Contents lists available at ScienceDirect

Journal of Research in Personality

journal homepage: www.elsevier.com/locate/jrp

Stockpiling during the COVID-19 pandemic as a real-life social dilemma: A person-situation perspective

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ARTICLE INFO

ABSTRACT

Prior research using economic games has shown that personality drives cooperation in social dilemmas. In this study, we tested the generalizability of these findings in a real-life social dilemma during the COVID-19 pandemic, namely stockpiling in the presence of low versus high resource scarcity. Honesty-Humility was negatively related to stockpiling intentions and justifiability of stockpiling. Moreover, we found a positive albeit weaker effect of Emotionality on stockpiling intentions. Victim Sensitivity was mostly positively associated with stockpiling intentions. None of the personality traits interacted with resource scarcity to predict stockpiling. Our findings replicate established associations between personality and cooperation in a real-life social dilemma, and suggest that the characteristics of interdependent situations during a pandemic additionally afford the expression of Emotionality.

1. Introduction

The COVID-19 pandemic reached Europe and North America during the early months of 2020. At that time, many people started to stockpile medical supplies and other goods, arguably to prepare for quarantines, national shut-downs, and anticipated disruptions of supply chains. In Germany, for instance, the purchase of soap more than doubled in the last week of February 2020, and purchase of sanitizer even increased sevenfold in comparison to the same week in 2019 (Statistisches Bundesamt, 2020). Sales surges were also reported for durable foods such as flour, yeast, or pasta (Statistisches Bundesamt, 2020). Although having an adequate stock of these goods can be individually beneficial in times of crisis, stockpiling may pose negative consequences on others: Some stores may experience short-term supply shortages as a consequence of individual stockpiling, and other customers may eventually be left empty-handed.

In the present article, we argue that stockpiling during a pandemic can be conceptualized as a social dilemma in a naturalistic setting, and that insights from standardized economic games modeling social dilemmas can be used to predict stockpiling. To test this claim, we recruited a large sample of German adults during the emerging COVID-19 pandemic and investigated to what extent well-known predictors of cooperation in game-based social dilemmas – such as broad personality traits (i.e., HEXACO dimensions), more specific traits (i.e., Victim Sensitivity), and context factors (i.e., resource scarcity) – account for stockpiling intentions and justifiability of stockpiling behavior.

Social dilemmas are "situations in which a non-cooperative course of action is (at times) tempting for each individual in that it yields superior (often short-term) outcomes for self, and if all pursue this non-cooperative course of action, all are (often in the longer-term) worse off than if all had cooperated" (Van Lange, Joireman, Parks, & Van Dijk, 2013, p. 126). Various types of social dilemmas exist that differ structurally, for example with regard to the number of individuals involved (i.e., dyads versus groups), the duration of interaction between individuals (e.g., one-shot versus repeated interaction), and whether "cooperation" refers to contribution to or non-consumption of a common resource (Van Lange et al., 2013). Stockpiling during a pandemic arguably constitutes a real-life social dilemma that involves a group of individuals (e.g., customers of a supermarket) engaging in repeated interactions (e.g., multiple purchases over the course of a pandemic) and in which cooperation is reflected in refraining from overconsuming a common resource (e.g., groceries or sanitary products).

In fact, the situational structure of the stockpiling dilemma is best described by the "tragedy of the commons" or a so-called *commons dilemma* (Hardin, 1968). In a commons dilemma, members of

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a group decide how much to harvest from a common resource. The amount each individual consumes is no longer available for other group members. Usually, the interaction (i.e., individuals harvesting from a common resource) is repeated over a certain amount of time, with the resource remaining after each interaction recovering at a certain reproduction rate. The interaction ends once the common resource is fully depleted, that is, once individuals' consumption exceeded the reproduction rate over a certain amount of time.

During the COVID-19 pandemic, individuals likewise decided how much to consume from a common resource such as groceries or sanitary products. The common resource would suffice for most or even all individuals if a sufficient number of individuals cooperated by refraining from overconsumption. However, if too many individuals decide to defect by purchasing more than they actually need, the common resource will become depleted eventually.

Empirical studies in behavioral economics and psychology typically use standardized economic games which provide a precise and parsimonious approach to model social dilemmas and to investigate cooperation in controlled experimental settings (Murnighan & Wang, 2016). However, the real-life social dilemma of stockpiling during a pandemic is arguably more complex than highly controlled game-like situations.

