

Personality Psychology

# Honesty-Humility, Beliefs, and Prosocial Behaviour: A Test on Stockpiling During the COVID-19 Pandemic

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Increasing evidence links personality to prosocial behaviour. HEXACO Honesty-Humility, in particular, has been linked to prosocial behaviour when it comes with a personal cost. Yet, evidence for such a link is mostly limited to the laboratory, although social dilemmas abound in daily life. Emergencies such as the COVID-19 pandemic pose salient conflicts of interests between individual and societal welfare. One example is the run on many basic goods in anticipation of lockdowns. Such social dilemmas afford the expression of personality traits associated with individual differences in prosocial behaviour. Indeed, across two studies ( $N = 601$ ), Honesty-Humility was positively, albeit weakly associated with refraining from stockpiling in the past and intentions to do so in the future. Causal mediation analysis shows that this was not due to differences in beliefs that others would refrain from stockpiling. Instead, results suggest that faced with a social dilemma, individuals high in Honesty-Humility may have been willing to forego individual benefit. This provides rare evidence on the relationship between Honesty-Humility and prosocial behaviour in a field setting.

With the spread of the 2019/20 COVID-19 pandemic to Europe and North America in early March 2020, there were widespread reports that people were buying up soap and hand sanitiser, but also food and other daily necessities. Social media reports showed emptied shelves and people buying entire shopping carts full of toilet paper. Indeed, by mid-March, stores across these regions had run out of many items, leading to further fears of long-term supply shortages (Corkery & Maheshwari, 2020; Pidd, 2020).

Stocking up on goods during an emergency forms a social dilemma. Under normal circumstances, there are few reasons to stockpile canned foods or toilet paper. During an emergency such as the COVID-19 pandemic, however, expectations change. People come to expect others to increase their purchases (Paloyo, 2020). This creates a coordination problem in which people would be best off if everybody kept purchasing regular amounts, but in which people may begin to stockpile out of fear that others will deplete supermarket stocks, leaving them with nothing. Indeed, reports suggest that at least in the early weeks of the COVID-19 pandemic in Europe and North America, mass purchases were caused by fears that other people were buying up reserves (Corkery & Maheshwari, 2020).

When others are stockpiling food and toilet paper, even if they do so out of fear of being left without, refraining from making extra purchases is a form of prosocial behaviour. What psychological traits may lead people to hold back

on buying? Among broad personality traits, Honesty-Humility has been most consistently and most strongly linked to prosocial behaviour (Thielmann et al., 2020). As proposed in the HEXACO model of personality, Honesty-Humility represents a tendency to forego opportunities for personal gain when they come at a cost to others (Ashton & Lee, 2007). Indeed, Honesty-Humility has been linked to a wide range of prosocial behaviours including cooperation in economic games (Thielmann et al., 2020) and organisational citizenship behaviours (Pletzer et al., 2019). Here, I build on this literature by testing the link between Honesty-Humility and stockpiling during the COVID pandemic.

## Honesty-Humility and Prosocial Behaviour

The relationship between Honesty-Humility and prosocial behaviour has been studied in the laboratory using a variety of economic games (Thielmann et al., 2020). In the Dictator Game, one player receives an endowment and can decide how much of this endowment to share with another player. Transfers are thus purely altruistic. In the Prisoner's Dilemma, two players each decide whether to cooperate or to defect. Mutual cooperation maximises joint outcomes, but individual payoffs are maximised by (unilateral) defection. Cooperation thus is a form of prosocial behaviour in the face of temptation to exploit others as well as fear of exploitation. Meta-analytic evidence supports Honesty-Hu-

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mility as a predictor of prosocial behaviour in the Dictator Game ( $\hat{\rho} = .26$ ) and social dilemma games such as the Prisoner's Dilemma ( $\hat{\rho} = .18$ ). Although these effects are small, among personality traits Honesty-Humility is among the strongest predictors of prosocial behaviour in such games (marginally stronger correlations were found for the narrow traits guilt proneness and Social Value Orientation).

Beyond laboratory studies of economic games, Honesty-Humility has been linked to (refraining from) unethical behaviour such as cheating, criminality, and counterproductive work behaviour, though mostly through survey measures. Meta-analytic evidence suggests a medium-sized correlation between Honesty-Humility and various behaviours in this domain ( $\hat{\rho} = -.41$ ; Zettler, Thielmann, et al., 2020). Studies of prosocial behaviour similarly find larger correlations using survey measures of altruism ( $\hat{\rho} = .49$ ; Zettler, Thielmann, et al., 2020) than using economic games. This suggests that correlations between Honesty-Humility and survey measures of pro- or anti-social behaviour might be inflated by common method bias.

