buy' more than an amount they had previously indicated was reasonable for them. We find that a message that emphasises norms and reciprocity reduces simulated panic buying behaviours but not intentions, whilst a message that makes an appeal to morals reduces both panic buying intentions and simulated behaviours. We discuss implications and opportunities for further research.

1. Introduction

Panic buying occurs when individuals purchase unusually large quantities of items, typically in response to a precipitating event such as a natural disaster or anticipation of a price increase (Forbes, 2017). This kind of spike in consumption patterns can significantly disrupt supply chains and the availability of products, resulting in shortages of medical and healthcare supplies, food, as well as other consumer and non-consumer goods. Panic buying can also have disproportionate impacts on the most vulnerable — reduced availability of key goods can mean that those who are only able to shop at certain times or who have other accessibility restrictions may not be able to purchase what they need, when they need it (McKay, Bastian, & Lindberg, 2021; Louie, Shi, & Allman-Farinelli, 2022).

As governments started to warn their citizens of the impending COVID19 pandemic in March 2020, many countries saw substantial panic buying, with viral images, videos of empty shelves, and even violence in supermarkets (Laato, Islam, Farooq, & Dhir, 2020; Sim, Chua, Vieta, & Fernandez, 2020). Further bouts of panic buying were also witnessed as governments announced lockdown mandates or other internal movement restrictions (Keane & Neal, 2021a).

During these periods of panic buying, governments, retailers and community leaders used messaging strategies to urge citizens not to panic buy, and to provide reassurance that supermarkets would stay open (ABC, 2020a; "Coronavirus: 'Don't panic, be community-minded', says loo roll boss", 2020; "Coronavirus: German minister warns against new wave of panic-buying", 2020; Locklear, 2020). However, to our knowledge, there is no research showing whether these messages were effective or not. While there have been suggestions for what kinds of controlling measures might be effective (S. M. Y. Arafat, Kar, & Kabir, 2021; Prentice et al., 2021), there have not been any attempts to generate evidence for whether specific messaging could drive changes in panic buying behaviours with real consumers. Messaging is critically important for governments, as it is one of the only immediate levers that can be used to stem panic buying. Other levers, such as directly enforcing rationing, would need time for implementation and involve a greater imposition on people's freedoms.

This study contributes to the literature in an important way, by providing evidence showing that specific messages can shift panic buying intentions, as well as simulated panic buying behaviours.

This paper is organised as follows: first, we review the relevant literature on panic buying and potential messaging interventions; second, we describe the trial design and methods used to collect data; and finally, we present results and discuss implications for policy and further research.

1.1 Panic buying and its drivers

Indices created from Google search data suggested widespread panic buying behaviours across many countries around March 2020, with Australia and the US as two countries with relatively high indices (Keane & Neal, 2021b). Official data from the Australian Bureau of Statistics shows a large and sustained increase in purchasing from supermarkets, beginning in March 2020 and persisting in the following months (ABS, 2020). Substantial increases in demand for specific goods have been reported across these countries, for example, prescriptions for diabetes medication (Engstrom et al., 2021), toilet paper (Hercher, 2020; Stratton, 2021), and liquor (Hu, Quigley, & Taylor, 2021). In addition to increased sales or demand, surveys from the end of March 2020 show that up to more than half of respondents in the US selfreport some kind of stockpiling behaviour (Amaral, Chang, & Burns, n.d.), indicating that these types of behaviours were commonplace.

An early literature review into panic buying during the pandemic highlighted four key psychological drivers of panic buying behaviour: the perceptions of the threat of the disease and scarcity of goods, a fear of the unknown, a potential coping behaviour, and broader social factors such as levels of social trust (Yuen, Wang, Ma, & Li, 2020). This has been reflected in broader research which reinforced these key drivers (Cypryan´ska & Nezlek, 2020; Jaspal, Lopes, & Lopes, 2020; Lehberger, Kleih, & Sparke, 2021; Li, Zhou, Wong, Wang, & Yuen, 2021; Omar, Nazri, Ali, & Alam, 2021), and other studies additionally highlighting death anxiety, analytical reasoning, and susceptibility to right-wing authoritarianism as being associated with panic buying (Bentall et al., 2021). Some researchers have also pointed to a distinction that panic buying is driven by perceived scarcity, while hoarding is driven by uncertainty (David, Visvalingam, & Norberg, 2021).