In a commons dilemma in form of an economic game, for example, the resource remaining after each round usually replenishes at a certain – and often known – reproduction rate. Thus, resource quantity in a subsequent round depends on both the remaining resource from the previous round and the reproduction rate. In the stockpiling case, however, the reproduction rate is represented by the amount a supermarket restocks and thus, is not necessarily linked to the resource quantity that was left on a given day. Another aspect that may be specific about the stockpiling dilemma is that consumption has short-term monetary costs – in the sense that buying stocks of groceries or sanitary products is costly – whereas consumption in a game-based commons dilemma is non-costly in short-term but exclusively beneficial to the individual.

In addition, stockpiling during a pandemic is characterized by more uncertainty and insecurity than non-cooperation within a respective economic game. This is because in economic games, individuals are usually fully informed about the structure of the situation. For example, in a game-based commons dilemma, individuals usually know about the reproduction rate and they are also aware of the consequences their own and the interaction partners' actions have. By contrast, in the stockpiling case, information about reproduction (i.e., whether or not a store restocks overnight) is essentially unavailable, and it is therefore also unknown to individuals whether their (over)consumption will affect their own and others' outcomes in the future. Uncertainty and insecurity about the structure of the situation are unique features of this real-life social dilemma that are typically not (or at least not comparably) apparent in a game-based commons dilemma. Consequently, stockpiling is likely to serve an emotional function in the sense that having a stock of the respective goods may reduce stress, anxiety, and feelings of uncertainty.

Taken together, the stockpiling dilemma has conceptual similarities with a game-based commons dilemma but also incorporates some differences. Therefore, it is unclear whether insights on cooperative behavior from game-based social dilemmas can be transferred to stockpiling during the COVID-19 pandemic. Addressing this issue, the aim of the present research is to examine whether personality traits and context factors that have been shown to predict cooperation in economic games also relate to stockpiling in real-life. To this end, we assessed two forms of responses to the stockpiling dilemma, namely (i) how strongly

individuals intend to stockpile (i.e., *stockpiling intentions)* and (ii) how justifiable they evaluate stockpiling in general (i.e., *justifiability of stockpiling behavior)*. We differentiated these constructs to reflect the conceptual distinction between behavioral intentions to stockpiling and judgements of stockpiling behavior, respectively (for a similar approach, see Dammeyer, 2020). This distinction was also implied by the fact that some personality traits should be specifically linked to stockpiling intentions (i.e., Emotionality and Victim Sensitivity) whereas other should be specifically linked to justifiability of stockpiling behavior (i.e., Agreeableness), and even others should be associated with both (i.e., Honesty-Humility).

Prior research using game-based social dilemmas to study cooperation has consistently shown that individuals differ in the extent to which they cooperate and that personality traits can account for such interindividual variation (for a meta-analysis, see Thielmann, Spadaro et al., 2020). Importantly, personality traits are more or less relevant for cooperation in certain situations, depending on the situational structure of the respective social dilemma. In other words, social dilemmas entail situational properties (i.e., *affordances*) that enable the expression of certain traits in behavior. Specifically, it has been proposed that social dilemmas may primarily involve four such affordances, namely *possibility for exploitation*, *possibility for reciprocity*, *dependence on others under uncertainty*, and *temporal conflict between short- and long-term interests* (Thielmann, Spadaro et al., 2020). In the following section, we discuss which of these affordances are particularly relevant for the stockpiling dilemma and employ this affordance perspective to derive hypotheses regarding the impact of personality and context factors on stockpiling. In addition to these four key affordances, Thielmann, Spadaro et al., (2020) proposed several subaffordances of the exploitation and reciprocity affordances that specifically allow the expression of certain social motives (e.g., altruism, fairness, greed etc.) in behavior. However, given that additional consideration of these subaffordances would have resulted in the exact same hypotheses, we will not refer to these subaffordances further in what follows.

First, the stockpiling dilemma involves a possibility for exploitation because individuals can increase their outcomes without fearing retaliation by their interaction partners. That is, individuals can stockpile certain goods without expecting sanctions from other customers or authorities. In such situations, Honesty-Humility from the HEXACO model should become relevant. Specifically, Honesty-Humility denotes the "tendency to be fair and genuine in dealing with others, in the sense of cooperating with others even when one might exploit them without suffering retaliation" (Ashton & Lee, 2007, p. 156). Thus, Honesty-Humility can be understood to represent *active* cooperativeness that drives cooperative behavior particularly in situations providing a possibility for exploitation (Hilbig, Zettler, Leist, & Heydasch, 2013, Hilbig, Kieslich, Henninger, Thielmann, & Zettler, 2018) – a proposition that has also been meta-analytically confirmed (Thielmann, Spadaro et al., 2020). Correspondingly, recent studies also found Honesty-Humility to be negatively associated with stockpiling intentions (Columbus, 2020). A large meta-analytic investigation across five samples in Denmark and Germany also found a significant yet very small correlation of $r = -0.04$ between Honesty-Humility and (self-reported) hoarding behavior during the COVID-19 pandemic (Zettler, Schild, et al., 2020). Note, however, that this correlation was non-significant (on the rather conservative significance level of $p < .010$) when considering each sample in isolation (Zettler, Schild, et al., 2020) and that another study also found a non-significant relationship between Honesty-Humility and stockpiling of toilet paper (Garbe, Rau, & Toppe, 2020). Nonetheless, based on the theoretical conceptualization of Honesty-Humility as a tendency of non-exploitation towards