Importantly, it is much less clear how strongly Honesty-Humility relates to individual acts of prosocial behaviours in daily life. A recent study of prosocial behaviour using experience sampling methods found no link between Honesty-Humility and prosocial behaviour towards close partners and towards general others (Columbus et al., 2019). This could reflect the challenge of predicting specific behaviours from broad traits (Möttus, 2016; Möttus et al., 2020; Thielmann et al., 2020).<sup>1</sup> At this point, however, few studies have investigated links between Honesty-Humility and specific individual behaviours outside the laboratory. The studies presented here add to this literature.

### Mechanistic Explanations of the Link Between Honesty-Humility and Prosocial Behaviour

Recent work has emphasised that Honesty-Humility should not predict prosocial behaviour independent of context. Rather, it is a predictor of active acts of prosociality in contexts that involve a conflict of interests (Thielmann et al., 2020). One reason for this is that those high in Honesty-Humility are willing to forego opportunities to benefit themselves when this would come at a cost to others (Ashton & Lee, 2007). Recent evidence suggests that this is more motivated by avoidance of self-advantageous inequality than by seeking to maximise overall welfare (Mischkowski et al., 2019). In contrast, studies of motives to 'prep' for a doomsday scenario show that Honesty-Humility is negatively associated with a competitive view of survival (Fetterman et al., 2019). Thus, individuals high in Honesty-Humility may refrain from stockpiling because they are willing to make sacrifices to promote equality and social welfare.

Another reason that Honesty-Humility may drive people to behave prosocially during a crisis is the relationship between Honesty-Humility and trust (Balliet & van Lange,

2013; Thielmann & Hilbig, 2015). Those high in Honesty-Humility expect others to be more cooperative (Thielmann & Hilbig, 2014), which may motivate them to behave prosocially themselves. Thus, high Honesty-Humility may also lead people to refrain from stockpiling because they expect others to do the same; conversely, low Honesty-Humility may be associated with distrust and lead people to buy up goods so that they are not left without.

Although the link between Honesty-Humility and trust is well-established (Thielmann & Hilbig, 2014), there is scant evidence that this serves as a mechanism linking Honesty-Humility and prosocial behaviour. Recent meta-analytic evidence shows that Social Value Orientation—which can be conceptualised as a facet of Honesty-Humility (Hilbig et al., 2014)—is linked to prosocial behaviour in large parts through expectations that others will behave cooperatively (Pletzer et al., 2018). However, similar evidence is absent for Honesty-Humility itself. Stockpiling at the start of the COVID-19 pandemic thus provided an opportunity to test whether Honesty-Humility is linked to prosocial behaviour in the field through beliefs about others' behaviour in this situation. I thus hypothesised that Honesty-Humility would predict stockpiling, in part because individuals high in Honesty-Humility would have more positive beliefs about the behaviour of their peers.

## Study 1

### Methods

#### Participants

$N = 200$  UK residents ( $\bar{x}_{age} = 34.25(26.09)$ ; 70.5% female) were recruited through the Prolific platform on March 13, 2020. Prolific is a UK-based platform whose survey pool is non-representative, but more diverse than typical student samples (Palan & Schitter, 2018; Peer et al., 2017). Participants were paid £0.40 for their participation in a three-minute survey. The sample size was chosen in line with financial constraints. Sensitivity power analysis using G\*Power (Faul et al., 2007) given the observed rate of stockpiling ( $\hat{p} = .36$ ) indicated 80% power to detect an odds ratio of 0.65 for the effect of Honesty-Humility on stockpiling.<sup>2</sup>

#### Historical Context

In the UK, media began to report on stockpiling of basic goods—brought on by the arrival of the COVID pandemic in Europe—at the beginning of March 2020 (Pidd, 2020). Compared to February 2020, Google search trends for the UK show a hundredfold increase in searches for 'stockpiling' between the week of March 1–7 and the week of March 15–21, peaking in the latter week. Increases in searches for 'hoarding' showed a similar pattern (see SI). Data for Studies 1 and 2 were thus collected at the height of awareness for stockpiling of goods in the UK.

1 It is worth noting that Columbus et al. (2019) also did not find a link between Honesty-Humility and prosocial behaviour in economic games, so this interpretation should be taken with caution.

2 Data, code, materials, and the preregistration for Study 2 are available on the Open Science Framework (<https://osf.io/xm6kg>)

**Table 1. Zero-order correlations between variables in Study 1. The upper triangle shows 95% confidence intervals for correlation coefficients. The diagonal shows means (and standard deviations, for continuous variables).**

	H-H	Stockpiling	Beliefs	Female	Age
H-H	4.70(.86)	[-.31, -.04]	[-.26, .01]	[-.18, .10]	[-.19, .08]
Stockpiling	-.18	.36	[.15, .41]	[-.04, .24]	[.02, .29]
Belief	-.13	.28	.67(.21)	[-.02, .26]	[-.05, .23]
Female	-.04	.10	.12	.71	[-.12, .16]
Age	-.05	.16	.09	.02	34.25(26.09)

Note: H-H = Honesty-Humility; Belief = Belief about others' stockpiling.