Some research has identified demographic factors that increase the likelihood of panic buying, including being younger, female, having children, and having a higher income (Bentall et al., 2021). However, other research has shown that panic buying occurs across income brackets, albeit at higher rates among those with higher incomes (Yoshizaki, de Brito Junior, Hino, Aguiar, & Pinheiro, 2020). Overall it appears that a combination of psychological beliefs, demographic characteristics, and social effects drive panic buying.

1.2 Panic buying as a collective collaboration problem

Many societal issues can be framed as a 'tragedy of the commons' (Diekert, 2012; Hardin, 1968), whereby universal utility is high under cooperation, but individuals benefit by not cooperating. Panic buying can also be seen as a collective cooperation problem — and indeed previous research has drawn parallels between game theoretic paradigms and responses to the COVID19 pandemic (Johnson, Dawes, Fowler, & Smirnov, 2020), including panic buying specifically (A. Nguyen, 2021; H. A. Nguyen, 2021).

One key construct in many of these game theoretic paradigms is a model or belief about what actions other players in the game are likely to take. Psychologically, this capacity is known as Theory of Mind (Singer, 2009), and this is a clear and important driver of panic buying behaviour. Specifically, this relates to the perception of scarcity and demand for a product, and how the perception of others might also have an impact (Wu, Fung, & Mobbs, 2021) (see Potential interventions to combat panic buying below). Notably, individuals who are more pro-social tend to expect more cooperative actions from others (Pletzer et al., 2018).

Previous research has shown that actions in collective collaboration problems like the prisoner's dilemma can be shifted by presenting the problem with different framing (Columbus, Mu¨nich, & Gerpott, 2020). This suggests that framing or messaging interventions may also be effective in altering panic buying behaviours.

1.3 Potential messaging interventions to combat panic buying

Some researchers have identified that interventions by businesses such as setting purchase limits can be effective at reducing panic buying (Prentice et al., 2021). One challenge for policymakers is that they have limited tools for intervening to combat panic buying, although communications are key tools that are readily available. However, to our knowledge, potential communications have not been tested — simulations of panic

behaviour have used agent-based modelling techniques rather than real consumers (Upton & Nuttall, 2014).

A number of potential solutions have been highlighted. For example, since perceptions of scarcity have repeatedly been shown to be a key driver of panic buying (Chua, Yuen, Wang, & Wong, 2021; Yuen et al., 2020), some researchers have suggested that messaging from governments could be used to combat this directly by reassuring consumers that there are no shortages (S. Y. Arafat, Kar, & Kabir, 2020; Islam et al., 2021). In particular, this reassurance may help to reduce the situational ambiguity faced by consumers that drives stress and ultimately panic buying (Herjanto, Amin, & Purington, 2021).

Similarly, social norms (the perceived standards by which society operates) are powerful determinants of behaviour, including panic buying (Rudert & Janke, 2021). In response to disaster, norms may be disrupted, meaning that new norms must take their place. These new emerging norms can be ultimately helpful (such as civilians helping each other escape the World Trade Center in response to the 9/11 attacks) or harmful (such as in mass panics) (Lemonik Arthur, 2013). In Australia, community-based messaging was commonly used throughout the pandemic (e.g. "Because of the efforts of every Victorian...") (Premier of Victoria, 2021). At a time when existing norms are disrupted, highlighting that most people typically behave in a beneficial way, and utilising elements of reciprocity (i.e. the social norm obliging repayment of favours, gifts, invitations, etc. and the shunning of those who freeload)(Cialdini, 2006) may help establish beneficial norms.

Alternatively, appealing to people's moral values and shame-based messaging have been used successfully to reduce harmful behaviour or promote positive behaviours, particularly in the health context (Amonini, Pettigrew, & Clayforth, 2015; Everett, Colombatto, Chituc, Brady, & Crockett, 2020; Feinberg & Willer, 2019). With viral images of panic buying common, there is an opportunity to call out individuals who go against moral values, and to use societal pressure to reduce panic buying — for example, some researchers have suggested that policymakers could combat panic buying by highlighting the impact of panic buying on the most vulnerable members of society (Dai, Kim, & Jia, 2022), or by encouraging consumers to think about others more generally to promote a greater sense of kinship and in-group identity (S. Y. Arafat et al., 2020; Billore & Anisimova, 2021; Simpson, 2006). These types of messages were common at the Federal level during

the pandemic in Australia — "It's [panic buying] ridiculous, it's un-Australian, and it must stop'.' (ABC, 2020b)