others (Ashton & Lee, 2007), we predicted a negative association of Honesty-Humility with stockpiling intentions as well as with justifiability of stockpiling behavior.

Second, stockpiling entails a possibility for reciprocity, in the sense that individuals can respond to others' behavior. For instance, one indirect proxy for other customers' stockpiling is the availability of resources in the supermarket: If certain resources are scarce during the weekly shopping trip, the impression that other people stockpile becomes more salient. If these resources are, however, available in abundance, people might conclude that others do, apparently, refrain from stockpiling. Indeed, this context factor seems particularly relevant as implied by research showing that a key predictor of cooperation in interdependent situations is the expectation that others will behave cooperatively (for meta-analyses, see Balliet & Van Lange, 2013; Pletzer et al., 2018). By contrast, individuals expecting that others might take advantage of those who cooperate (e.g., through stockpiling) should behave uncooperatively, too, to avoid being exploited. We therefore manipulated resource scarcity (high versus low) to induce beliefs about the (un)cooperativeness of others. Our prediction was that high (as compared to low) resource scarcity would lead to more stockpiling intentions and stronger justifiability of stockpiling behavior.

In terms of personality traits, the situational affordance of reciprocity should be particularly associated with HEXACO Agreeableness which represents "the tendency to be forgiving and tolerant of others, in the sense of cooperating with others even when one might be suffering exploitation by them" (Ashton & Lee, 2007, p. 156). Thus, Agreeableness captures *reactive* forms of cooperativeness (Hilbig et al., 2013), manifesting itself in more cooperation in situations in which one can reciprocate another's uncooperative behavior (Hilbig, Thielmann, Klein, & Henninger, 2016; Thielmann, Spadaro, & Balliet, 2020). Therefore, Agreeableness is most likely to be expressed in lenient attitudes towards stockpiling behavior, and we consequently hypothesized a positive association of Agreeableness with justifiability of stockpiling behavior. In turn, because Agreeableness is particularly likely to play out if others behave uncooperatively, we also predicted an interaction of Agreeableness with resource scarcity on justifiability of stockpiling behavior, in the sense that the positive association of Agreeableness should be stronger under high (versus low) resource scarcity.

Third, stockpiling during the COVID-19 pandemic entails dependence under uncertainty. That is, individuals do not have full control over their individual outcomes (i.e., the type and amount of goods they can purchase) and often learn about others' behavior (i.e., whether or not others stockpile) only after having made their own decision. For example, customers individually have to decide how much to purchase without knowing how other customers will behave in the future. In such situations, beliefs about others (un)-cooperative behavior may guide individual decisions (Thielmann, Spadaro et al., 2020). A personality trait that should be afforded by the situational characteristic of dependence under uncertainty is Victim Sensitivity (Schmitt, Neumann, & Montada, 1995). This construct captures a stable tendency to perceive situations as unjust to oneself, and to show strong cognitive (e.g., rumination), emotional (e.g., anger), and behavioral reactions (e.g., punitiveness) to this perceived injustice (Schmitt, Gollwitzer, Maes, & Arbach, 2005). Victim Sensitivity often predicts less prosocial behavior (Fetchenhauer & Huang, 2004; Gollwitzer, Schmitt, Schalke, Maes, & Baer, 2005), but victim sensitive individuals are not per se uncooperative or selfish. Rather, their willingness to cooperate is particularly low when they fear being exploited (Baumert et al., 2020). The notion that Victim Sensitivity involves a fear of being exploited also lies at the heart of the *sensitivity to mean intentions (SeMi)* model (Gollwitzer & Rothmund, 2009;