## Materials and Procedure

First, Honesty-Humility was assessed using 16 items from the HEXACO 100 (Lee & Ashton, 2018), using a seven-point scale. The scale showed good reliability,  $\omega_t = .81$ .

Subsequently, participants were asked to report their behaviour "in the last two weeks specifically in response to the coronavirus." Specifically, one item addressed stockpiling ("I have bought more food or supplies than usually."). The survey also included four items related to social distancing (see SI). All items were answered in a yes/no format ( $n = 2$  indicated "does not apply" on the stockpiling item and excluded from further analyses).

Participants were subsequently informed that 100 people from the UK using the Prolific platform would answer the above question. Then, they were asked to indicate how many, out of these 100 participants, they believed would answer 'yes'.

## Software

Data for Studies 1 and 2 were analysed using R (R Core Team, 2020) and tidyverse (Wickham et al., 2019).

## Results

36.36% of participants reported having bought more food or supplies than usually during the preceding two weeks in response to the COVID-19 pandemic. However, on average, participants expected that 66.55% ( $SD = 20.92$ ) of their peers would indicate to have behaved this way. People thus clearly overestimated the proportion of people who engaged in stockpiling.

I used a generalised linear mixed model with logit link function to examine the relationship between Honesty-Humility and stockpiling (Fig. 1A). Individuals higher in Honesty-Humility were less likely to have bought additional goods out of concern over the COVID-19 pandemic,  $\beta = -0.40$ ,  $SE = 0.16$ ,  $Z = -2.53$ ,  $p = 0.012$ ,  $OR = 0.67$ . In contrast, Honesty-Humility was not significantly related to beliefs about other people's stockpiling behaviour,  $\beta = -0.13$ ,  $SE = 0.07$ ,  $Z = -1.79$ ,  $p = 0.075$ , Fig. 1B. Beliefs about others' behaviour did relate strongly and positively to people's own behaviour,  $\beta = 0.72$ ,  $SE = 0.19$ ,  $Z = 3.78$ ,  $p < 0.001$ ,  $OR = 2.05$ , Fig. 1C.

To test whether beliefs about others' behaviour mediated the relationship between Honesty-Humility and stockpiling, I conducted a mediation analysis using the R package 'mediation' (Tingley et al., 2014). This revealed a non-significant average direct effect,  $\beta = -0.07$ , 95% CI = [-0.12, 0.00],  $p = 0.056$ , as well as a non-significant average mediation effect,  $\beta = 0.02$ , 95% CI = [-0.04, 0.00],  $p = 0.052$ , proportion of total effect mediated = 0.20.

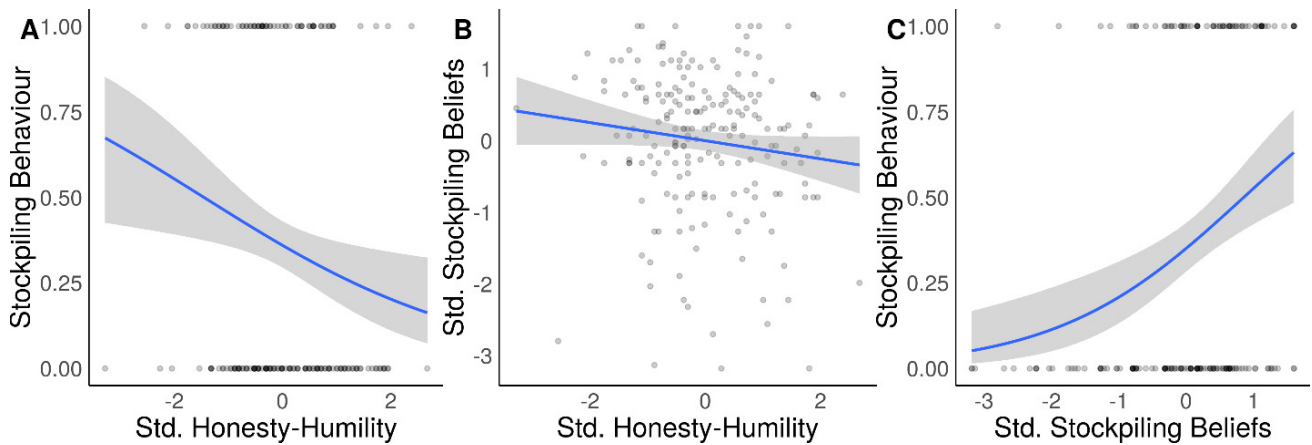
## Intermediate Discussion

Study 1 revealed a significant, albeit small, correlation between Honesty-Humility and stockpiling in response to the COVID-19 pandemic. However, only a non-significant share of this relationship was mediated by beliefs about others' behaviour. Believing that others had increased their purchases was associated with having done so oneself; however, Honesty-Humility did not predict beliefs that others were stockpiling.