Notably, a number of researchers have argued that there is a risk that messaging about panic buying could have a "backfire" effect (whereby messaging *increases* the likelihood or amount of panic buying), particularly if the messaging specifically highlights panic buying or shortages as key issues (Taylor, 2021; S. Y. Arafat et al., 2020; Chua et al., 2021). The concern is that messaging about panic buying makes the issue more salient, and attempts to refute it will only serve to enhance its prominence — this phenomenon, also known as ironic effects of negation, has been demonstrated in a range of domains (including eating behaviour, Adriaanse, Van Oosten, De Ridder, De Wit, and Evers (2011); and financial decision making, Wirth, Kunde, and Pfister (2019)). Consequently, it is important to test whether not mentioning panic buying at all influences people's behaviour and responses.

2. Methods

We aimed to identify the types of messages that are most effective at preventing or reducing panic buying behaviour. To do this, we used an online experiment to test the effectiveness of three different messages based on the key drivers identified above. Given the risks described above of a backfire effect, all messages are designed to avoid explicitly mentioning panic buying, and instead use more passive framing ("buy only what you need"). In addition, we included a no-action control to test whether the other message alternatives were actually better than saying nothing at all about panic buying.

2.1 Participants

Our participants were 2,002 adult (over 18 years old) Australians representatively sampled with respect to age and gender. We recruited participants via a panel provider (PureProfile) over a one week period starting the 18th of June 2021. Prior to participation, participants were fully briefed about the content and nature of the task, and were told their participation was anonymous and confidential. Participants provided informed consent prior to participation in the study.

Note that while the goal was to attain an approximately representative sample, due to time limits we softened the restriction on age bands by 5%. This means that the sample

within the 18-24 age band is slightly underrepresented (n = 189). We did not expect this to significantly impact our results or their interpretation.

2.2 Interventions

Our messages were developed based on our understanding of the psychological drivers of panic buying summarised above.

The first message used a framing that involved **Norms and reciprocity**.

> "To help your family and your community, please buy only what you need and think of others when you shop at the supermarket. Most people do the right thing."

The second message specifically targeted perceptions of **Scarcity**:

> "Australia produces three times as much food as it consumes. We're not going to run out so please buy only what you need at the supermarket."

The third message was framed as an **Appeal to morals**, which was similar to the **Norms and reciprocity** message, but additionally incorporated an element of shaming (Kellermann & Cole, 1994):

> "If you're greedy and buy more than you need at the supermarket, there will be gaps on shelves and the state's most vulnerable people will miss out."

As the ironic effects of negation theoretically pose a risk of backfire (S. Y. Arafat et al., 2020; Chua et al., 2021), we also included a **No message** control condition where participants did not receive any messaging aside from the protocol, to test whether the other message alternatives were actually better than saying nothing at all about panic buying.

2.3 Protocol

Participants were first screened for age and gender criteria to ensure representative sampling. Any participants who did not meet these criteria were exempted from the study. Participants were then asked to complete a consent form and to respond to a survey of questions. Participants who did not consent were exempted from the study. Participants were then randomly assigned to one of the four conditions above.

In the first stage of the task, participants were presented with a hypothetical scenario where a new COVID-19 outbreak had been announced and the government had imposed some restrictions. The tone and content of this message was very similar to that used by state governments in Australia. In each of the four conditions, the announcement was exactly the same:

> "Due to a recent outbreak of community transmission of coronavirus (COVID-19), the state will be introducing tighter restrictions from 11.59pm tonight. Under the restrictions, there will only be five reasons to leave the home: shopping for essential supplies, care and caregiving, exercise, essential work and study, and getting vaccinated. Exercise and shopping will be limited to within 5 kilometres of the home (where practical). Anyone who has symptoms is encouraged to get tested, and isolate until they get their test results."

Each treatment also saw an additional sentence, which corresponded to the intervention messages above (but which was omitted in the control condition). Participants were also reminded that this was a hypothetical exercise, and if they were to experience any distress from the scenario, were encouraged to use resources such as (national help lines and websites for mental health and support services.