Gollwitzer, Rothmund, & Süssenbach, 2013). This model builds on the assumption that victim sensitive individuals particularly attend to cues of others' untrustworthiness in socially uncertain situations. In the presence of such cues, a so-called "suspicious mindset" is activated. As a consequence, victim sensitive individuals revoke cooperation to preemptively avoid being exploited by others (Gollwitzer et al., 2013). Based on this evidence and the SeMi model, we expected Victim Sensitivity to interact with resource scarcity – a situational cue indicating others' untrustworthiness – to predict stockpiling. Specifically, we hypothesized that Victim Sensitivity will be positively related to stockpiling intentions under high resource scarcity, but less so under low resource scarcity. In addition to being sensitive to injustice from a victim's perspective, people can also be sensitive to injustice as neutral observers ("Observer Sensitivity"), beneficiaries ("Beneficiary Sensitivity"), or perpetrators ("Perpetrator Sensitivity"). We did not derive any hypotheses about the effects of these perspectives of Justice Sensitivity on our dependent variables. However, we measured them for the sake of completeness and controlled for their shared variance in some of our analyses.

The hypotheses we derived so far are based on three situational affordances (i.e., possibility for exploitation, possibility for reciprocity, and dependence under uncertainty) that have been identified to be present in social dilemmas (Thielmann, Spadaro et al., 2020). As detailed above, the real-life dilemma of stockpiling is, however, more complex than a game-based social dilemma and should therefore involve additional situational affordances. More specifically, stockpiling may help to cope with anxiety, stress, and feelings of uncertainty elicited by the pandemic and thereby serve an emotional function (e.g., by assuring to have a personal stock of the goods one needs). Thus, we argue that *insecurity* should be another situational affordance involved in the stockpiling situation. This situational affordance has been identified in the so-called *situation, trait and outcome activation (STOA)* model and should particularly allow the expression of HEXACO Emotionality (De Vries, Tybur, Pollet, & van Vugt, 2016). According to Ashton and Lee (2007), "[...] Emotionality represents tendencies relevant to the construct of kin altruism (Hamilton, 1964), including not only empathic concern and emotional attachment toward close others (who tend to be one's kin) but also the harm-avoidant and help-seeking behaviors that are associated with investment in kin" (p. 156). This suggests that individuals high in Emotionality might additionally view stockpiling as a means to care for one's family and close others if goods are bought for or shared with them. Supporting this reasoning, a recent study showed a positive relation between HEXACO Emotionality and stockpiling of toilet paper (Garbe et al., 2020). Moreover, another study found that Big Five Neuroticism – which has close conceptual links to Emotionality (Ashton, Lee, & De Vries, 2014) – was positively correlated with self-reported stockpiling during the COVID-19 pandemic (Dammeyer, 2020). By contrast, however, other studies found non-significant relationships of Big Five Neuroticism (Aschwanden et al., 2021) and/or HEXACO Emotionality (Zettler, Schild, et al., 2020) with self-reported hoarding behavior. Based on the affordance perspective, we hypothesized a positive relation of Emotionality with stockpiling intentions. In addition, we predicted an interaction effect of Emotionality and resource scarcity on stockpiling intentions in the sense that the positive association of Emotionality should be stronger under high (versus low) resource scarcity.

The goal of the present study was to test whether associations of personality traits with prosocial behavior from economic games can be transferred to stockpiling during the COVID-19 pandemic as a real-life social dilemma. We conducted an online experiment during the beginning of the COVID-19 pandemic in Germany. At this time, reports about stockpiling were highly prevalent in the

media and clearly observable in many stores. We manipulated resource scarcity (high versus low) in a fictional shopping scenario and examined the extent to which personality (i.e., HEXACO dimensions and Victim Sensitivity) predicts participants' self-reported stockpiling intentions and justifiability of stockpiling behavior.[1]

2. Method

We report how we determined our sample size, all data exclusions, all manipulations, and all measures in the study (Simmons, Nelson, & Simonsohn, 2012). The study materials, dataset, and analysis script are available on the Open Science Framework (OSF; https://osf.io/wbxnr/).

2.1. Context

Our study was online for 14 days between March 23 and April 5, 2020. This period was characterized by strict governmental regulations in response to the rapid spread of COVID-19 in Germany. Universities, schools, and kindergartens in most German states were closed after March 13. Gatherings of more than two people who were not living together were prohibited as of March 22. Likewise, restaurants and bars were closed as of March 22 and were only allowed to offer takeaway food.

Supermarkets and pharmacies were open throughout but some products (e.g., disinfectants, face masks, toilet paper, or flour) were sold out regularly, presumably as a consequence of stockpiling (for example, see Diemand, Jansen, Müssgens, Piller, & Preuss, 2020). Stockpiling tendencies decreased again around mid-April 2020 (Statistisches Bundesamt, 2020).