One way to interpret these results is that people higher in Honesty-Humility refrained from stockpiling not because of their beliefs about others' behaviour, but out of consideration for others. These concerns can take different forms, such as a motivation to maximise joint outcomes or an aversion to (self-advantageous) inequity (Fehr & Schmidt, 1999). Recent work suggests that individuals high in Honesty-Humility are willing to bear individual costs to maximise joint outcomes. When maximisation of joint outcomes and inequity aversion stand in conflict, however, Honesty-Humility is weakly associated with a preference for inequity aversion, and more so when inequity would be self-advantageous (Mischkowski et al., 2019). The weak correlations in this study suggest, however, that the broad Honesty-Humility trait does not distinguish cleanly between different motives underlying prosocial behaviour. While recognising that other people may engage in stockpiling, those high in Honesty-Humility may thus have held back to ensure that everybody receives a fair share or because they perceived stockpiling as harming social welfare.

## Study 2

Study 1 was largely exploratory and involved a relatively small sample. I thus sought to replicate the observed results in a preregistered follow-up study. In addition, although



**Figure 1. Relations among Honesty-Humility, beliefs, and behaviour.**

A Logistic regression predicting stockpiling from Honesty-Humility. B Linear regression predicting beliefs about others' stockpiling from Honesty-Humility. C Logistic regression predicting stockpiling from beliefs about others' stockpiling.

I hypothesised that people's beliefs that others engage in stockpiling may drive them to change their shopping behaviour, it may be that people's behaviour drives their beliefs (Thielmann & Hilbig, 2014). This could be because shopping exposes people to others' behaviour (e.g., in the form of empty shelves), or because they seek to justify their own behaviour. To further disentangle these factors, I therefore included people's future shopping intentions as a second outcome.

To test causally whether beliefs mediate between personality and behavioural intentions, I used an instrumental variable approach in which the mediator—beliefs—is manipulated exogenously. For this purpose, I exploited the fact that in Study 1, people vastly overestimated how many of their peers engaged in stockpiling. Appeals using descriptive norms have been shown to be powerful interventions to promote prosocial behaviour (Cialdini et al., 1990; Goldstein et al., 2008), and research on the Theory of Planned Behaviour has directly linked descriptive norms to intentions (Rivis & Sheeran, 2003). I thus informed half of the sample in Study 2 of this lower-than-expected rate of stockpiling before eliciting their beliefs and intentions to stockpile in the near future. Whether or not participants were exposed to this information serves as an instrumental variable for their beliefs. This makes it possible to causally identify the indirect effect of Honesty-Humility on intentions to stockpile via beliefs.

Alternatively, the results suggested that Honesty-Humility may relate to stockpiling not because people differ in their beliefs about their peers, but in their consideration of others' outcomes. Such social motives (or *social preferences*) can take different forms. Here, I also included a measure of the motivation to maximise joint outcomes ('MaxJoint') and a measure of the motivation to maximise one's own outcomes ('MaxOwn'). Maximising joint outcomes captures a central motif of 'prosocial' motivation, whereas maximising

individual outcomes captures a central motif of 'pro-self' motivation (van Lange, 1999). These two measures should thus capture the core of a selfish motivation underlying stockpiling.

## Methods

### Sample

$N = 401$  UK residents ( $\bar{x}_{age} = 35.24(12.65)$ ; 64.09% female) were recruited through the Prolific platform on March 17, 2020. Participants were paid £0.60 for their participation in a five-minute survey. To conservatively increase power, sample size was doubled compared to Study 1. Sensitivity power analysis using G\*Power (Faul et al., 2007) given the observed rate of stockpiling from Study 1 ( $\hat{p} = .36$ ) indicated 80% power to detect an odds ratio of 0.74 for the effect of Honesty-Humility on stockpiling, and 96% power to detect an effect of the size observed in Study 1 ( $OR = .67$ ).

### Materials and Procedure

Materials and procedure were largely the same as for Study 1. Honesty-Humility ( $\omega_t = 0.85$ ) was measured using 16 items from the HEXACO 100 (Lee & Ashton, 2018), on a seven-point scale.<sup>3</sup> Stockpiling was measured using the same one-item measure; also included were two masking questions about social distancing and hand washing.

Participants answered three items each measuring their motivation to maximise joint outcomes ("I wanted to assure the best outcome for everybody."; "I wanted to do what's best for everybody", "I wanted to act in the way that's best for society") and their motivation to maximise their personal outcomes (e.g., "I wanted to make sure I have enough for myself.", "I wanted to take care of myself", "I wanted to do what's best for myself"; Likert-type, 1 = "strongly disagree", 5 = "strongly agree"). The items were adapted from van

<sup>3</sup> The survey also included Emotionality for a preregistered exploratory analysis; see SI.