Following this, we asked participants about their desire to go to the supermarket, and whether they would change their typical purchase quantity of products identified as being high-risk for panic buying (e.g. toilet paper, meat, flour, pasta or rice, canned goods, long life milk, sanitary products). We also asked participants how likely they thought stores would run out of these items, and their trust that other people would shop responsibly for these items. Finally, we asked participants if they had ever increased their purchase of any of these items in response to events arising from the COVID-19 pandemic in the past. We then asked participants to respond to an attention check, which was to enter the word "silver" in a free text box. Participants who failed this attention check were excluded.

The next stage of the task was for participants to choose one of the items above, and to approximate how many units of this item they would need for a two week home-isolation period.

We treated this quantity as a participant's "baseline" purchase quantity. This was emphasised to participants with the text: "Remember, the amount you chose previously

([baseline number] packs) is a sensible amount of [baseline item] to purchase. Supermarkets cater for everyone's normal demand with only a small buffer, and purchasing any more than you need can impact others' requirements." After this, respondents were presented with a decision tree which reflected the structure of a modified prisoner's dilemma game (see Fig 2), and the following text: "Depending on your choice, and the choice of other Australians participating in this survey, you could earn an extra bonus, based on the decision tree and table below."

Participants were also shown the text: "Remember, others will be making the same choice as you - and their decision will affect yours." The intervention message that corresponded to their treatment condition was then repeated.

The "other player" in the prisoner's dilemma was defined as the majority of all others - i.e., if a majority of other respondents chose to purchase their baseline or below, it would count as them cooperating. We chose payoffs to replicate the ratios typically found in the literature.

The structure of the decision tree was chosen to reflect the incentives to panic buy present in a real-world scenario. That is, participants could maximise their individual payoff by acting in a "selfish" manner (purchasing more than they need, and possibly impacting others). However, if every participant acted in this way (and this caused item shortages), the payoff would be greatly reduced. On the other hand, if participants behaved in a "selfless" way, and others also behaved in this way (i.e. everyone bought only what they need), the collective payoff would be maximised. However, if the remaining participants panic bought and created shortages, then a participant who acted selflessly would be left with the worst outcome.