In addition, prices for certain products (e.g. face masks, hand sanitizer) might have increased over the course of the pandemic, particularly in online reselling shops. By contrast, prices for groceries in German supermarkets did not increase significantly during that time. For the sake of comparability between the stockpiling dilemma and game-based commons dilemmas, we wanted to rule the possibility out that participants stockpiled simply because they anticipated further price increases (e.g., for face masks), and thus, focused in the present study on stockpiling of groceries in supermarkets.

2.2. Measures

2.2.1. HEXACO dimensions

We used the German version (Moshagen, Hilbig, & Zettler, 2014) of the 60-item HEXACO Personality Inventory Revised (Ashton & Lee, 2009) to measure the six HEXACO dimensions. Items were presented on one survey page, in randomized order. Participants rated their agreement with each item on a 5-point response scale, ranging from 1 = *strongly disagree* to 5 = *strongly agree*. Internal consistencies were satisfactory for all dimensions (see Table 1). We also embedded an instructed attention check (i.e., "Please select 'strong agreement' here (this serves to check your attention).") in the HEXACO items.

2.2.2. Justice Sensitivity

We applied the Justice Sensitivity Inventory in form of its German short version comprising eight items (Baumert et al., 2014). Participants completed the Victim Sensitivity items first before continuing with the Observer, Beneficiary, and the Perpetrator Sensitivity items in that order. The order of the two items within each subscale was randomized. Participants rated each item on a 5-point response scale, ranging from 1 = *strongly disagree* to 5 = *strongly agree*. We followed the recommendation by Eisinga, Te Grotenhuis, & Pelzer, 2013 and report the Spearman-Brown coefficients as internal consistency estimates for all two-item scales. This procedure yielded an estimate of $\rho = 0.75$ for Victim Sensitivity.

2.2.3. Dependent variables

We used self-developed measures to assess our dependent variables (DVs). Stockpiling intentions were assessed using two items reading "I would buy more products than I normally need for a week" and "I would only buy as many products as I normally need for a week" (the latter was reverse-coded; $\rho = 0.86$). Justifiability of stockpiling behavior was measured using four self-developed items. More specifically, the items were "In such a situation, it is... [...perfectly fine /...absolutely appropriate /...egoistic /...irresponsible] to buy more than one actually needs" (the latter two reverse-coded; $\omega_{Total} = 0.82$). All six items pertaining to our dependent variables were rated on a 6-point response scale, ranging from 1 = *strongly disagree* to 6 = *strongly agree.* Items were presented in random order.

2.2.4. Measures for exploratory purposes

We also measured additional variables for exploratory purposes. Specially, we assessed Need for Cognition with a short four-item scale (Beißert, Köhler, Rempel, & Beierlein, 2015; $\omega_{Total} = 0.51$), negative attitudes towards others' stockpiling behavior (10 self-developed items; $\omega_{Total} = 0.89$), negative emotions towards stockpiling (seven items adapted from the German version of the Positive and Negative Affect Scale; Krohne, Egloff, Kohlmann, & Tausch, 1996; $\omega_{Total} = 0.77$), acceptability of a policy that limits the purchase quantity to household standards (seven self-developed items; $\omega_{Total} = 0.87$), trust in authorities during the pandemic (four self-developed items; $\omega_{Total} = 0.73$), and factual knowledge about COVID-19 (10 dichotomous "true or false" items). These measures are not relevant for the present research question and are therefore not further discussed. All item wordings and the dataset are available on the OSF. Moreover, we provide means, standard deviations, and correlations between all variables assessed in the study in the Supplementary Online Materials (Table S1 and Table S2).

2.3. Procedure

Participants first provided informed consent and demographic information. Next, they filled out the HEXACO-60 and the Justice Sensitivity Inventory.[2] We randomized the order of the two respective survey pages. We then introduced our experimental manipulation of resource scarcity. Participants were asked to imagine going to the supermarket for the weekly shopping during the ongoing COVID-19 pandemic, being presented with the following passage (translated from German): "Imagine going to the supermarket to do your weekly shopping during the ongoing corona pandemic these days. You encounter the following situation: Most of the shelves are quite full [empty]." This text passage was accompanied by a picture

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[1] Our hypotheses, methods, and analytic plan were pre-registered (https://aspredicted.org/gu4bn.pdf). The situation regarding the spread of COVID-19 and the resulting stockpiling tendencies changed rapidly around the time of data collection. We therefore wanted to start data collection as quickly as possible and thus, launched the survey before we had completed the pre-registration. More specifically, we started data collection on 23rd of March, completed the pre-registration on 26th of March, and the study was online until 5th of April 2020. We did not inspect nor analyze any data before data collection was completed. We obtained ethics approval for an umbrella project on the psychological effects of the COVID-19 pandemic from the local ethics committee at the University of Koblenz-Landau's psychology department.