Lange et al. (2011). Model comparison suggested that the two-factor model (AIC = 4731) was superior over a one-factor model (AIC = 5258). Both scales were reliable (MaxJoint,  $\omega_t = 0.91$ ; MaxOwn,  $\omega_t = 0.86$ ).

Subsequently, half of the participants received a short message informing them that in a previous study, I had asked the same question about shopping behaviour. Participants read that “On average, people believed that 67 out of 100 people had bought more groceries than usually during the previous two weeks. However, in fact, only 36 out of 100 people said that they had bought more groceries than usually because of the coronavirus. Most people said they did not increase their shopping.” Then, beliefs were elicited as in Study 1.

Finally, participants were asked to indicate their intended behaviour “during the current week”; the study was conducted on a Tuesday. Stockpiling intentions were measured using a single item, “I am planning to buy more food or supplies than usually” (Likert-type, 1 = “strongly disagree”, 5 = “strongly agree”).

## Analysis

### Parallel Encouragement Design

To provide a stronger test of the causal link between Honesty-Humility, beliefs, and stockpiling, I employ a design-based approach to causal mediation (Tingley et al., 2014). Specifically, I test whether the link between Honesty-Humility and intentions to stockpile is mediated by beliefs that others have stockpiled in the past. To do so, I use a parallel encouragement design in which the mediator is manipulated (orthogonally to the predictor). This secondary manipulation serves as an instrumental variable for the (measured) mediator (Imai et al., 2011). By separately manipulating the mediator, this approach assures that the path from  $M$  to  $Y$  (often called the  $b$  path) can be interpreted causally, because it excludes both confounding by common causes to  $M$  and  $Y$  and reverse causation. In addition, it is no longer necessary to account for alternative mechanisms.

The statistical analysis rests on a two-stage least squares regression (Imai et al., 2011; Kleiber & Zeileis, 2008). This approach first regresses the measured mediator  $M$  on the treatment  $T$  and the instrumental variable for the mediator  $Z$ . At the second stage, the outcome  $Y$  is regressed on the treatment  $T$  and the predicted values for  $M_i$ :

$$M_i = \alpha_2 + \beta_2 T_i + \lambda Z_i + \varepsilon_{i2} \quad (1)$$

$$Y_i = \alpha_3 + \beta_3 T_i + \gamma M_i + \varepsilon_{i3} \quad (2)$$

The average causal mediation effect and average direct effect are estimated by  $\hat{\beta}_2 \hat{\gamma}$  and  $\hat{\beta}_3$ , respectively. I used ordinary nonparametric bootstrap to obtain the confidence interval of the indirect effect using the adjusted bootstrap percentile method (Canty & Ripley, 2017).

## Results

### Confirmatory Analyses

Somewhat more participants reported to have bought more food or supplies than usually during the preceding two weeks than in Study 1 (40.95%). I used a generalised lin-

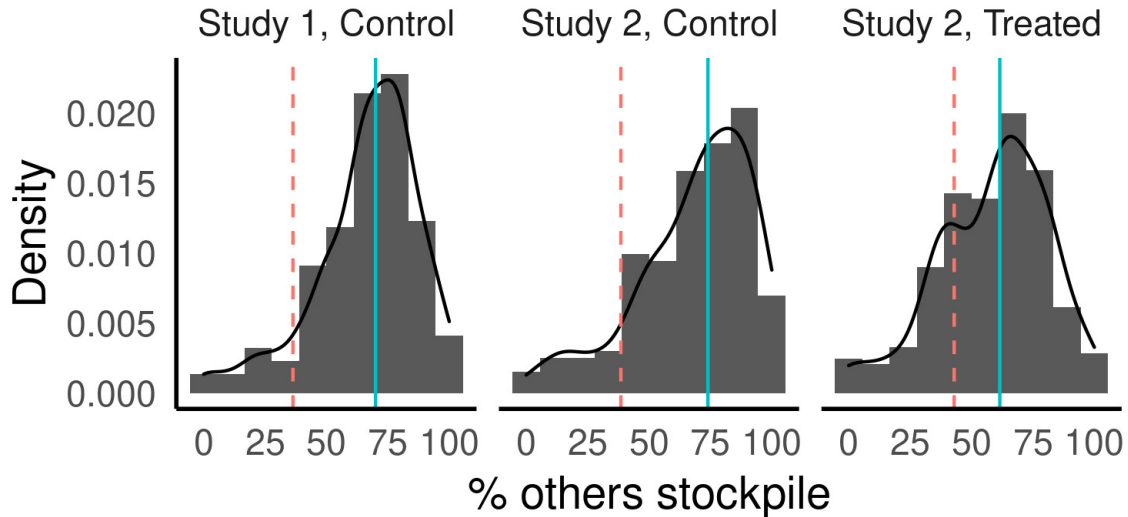
ear mixed model to examine the relationship between Honesty-Humility and stockpiling. Individuals higher in Honesty-Humility were only non-significantly less likely to have bought additional goods out of concern over the COVID-19 pandemic,  $\beta = -0.14$ ,  $SE = 0.10$ ,  $Z = -1.41$ ,  $p = 0.158$ ,  $OR = 0.87$ .