Figure 1: Items chosen by participants in the prisoner's dilemma scenario. Participants who chose the "Other" category, nominated items such as frozen food, alcohol, snack foods, cleaning products, and pet food.
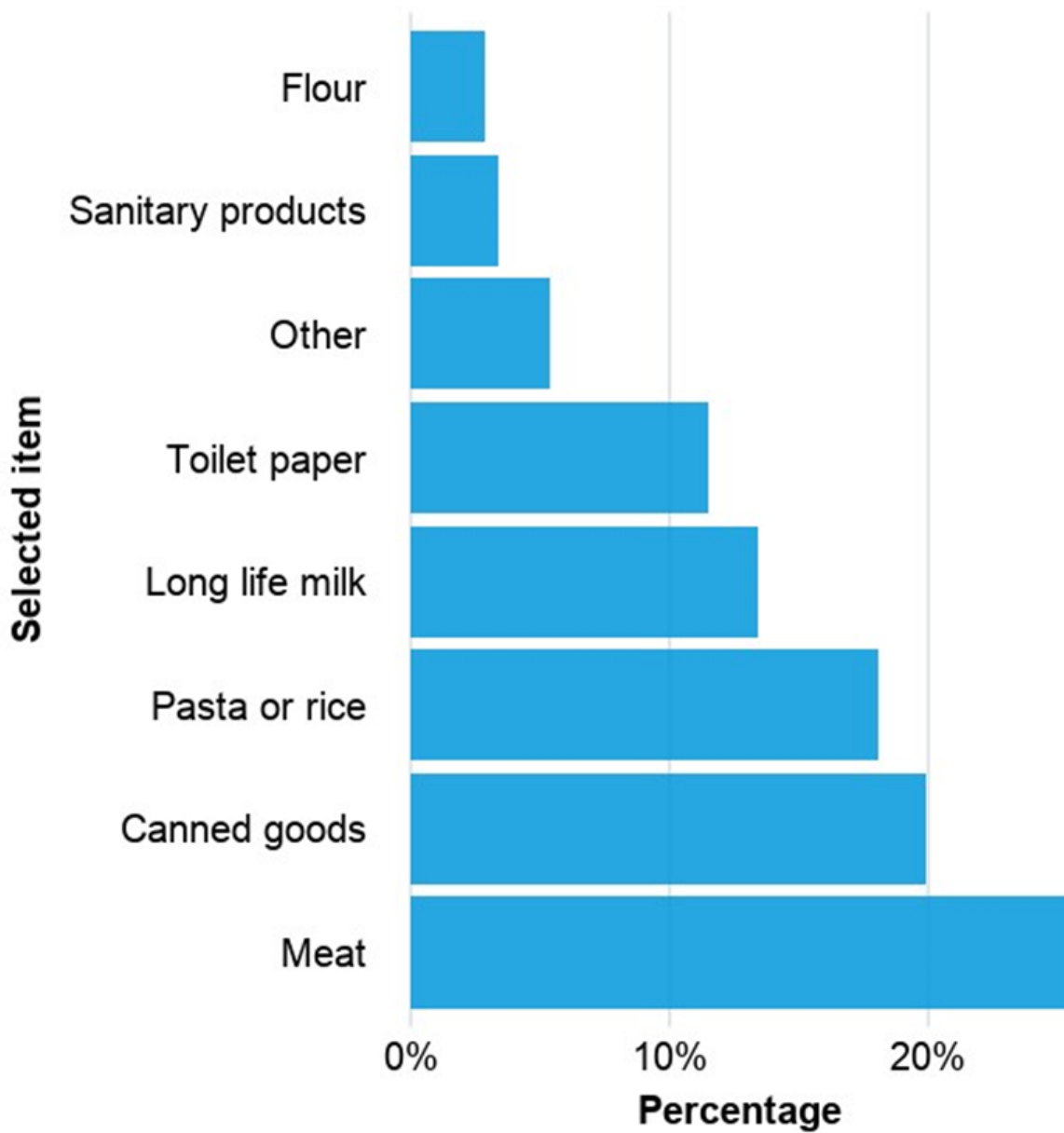
Figure 2: Prisoners dilemma scenario. Respondents were asked to pick a product, and asked how much they would need for two weeks at home. They were then given the hypothetical option to either choose to purchase only as much as they need, less than what they need, or more than this amount. Importantly, they were told that they could earn an additional payment depending on their choice and the choices of others.
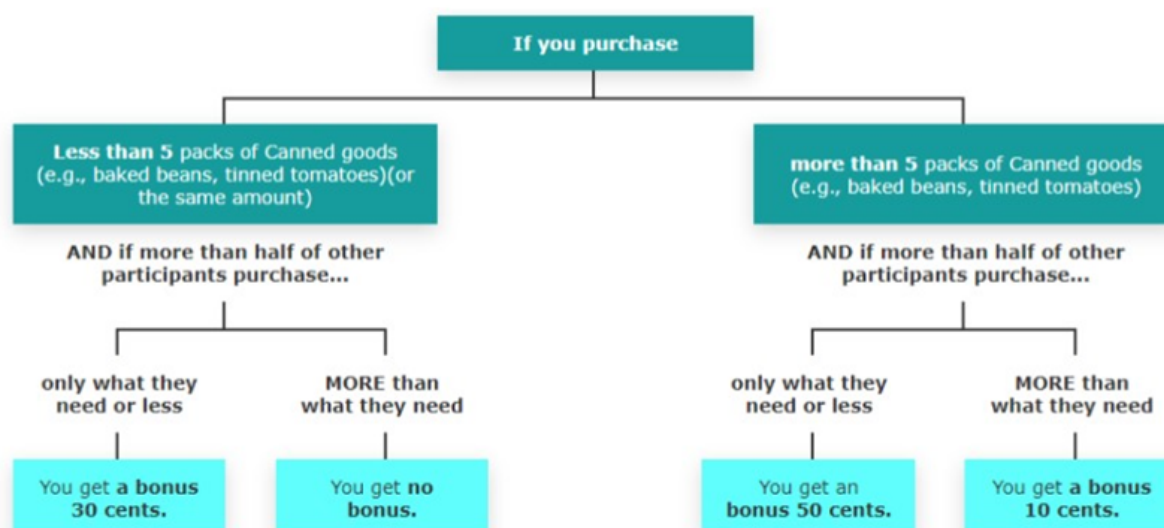
Notably, there is some variation in the perception of what constitutes panic buying (Ntontis et al., 2021). Here, we operationalised panic buying behaviour as choosing to purchase more than the baseline quantity nominated by participants — i.e. more than they needed. Participants could choose to purchase as much (or less than) the amount they selected as their baseline (which corresponds with cooperating in the prisoner's dilemma) or more than their baseline (which corresponds with defecting in the prisoner's dilemma).