[2] At this stage, we also assessed the Need for Cognition scale which was presented on the same survey page right after the Justice Sensitivity Inventory.

Table 1
Correlations and internal consistencies for main study variables.

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Honesty-Humility	*0.76* [0.73, 0.79]												
2. Emotionality	−0.03 [−0.10, 0.04]	*0.80* [0.78, 0.82]											
3. Extraversion	0.06 [−0.01, 0.13]	−0.21*** [−0.28, −0.14]	*0.78* [0.76, 0.81]										
4. Agreeableness	0.20*** [0.14, 0.27]	−0.12*** [−0.19, −0.05]	0.07 [−0.00, 0.14]	*0.75* [0.72, 0.78]									
5. Conscientiousness	0.06 [−0.01, 0.13]	−0.01 [−0.08, 0.06]	0.07 [−0.00, 0.14]	−0.07* [−0.14, −0.00]	*0.77* [0.74, 0.79]								
6. Openness to Experience	0.11** [0.04, 0.17]	−0.07 [−0.14, 0.00]	0.20*** [0.13, 0.27]	0.01 [−0.06, 0.08]	0.06 [−0.01, 0.13]	*0.71* [0.68, 0.74]							
7. Victim Sensitivity	−0.31*** [−0.37, −0.24]	0.23*** [0.16, 0.29]	−0.24*** [−0.30, −0.17]	−0.22*** [−0.28, −0.15]	−0.01 [−0.08, 0.06]	−0.18*** [−0.24, −0.11]	*0.75* [0.71, 0.80]						
8. Observer Sensitivity	0.10** [0.03, 0.17]	0.19*** [0.12, 0.26]	0.01 [−0.06, 0.08]	−0.00 [−0.07, 0.07]	0.05 [−0.02, 0.12]	0.13*** [0.06, 0.20]	0.26*** [0.19, 0.32]	*0.69* [0.63, 0.74]					
9. Beneficiary Sensitivity	0.20*** [0.13, 0.27]	0.30*** [0.24, 0.36]	−0.10** [−0.17, −0.03]	0.03 [−0.04, 0.10]	0.03 [−0.04, 0.10]	0.06 [−0.01, 0.13]	0.19*** [0.12, 0.26]	0.40*** [0.34, 0.46]	*0.75* [0.72, 0.79]				
10. Perpetrator Sensitivity	0.43*** [0.37, 0.48]	0.18*** [0.11, 0.25]	0.01 [−0.06, 0.08]	0.14*** [0.07, 0.21]	0.07 [−0.00, 0.14]	0.12*** [0.05, 0.19]	0.01 [−0.06, 0.08]	0.29*** [0.23, 0.36]	0.34*** [0.28, 0.40]	*0.76* [0.71, 0.81]			
11. Resource scarcity: High (versus low)	−0.01 [−0.08, 0.06]	−0.06 [−0.13, 0.00]	0.05 [−0.02, 0.11]	0.03 [−0.04, 0.10]	0.04 [−0.03, 0.11]	0.00 [−0.07, 0.07]	−0.01 [−0.08, 0.06]	−0.05 [−0.12, 0.02]	0.01 [−0.06, 0.08]	0.02 [−0.05, 0.09]	– [–, –]		
12. Stockpiling intentions	−0.21*** [−0.27, −0.14]	0.10** [0.03, 0.17]	−0.06 [−0.13, 0.01]	−0.04 [−0.11, 0.03]	−0.05 [−0.12, 0.02]	−0.04 [−0.11, 0.03]	0.14*** [0.07, 0.20]	0.03 [−0.04, 0.10]	−0.09* [−0.15, −0.02]	−0.08* [−0.15, −0.01]	0.07 [−0.00, 0.14]	*0.86* [0.83, 0.89]	
13. Justifiability of stockpiling	−0.17*** [−0.23, −0.10]	0.05 [−0.02, 0.12]	−0.07* [−0.14, −0.00]	0.04 [−0.03, 0.10]	−0.06 [−0.13, 0.01]	−0.06 [−0.13, 0.01]	0.14*** [0.07, 0.20]	−0.03 [−0.10, 0.04]	−0.11** [−0.18, −0.04]	−0.08* [−0.15, −0.01]	−0.03 [−0.10, 0.04]	0.64*** [0.60, 0.68]	*0.82* [0.79, 0.85]