Honesty-Humility was positively associated with motivation to maximise joint outcomes,  $\beta = 0.16$ ,  $SE = 0.05$ ,  $t = 3.21$ ,  $p = 0.001$ , and negatively with motivation to maximise own outcomes,  $\beta = -0.18$ ,  $SE = 0.05$ ,  $t = 3.56$ ,  $p < 0.001$ . To test whether MaxJoint and MaxOwn motivation mediated the relationship between Honesty-Humility and stockpiling, I conducted two causal mediation analyses using the R package ‘mediation’ (Tingley et al., 2014). As preregistered,  $p$ -values for the tests of average causal mediation effects were Bonferroni-corrected for multiple comparisons. For MaxJoint motives, this revealed a non-significant average causal mediation effect,  $\beta = -0.01$ , 95% CI = [-0.02, 0.00],  $p = 0.064$ , proportion of total effect mediated = .19. The average direct effect was not significant,  $\beta = -0.03$ , 95% CI = [-0.07, 0.02],  $p = 0.254$ . In contrast, for MaxOwn motives, the average causal mediation effect was significant,  $\beta = -0.02$ , 95% CI = [-0.04, -0.01],  $p < 0.001$ , proportion of total effect mediated = 0.60, while the average direct effect was not,  $\beta = -0.01$ , 95% CI = [-0.06, 0.04],  $p = 0.604$ . Sensitivity analysis indicated that the indirect effect is robust to violations of sequential ignorability (i.e., confounding by unobserved variables affecting both mediator and outcomes) up to a correlation between the residuals of the mediator and outcome regressions of  $\rho = 0.3$  (Imai et al., 2010).

Honesty-Humility was positively associated with intentions to refrain from stockpiling in the future,  $\beta = -0.24$ ,  $SE = 0.05$ ,  $t = -4.90$ ,  $p < 0.001$ . I tested whether this effect was mediated by beliefs that other people were buying more goods than usually. A message about descriptive norms served as an instrumental variable for beliefs in a parallel encouragement design (Imai et al., 2011). Indeed, the message reduced beliefs that other people were buying more goods than usually,  $\bar{x}_{Control} = 68.61(23.22)$ ,  $\bar{x}_{Message} = 58.70(22.37)$ ,  $\beta = -0.43$ ,  $SE = 0.10$ ,  $t = -4.34$ ,  $p < 0.001$ , Fig. 2. However, beliefs did not mediate between Honesty-Humility and refraining from stockpiling, bootstrapped 95% CI for the indirect effect = [-0.02, 0.05].

### Exploratory Combined Analysis

Across Studies 1 and 2, Honesty-Humility and past stockpiling were assessed the same way. I therefore exploratorily combined data from both studies. Results from the combined analysis of 600 cases showed a small, but significant negative relationship between Honesty-Humility and stockpiling,  $\beta = -0.22$ ,  $SE = 0.08$ ,  $Z = 2.61$ ,  $p = 0.009$ ,  $OR = 0.80$ . This effect was robust to controlling for study, the interaction between study and Honesty-Humility, as well as age and gender (see SI).



**Figure 2. An appeal to descriptive norms reduces beliefs that others stockpile.**

Study 1 elicited beliefs and reports of people's own behaviour. In Study 2, half of the participants were informed about the true rate of stockpiling in Study 1 ('Treated'). The other half did not receive any message ('Control'). Histograms and density plots show the distribution of beliefs about the percentage of others who engage in stockpiling. Solid blue bars show the median belief; dashed red bars show the actual rate of self-reported stockpiling for each wave.

## Discussion

### Personality and Stockpiling

The COVID-19 pandemic is posing a plethora of societal challenges in which individuals must choose between maximising their own benefits and promoting social welfare. One case is the decision to stockpile daily necessities. I have argued that Honesty-Humility should explain variation in who does (and does not) stockpile goods under conditions when this forms a social dilemma. Across two studies (one preregistered), Honesty-Humility was negatively associated with past stockpiling, although only significantly so in the first study and in an exploratory combined analysis. Moreover, in the second study, Honesty-Humility was positively associated with intentions to refrain from stockpiling in the (near) future.

The association between Honesty-Humility and past (Study 1) or future (Study 2) stockpiling was not mediated by beliefs about the shopping behaviour of others. In Study 2, I used an appeal to descriptive norms in a parallel encouragement design to successfully (and accurately) reduce people's beliefs that others were buying more goods than normally. However, this did not reduce intentions to stockpile. Further results suggest that people—and especially those

higher in Honesty-Humility—may refrain from stockpiling because they are more willing to forego individual welfare maximisation.