The payoffs were chosen to reflect typical payoff matrices in similar experiments (Columbus et al., 2020), normalised with respect to the total incentives that participants were offered. Participants were provided with $2.80 as remuneration for participation, with the opportunity to earn up to a further 50 cents depending on their responses.

Note, whilst we told participants that their payoffs may vary, for ethical and logistical reasons, we simply gave all participants the maximum extra incentive possible (i.e. they all received 50 cents in addition to standard compensation). We did this to ensure that no participant was potentially disadvantaged, and also because the additional incentive could

only be administered significantly after the survey (i.e., after data collection and analysis had been completed), diminishing its impact. The fact that participants received the full incentive was only revealed after the task, as a debriefing statement.

The behavioural responses captured as part of the modified prisoner's dilemma complement the responses participants provided earlier about their intentions to panic buy, as self-reported intentions often depart from observed behaviour (Sheeran & Webb, 2016; Dang, King, & Inzlicht, 2020; Webb & Sheeran, 2006).

2.4 Data analysis

All statistical analyses were carried out in R (R Core Team, 2013). For all statistical tests, we used robust linear or logistic regression. Standard errors were adjusted using the 'sandwich' package (Zeileis, Ko¨ll, & Graham, 2020; Zeileis, 2004).

As pre-specified in our analysis plan, we ran two models for each set of analyses. The first 'simple' model contained only the key independent variables. The second 'full model' contained these as well as the covariates of gender, age, number of dependents, income bracket, and education level. All plots represent the estimates of the latter model, relative to the intercept from the simple model. For brevity the simple models are reported in the tables in the main text (the 'full model' estimates are presented in the supplementary information). Note that the estimates from each of these models did not differ substantially.

Where appropriate, we corrected for multiple comparisons using BenjaminiHochberg step-up procedure. All tests were two-tailed unless otherwise specified. We used an alpha level of .05 for all statistical tests. Our analysis approach was preregistered on the Open Science Framework prior to data collection (https://osf.io/bzqek).

3. Results

3.1 The appeal to morals reduced panic buying intentions

After seeing the hypothetical scenario, the **Appeal to morals** had the largest impact on purchasing intentions, compared to the no message control. It reduced intentions to panic buy by 0.1 points on a 1-7 scale (with 4 representing no change, and 7 representing a large increase). Whilst this is a relatively small change, it is statistically significant, and likely reflects the fact that panic buying is driven by a small proportion of the population.

The **Scarcity** message also saw a reduction in intentions to increase purchasing, but by a smaller amount (0.07 points). This difference was approaching significance at conventional levels ($p < 0.1$). In contrast, the **Norms and reciprocity** message had almost no impact on panic buying intentions compared to the control (**No message** about panic buying).

Figure 3: Self-reported intention to purchase more than needed. (see also Figure 4).
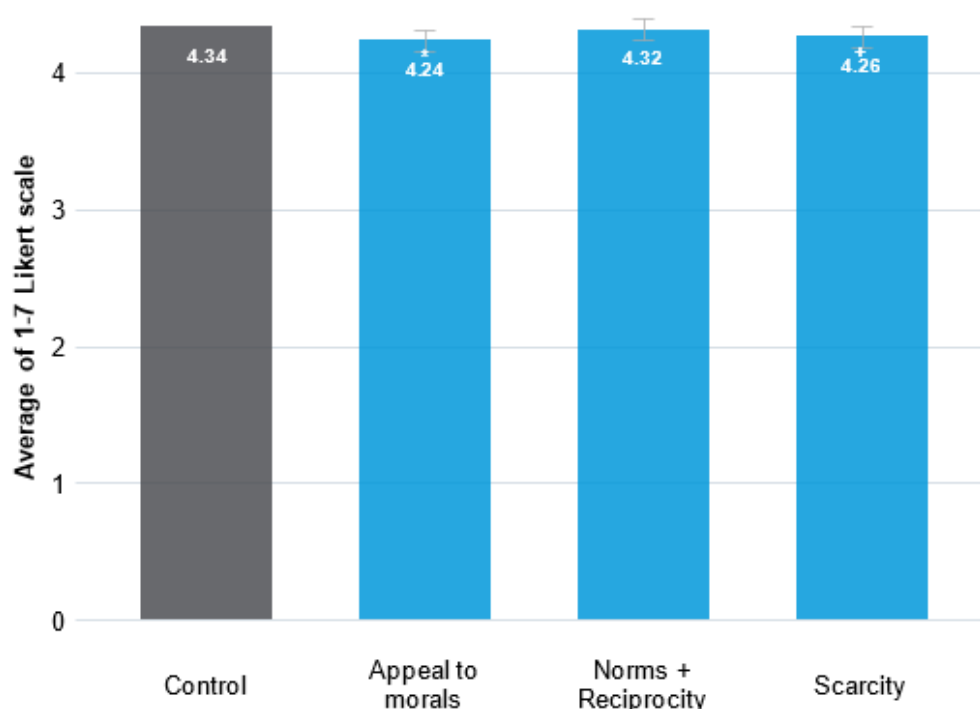
3.2 Appeal to morals and norms and reciprocity reduced panic buying behaviours