Note. Estimates in the lower part are Pearson's zero-order correlations. Resource scarcity was experimentally manipulated (*low* vs. *high*) and thus, these are point biserial correlations. Resource scarcity is coded as −1 = *low* and 1 = *high*. Estimates on the diagonal (in italics) are omega (ω_{Total}) for measures with three or more items (i.e., the HEXACO dimensions and justifiability of stockpiling) as recommended by Dunn, Baguley, and Brunsden (2014). For two-item measures (i.e., Justice Sensitivity perspectives and stockpiling intentions), estimates on the diagonal are Spearman-Brown coefficients (Eisinga, Te Grotenhuis, & Pelzer, 2013). Numbers in brackets represent lower and upper bounds of 95% confidence intervals. Confidence intervals for internal consistency measures were bootstrapped with 5000 iterations. * $p < .05$. ** $p < .01$. *** $p < .001$.

of either filled shelves (*low resource scarcity*) or emptied shelves (*high resource scarcity*). We used five different pictures per condition presenting different goods such as groceries or sanitary products to prevent any systematic effects caused by a specific type of product. Each participant was presented with one randomly selected picture. The content of pictures (i.e., goods) was the same across conditions (i.e., the stimulus set contained one picture with a filled pasta shelf and one picture with an emptied pasta shelf etc.).[3]

Subsequently, we measured our dependent variables which were presented on the same page as the experimental manipulation. Importantly, instructions emphasized that participants should imagine that they would usually go to the supermarket once a week and that they would thus return again the week thereafter. This instruction was implemented to ensure that stockpiling can be validly interpreted as non-cooperative rather than reflecting a prosocial act (e.g., an attempt to go to the supermarket less often to reduce the risk of infecting others).

Next, participants responded to two exploratory control items designed to assess the plausibility of the scenario ("The situation in the supermarket does not seem plausible to me during the current corona pandemic", reverse-coded) and perceptions of resource scarcity in real-life ("When I go shopping these days (since the beginning of the corona pandemic), most supermarket shelves are pretty empty."; both on a 6-point response scale ranging from 1 = *strongly disagree* to 6 = *strongly agree*). They also completed a manipulation check asking the extent to which the supermarket shelves depicted on the picture were 1 = *very empty* to 6 = *very filled*.[4] On this survey page, we also asked whether participants had completed the survey attentively and whether they thought their responses were reliable using a so-called "use me"

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[3] Unfortunately, the license for these picture does not permit sharing the original files. More information is available from the first author upon request.

[4] This item was included to assess the effectiveness of our manipulation and not to screen for inattentive responding. Thus, no participants were excluded based on this item (see "Participants" section and pre-registration for our exclusion criteria).

item. Finally, we raffled four vouchers each worth 25€ as incentive for participation and informed participants about the purpose of our study.

2.4. Participants

We recruited participants online via a large mailing list, social media, and the PsyWeb panel (https://psyweb.uni-muenster.de). Given the very dynamic situation with regard to the spread of COVID-19, we decided to base our sampling strategy on pragmatic constraints and collected data from as many participants as possible within a pre-defined timeframe (i.e., until April 5, 2020).

A total of 941 participants started the study of which 811 completed it. As pre-registered, we excluded participants who failed the instructed attention check that was embedded in the HEXACO-60 (n = 13). Further, one participant indicated on the "use me" item that their responses were not reliable and, thus, was excluded from the analyses.[5] Our final sample consisted of N = 797 participants. The participants' age ranged from 18 to 84 years (M = 35.83, SD = 15.99) and the sample was predominantly female (597 women, 197 men, 3 other). Participants in the final sample were almost equally distributed across conditions (i.e., n = 400 in the *low resource scarcity* condition and n = 397 in the *high resource scarcity* condition), suggesting that exclusions due to drop-out or non-attentive responding did not systematically vary across experimental conditions (see Zhou & Fishbach, 2016). Only 1% (n = 10) of participants were currently or had previously been infected with the virus, and 7% (n = 53) had a (currently or previously) infected close friend or family member. Moreover, 7% (n = 55) were quarantined and 25% (n = 198) had a close friend or family member who was quarantined during the time of participating in the study.