A number of other studies have explored the relationship between personality traits and stockpiling. Zettler, Schild, et al. (2020) report a very small association between Honesty-Humility and stockpiling in Danish and German samples (zero-order correlation, 95% CI [-.07, -.02]). Some of their data also shows a small association between the Dark Factor of Personality and stockpiling, which is highly similar to and strongly associated with Honesty-Humility (Moshagen et al., 2018). In contrast, Garbe et al. (2020) find mostly non-significant links between Honesty-Humility and various indicators of stockpiling specifically of toilet paper (zero-order correlations of Honesty-Humility with (a) amount bought, 95% CI [-.07, .06], (b) frequency of purchases, [-.08, .05], and (c) amount stocked at home, [.05, .17]); these effects are all non-significant when including regression controls.<sup>4</sup> Garbe et al. (2020) as well as Bentall et al. (2020; using the Big Five Inventory) also report somewhat inconsistent effects for other personality dimensions including Conscientiousness, Emotionality/Neuroticism, and Openness to Experience. The most robust data do not support such links, however (Zettler, Schild, et al., 2020).

<sup>4</sup> Garbe et al. (2020) did not ask about increases in purchases, but about absolute amounts bought or stocked, so their outcome variables may reflect general differences in purchasing patterns more than items that specifically ask about stockpiling or changes in purchasing patterns.

**Table 2. Zero-order correlations between variables in Study 1. The upper triangle shows 95% confidence intervals for correlation coefficients. The diagonal shows means (and standard deviations, for continuous variables).**

	H-H	Stockpiling	MaxJoint	MaxOwn	Intention	Belief	Female	Age
H-H	4.92(.93)	[-.17, .03]	[.06, .25]	[-.27, -.08]	[-.33, -.14]	[-.09, .10]	[.11, .30]	[.14, .33]
Stockpiling	-.07	.41	[-.21, -.01]	[.17, .35]	[.43, .58]	[.25, .42]	[-.07, .13]	[-.01, .19]
MaxJoint	.16	-.11	4.15(.76)	[-.03, .16]	[-.19, .01]	[-.16, .03]	[.00, .20]	[-.22, -.02]
MaxOwn	-.18	.26	.07	3.93(.79)	[.26, .43]	[.00, .19]	[-.07, .13]	[-.19, .01]
Intention	-.24	.51	-.09	.35	2.95(1.20)	[.25, .42]	[-.14, .06]	[-.02, .17]
Belief	.01	.34	-.07	.10	.34	63.2(23.3)	[-.08, .11]	[-.03, .17]
Female	.21	.03	.10	.03	-.04	.01	.64	[-.05, .14]
Age	.23	.09	-.12	-.09	.07	.07	.05	35.24(12.65)

Note: H-H = Honesty-Humility; MaxJoint = Motivation to maximise joint outcomes; MaxOwn = Motivation to maximise own outcomes; Belief = Belief about others' stockpiling.

Overall, it appears that the link between personality traits, including Honesty-Humility, and stockpiling is weak. However, situational factors may obscure some of the link. In particular, Honesty-Humility may only predict stockpiling as prosocial behaviour at times when this forms a social dilemma. This might explain why studies that combine data across countries (such as Garbe et al., 2020) and time (such as Zettler, Schild, et al., 2020) find weak personality-behaviour links. Indeed, there is some indication that the link between Honesty-Humility and stockpiling was stronger in the first study reported by Zettler, Schild, et al. (2020), which was conducted during the same week as the data presented here ( $r = .07$ ; the CI is not reported but includes zero). Integrative data analyses may be able to further elucidate this in the future, though the link is certain to be small under all conditions.

### Honesty-Humility, Trust, and Prosocial Behaviour

There now exists ample evidence that Honesty-Humility is associated with prosocial behaviour in controlled laboratory experiments (Thielmann et al., 2020). In contrast, there is much less evidence that Honesty-Humility also predicts behaviour in the field, and indeed some studies reporting null effects (e.g., Columbus et al., 2019). The present studies add to this literature. However, they paint a mixed picture: While Honesty-Humility was associated with past (Study 1) and future (Study 2) stockpiling, the pre-registered test predicting past stockpiling in Study 2 was non-significant.

Pooling data on past stockpiling from Studies 1 and 2, the odds ratio of 0.80 compares roughly to a Pearson's correlation of  $-.09$  (95% CI:  $-.15, -.02$ ).<sup>5</sup> This is half the size of the meta-analytic estimate for the association between Honesty-Humility and cooperation in social dilemma games ( $\hat{p} = .18$ ; Thielmann et al., 2020). The estimates reported by Zettler, Schild, et al. (2020) and Garbe et al. (2020) are even lower. This highlights that associations between Honesty-Humility and specific prosocial behaviours in the field may significantly deviate from estimates obtained under controlled conditions in the laboratory.