Both the **Appeal to morals** and the **Norms and reciprocity** treatments saw a large and significant reduction in simulated panic buying in our behavioural task, compared to the control (no message about panic buying) (see Figure 4). This translated to a decrease of 8.6 and 8 percentage points respectively (relative decreases of 42% and 39%) in the likelihood that re-spondents chose to purchase more than they needed. The Scarcity arm saw a reduction as well, but this was not statistically significant (Table 1).

Figure 4: Prisoners dilemma results
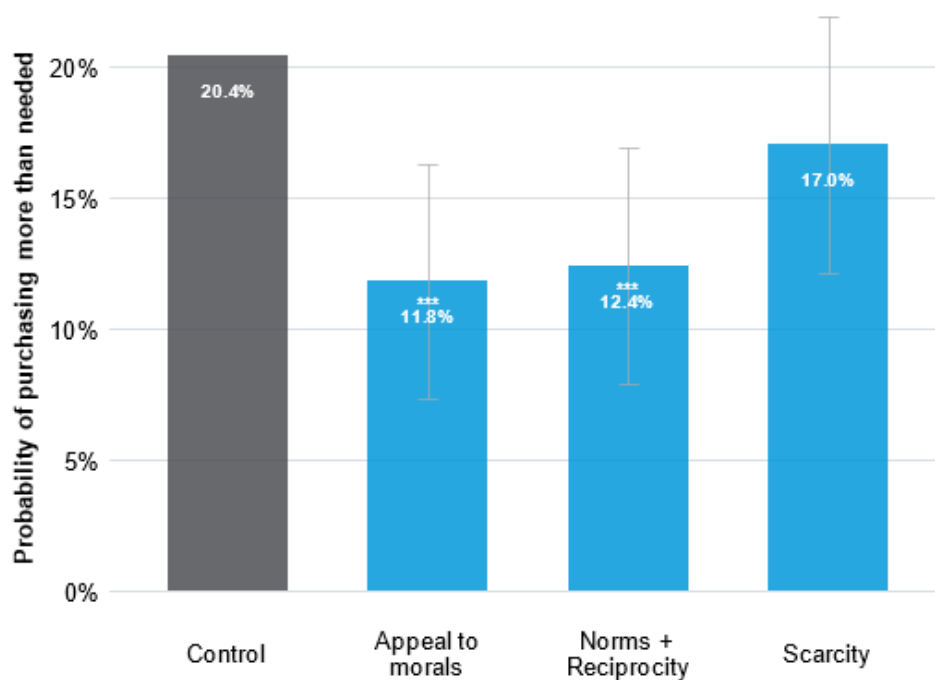
Table 1: Results of the prisoner's dilemma task

	Dependent variable: Purchasing more than needed
Norms + Reciprocity	−0.589***
	(0.174)
Scarcity	−0.217
	(0.166)
Appeal to morals	−0.675***
	(0.177)
Constant	−1.361***
	(0.111)
Observations	2,002
Log Likelihood	−846.139
Akaike Inf. Crit.	1,700.278
Note:	*p<0.1; **p<0.05; ***p<0.01

3.3 The scarcity message reduced expectations of products running out

The **Scarcity** message — which highlighted that Australia had no shortage of supplies — appeared to be the best at reducing expectations that products might run out. This may partly explain why this message also saw a reduction in the intentions to increase purchasing.

This is perhaps unsurprising — a key driver of panic buying is a perception that there will be shortages. This can be driven by a rational assessment of the wider situation (for example, arguably people will use more of certain products if confined at home), but can also be in anticipation of panic buying by others. However it is important to note that whilst there is some evidence of the **Scarcity** message reducing intentions and perceptions of scarcity, this does not translate into statistically significant changes in actual behaviour in the second part of the trial.

3.4 Trust in others to do the right thing is low

Overall, none of the treatments appear to change respondents' perception as to whether others will shop responsibly, and trust in others was low. Across all treatments, around two thirds of all respondents trusted others to shop responsibly either slightly or not at all. Put another way, the average respondent rated their trust in others shopping responsibly and not buying too much as approximately 2 on a 1-5 scale (where 1 corresponds to "not at all" and 5 to "completely"). For reference, 2 on the scale corresponded with an answer of "slightly".

We also asked for trust in others to shop responsibly for specific products. Interestingly, trust in others was particularly low for toilet paper — respondents' average rating was approximately 1.7 (i.e., between "not at all" and "slightly").

Notably, despite trust in others being relatively low, the majority of respondents did not panic buy in our simulated task (close to 80%), and a similar proportion reported little to no increase in past purchasing behaviour of key items. It is likely that this represents a form of pluralistic ignorance, in that whilst most people don't themselves panic buy, the perception is that panic buying is highly prevalent in the wider community.

3.5 There is strong community support for supermarket purchase limits

There was overwhelming support for supermarkets introducing their own purchase limits. On a 1-5 scale (strongly oppose to strongly support), the average across the country was well above 4, corresponding to an average of "support".

Notably, when looking at a breakdown of responses, around 80% either supported or strongly supported the measures, with just 6% opposing or strongly opposing. Support for these measures was consistent across demographics, though notably older cohorts were the most supportive overall, with 90% of those aged over 65 supporting or strongly supporting purchase limits.

4. Discussion

There was a large and significant reduction in simulated panic buying behaviour from both the **Appeal to morals** and **Norms and reciprocity** messages. Both results are interesting — the **Appeal to morals** message reduces both intentions and behaviour, suggesting that making a strong moral appeal has a powerful impact on people. In contrast, the **Norms and reciprocity** message does not seem to affect intentions at all, but it has a very big impact on simulated behaviour. Notably, the norms and reciprocity message may be particularly relevant — the trial shows that despite most people not panic buying in our simulated task and reporting low levels of past panic buying behaviour, trust in others is relatively low. Hence there may be a role for governments to inform the public about the fact that the majority of people do the right thing. Importantly, the results also suggest that there are benefits to promoting positive messages, and that the risk of 'backfire' effects can be mitigated by not using the phrase 'panic buying'.

It is also important to note that both successful messages include multiple components (e.g., the moral appeal includes an admonishment for being greedy, and highlights the impact on the vulnerable) — it is not clear whether one part of the messages is more important than the other. Given the success of the two messages there may also be benefits in combining them — for example, by indicating that those who panic buy are not only doing the wrong thing, but that they are also in the minority (and most people do the right thing). There may also be ways to further improve the effectiveness of the messages by testing more (or less) emotive moral language, by separating out the components of the

messages to identify the most effective parts, or by pairing the messages with compatible imagery.

Further work could also test whether different messengers impact the effectiveness of the message (Wilson & Sherrell, 1993) — for example, whether the message is received differently from a politician or a health expert. Alternatively, testing could evaluate whether message effectiveness varies depending on trust in government and institutions, or based on political affiliation of the respondent and the messenger. Perhaps the most promising avenue might be to find ways to preemptively reduce panic buying — for example, by using messaging, media stories or other initiatives to build trust (Balog-Way & McComas, 2020; Catellani, 2020).

Finally, it is important to note that the experiment was conducted during a period of time with specific conditions. When the experiment was conducted, most participants would likely have had some previous experience of pandemic-driven panic buying and restrictions, and they may already have thought through (implicitly or explicitly) some of the trade-offs we presented. Hence another area for further work would be to consider more unusual or uncommon cases of panic buying, or panic buying where there is actually a genuine shortage or scarcity — for example, panic buying of fuel during times of shortage.

Overall this work demonstrates that simple messages can have an impact on intentions and potentially behaviour, suggesting that despite limited levers, there are steps that policymakers and other authorities can take to reduce the impacts of panic buying during times of crisis.

Data and code availability

Behavioural data and accompanying code for all behavioural analyses and figures can be found on the Open Science Framework (https://osf.io/bzqek). Any other information is available from the corresponding author on reasonable request.

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