Previous work has found that Honesty-Humility is associated with trust in strangers (Thielmann & Hilbig, 2014). However, much of this work has studied trust behaviour in experimental games, where beliefs about others' behaviour are confounded with prosocial motives (Thielmann et al., 2020). In contrast, there was no apparent association between Honesty-Humility and expectations that others would engage in stockpiling. In turn, it appears that those high in Honesty-Humility were motivated to refrain from stockpiling because they were willing to forego individual gain to do so (but not because they were motivated by social welfare concerns).

The present study also provides causal evidence that correcting inaccurate beliefs may not promote intentions to

engage in prosocial behaviour, even if beliefs and behaviour are initially correlated. This may be because changing beliefs about the rate of others who engage in stockpiling may not have affected the expectation that there would be shortages. Thus, appeals using descriptive norms may be ineffective when norm-conforming behaviour is perceived as individually costly.

Further work is necessary to elucidate the relationship between Honesty-Humility, trust, and prosocial behaviour. In particular, it will be important to study the degree to which Honesty-Humility is associated with positive expectations about others' behaviour, both in the laboratory and in the field. Where such an association exists, however, the instrumental variable approach employed in this paper may be a powerful method to study the mechanisms by which personality affects prosocial behaviour.

### Limitations

The present studies largely use cross-sectional, correlational designs with their accompanying shortcomings. In particular, the relations between personality, beliefs, and retrospective self-reports of behaviour in Study 1 do not allow for strong causal claims. Some of these weaknesses are addressed in the design of Study 2, which manipulated beliefs directly to test a causal mediation hypothesis. Study 2 also used intentions as a second outcome measure to somewhat disentangle own behaviour and beliefs about others' behaviour. Although intentions are not equal to behaviour, this presents a conservative test: if manipulating beliefs does not change intentions, it is unlikely to still change behaviour. However, additional future work, including experimental and longitudinal designs, would be welcome.

Study 2 also included two measures of social motives as alternative mediators between Honesty-Humility and prosocial behaviour. These measures were constructed ad hoc, albeit on the basis of prior, similar work. Still, their validity should be treated with caution. In particular, it is possible that the measures overlapped with other, related constructs. For example, items measuring maximisation of joint outcomes might also have tapped into aversion to inequality. Further work on the relationship between Honesty-Humility and social motives is certainly needed.

The results show a significant indirect effect through motivation to maximise personal outcomes (but not motivation to maximise societal outcomes). In this case, the total effect of Honesty-Humility on stockpiling behaviour was not significant. However, the power to detect an indirect effect can be larger than that to detect a total effect (Kenny & Judd, 2014). Thus, an indirect effect can be detected even if the total effect is non-significant. Still, these effects were very small and should only be taken as an indication of a possible mediating mechanism. In addition, given that the analyses on social motives relied on correlational data, the possibility of confounding cannot be excluded.

Despite these shortcomings, the studies presented here provide some rare evidence on the relationship between

<sup>5</sup> Calculated from the odds ratio as  $r = \cos\left(\frac{\pi}{1+OR^{0.5}}\right)$ , following Bonett (2007).



Honesty-Humility and prosocial behaviour in a field setting. Moreover, Study 2 employs a parallel encouragement design to causally test beliefs as a mechanism mediating between personality and behaviour. Given that explicit causal inference is still rare in the domain of personality psychology (Grosz et al., 2020), this is a particular strength of this study.

### Constraints on Generality

This study tests the relationship between Honesty-Humility and stockpiling under conditions of a pandemic and, more importantly, a well-publicised run on basic goods. Search trend data show that the perceived threat of stockpiling was temporally constrained to a few weeks at the beginning of the pandemic in the UK. This particular setting provides the social dilemma in which theory suggests Honesty-Humility might be expressed (Columbus et al., 2019; de Vries et al., 2016; Thielmann et al., 2020). The presence of an expectation of scarcity (and not merely of a pandemic) thus is a crucial constraint on the generality of the effects reported here.

### Conclusion

Large-scale emergencies such as the COVID-19 pandemic are certainly “strong situations” (Mischel, 1977). Yet, there is clear evidence that not all people react alike to individual and societal challenges. From the perspective of broad factor models of personality, Honesty-Humility is a trait particularly suited to explaining individual differences in behaviour in the face of conflicts of interests between individual well-being and societal welfare. The present studies provide some evidence that Honesty-Humility is linked to prosocial behaviour—specifically, refraining from stockpiling—during vast societal emergency. Importantly, there

is little evidence that this is because those high in Honesty-Humility trust others to behave more prosocially.

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### Contributions

Substantial contributions to conception and design; acquisition of data; analysis and interpretation of data; drafting the article or revising it critically for important intellectual content; final approval of the version to be published: SC.

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### Competing interests

The author declares no competing interests.

### Supplemental material

Text S1. Robustness checks and additional results.

### Data accessibility statement

Data, code, materials, and preregistration are available on the Open Science Framework (<https://osf.io/xm6kg/>).

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