To identify the effect sizes we were able to detect with our sample size, we conducted two sensitivity power analyses using G*Power (Faul, Erdfelder, Buchner, & Lang, 2009), both with a power of 1- β = 0.90 and a significance level of α = 0.05. First, we estimated the effect size we could uncover for one-sided t-tests (for investigating mean differences in our dependent variables between conditions). This yielded a very small effect size of d = 0.10. Second, we estimated the minimum effect size of a single regression coefficient (increase in R^2) we were able to detect in a multiple regression including three predictors. This analysis suggested that our sample size allowed detecting small effects of f^2 = 0.01, corresponding to an R^2 = 0.01 or a Pearson's correlation of r = 0.10. We considered this effect size appropriate for our purposes because it is comparable to the size of meta-analytic estimates for the (uncorrected) correlations of Honesty-Humility and Agreeableness with cooperation in game-based commons dilemmas (r = 0.14 and r = 0.10, respectively; Thielmann, Spadaro et al., 2020). We did not find empirical benchmarks for the respective effects of Emotionality, Victim Sensitivity, resource scarcity, nor for the interaction effects.

3. Results

Analyses were conducted in R (R Core Team, 2020), mainly using the packages *tidyverse* (Wickham et al., 2019), *sjPlot* (Lüdecke, 2018), *MBESS* (Kelley, 2017) and *apaTables* (Stanley, 2018). Correlations between the main study variables are displayed in Table 1.

3.1. Manipulation check

We first checked the effectiveness of our manipulation by comparing the extent to which individuals rated the depicted shelves as empty or full between experimental conditions. Participants in the *low resource scarcity* condition rated the supermarket shelves as less empty (M = 5.12, SD = 1.11) than participants in the *high resource scarcity* condition (M = 1.77, SD = 0.91), yielding a large effect, d = 3.29, 95% CI [3.08, 3.51]. Levene's test for homogeneity of variances indicated that variances of this item were significantly different between conditions, F(1, 795) = 8.05, p = .005. Consequently, we conducted Welch's t-test (one-sided) to test for mean differences between conditions, and found a significant effect, t (767.98) = 46.54, p < .001. This suggests that our experimental manipulation was successful in the sense that resource scarcity was perceived as higher in the *high* as compared to the *low resource scarcity* condition.

3.2. Resource scarcity

First, we investigated whether experimentally induced resource scarcity influenced participants' stockpiling intentions and their perceptions of justifiability of stockpiling. Descriptively, stockpiling intentions were greater on average when resource scarcity was *high* (M = 2.70, SD = 1.32) rather than *low* (M = 2.52, SD = 1.33). In line with our hypothesis, a one-sided t-test yielded a significant result, t(795) = −1.93, p = .027, although the effect size was only small, d = −0.14, 95% CI [−0.28, 0.00].[6]

The descriptive patterns for justifiability of stockpiling behavior indicated that participants judged stockpiling as slightly less justifiable when resource scarcity was *high* (M = 2.33, SD = 1.03) rather than *low* (M = 2.39, SD = 1.10). This mean difference was non-significant in a one-sided t-test, t(795) = 0.76, p = .776, and indeed negligible in size, d = 0.05, 95% CI [−0.09, 0.19]. Thus, contrary to our hypothesis, resource scarcity did not affect participants' justifiability of stockpiling behavior.

3.3. Personality

We continued with investigating the effects of the personality variables under scrutiny (i.e., Honesty-Humility, Agreeableness, Emotionality, and Victim Sensitivity) on stockpiling intentions and justifiability of stockpiling behavior. To this end, we computed several multiple linear regressions, separately for each personality trait and for both DVs. Specifically, we entered one personality trait (mean centered), resource scarcity (effect-coded with −1 = *low* and 1 = *high)*, and their interaction as predictors and either stockpiling intentions or justifiability of stockpiling behavior as criterion. Fig. 1 and Table 2 show the results for stockpiling intentions; Fig. 2 and Table 3 show the results for justifiability of stockpiling behavior.

For Honesty-Humility, we hypothesized negative main effects across conditions on stockpiling intentions as well as on justifiability of stockpiling behavior. Descriptively, zero-order correlations with stockpiling intentions (r = −0.21) and justifiability of stockpiling behavior (r = −0.17) were in line with our hypotheses. Correspondingly, Honesty-Humility was a significant negative predictor of stockpiling intentions, B = −0.44, p < .001, and justifiability of stockpiling behavior, B = −0.29, p < .001 in the regression analyses. The interaction effects of Honesty-Humility with

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[5] As preregistered, we also screened the data set for non-serious participation but did not find evidence of "clicking through". Thus, no additional participants were excluded based on this screening.

[6] We used one-sided t-tests because our pre-registered hypotheses were that high (vs. low) resource scarcity would lead to *more* stockpiling intentions and *stronger* justifiability of stockpiling behavior (i.e., directed hypotheses). We therefore consider one-sided tests appropriate. Note, however, that a two-sided test for the effect of resource scarcity on stockpiling intentions would have been non-significant (p = .054).
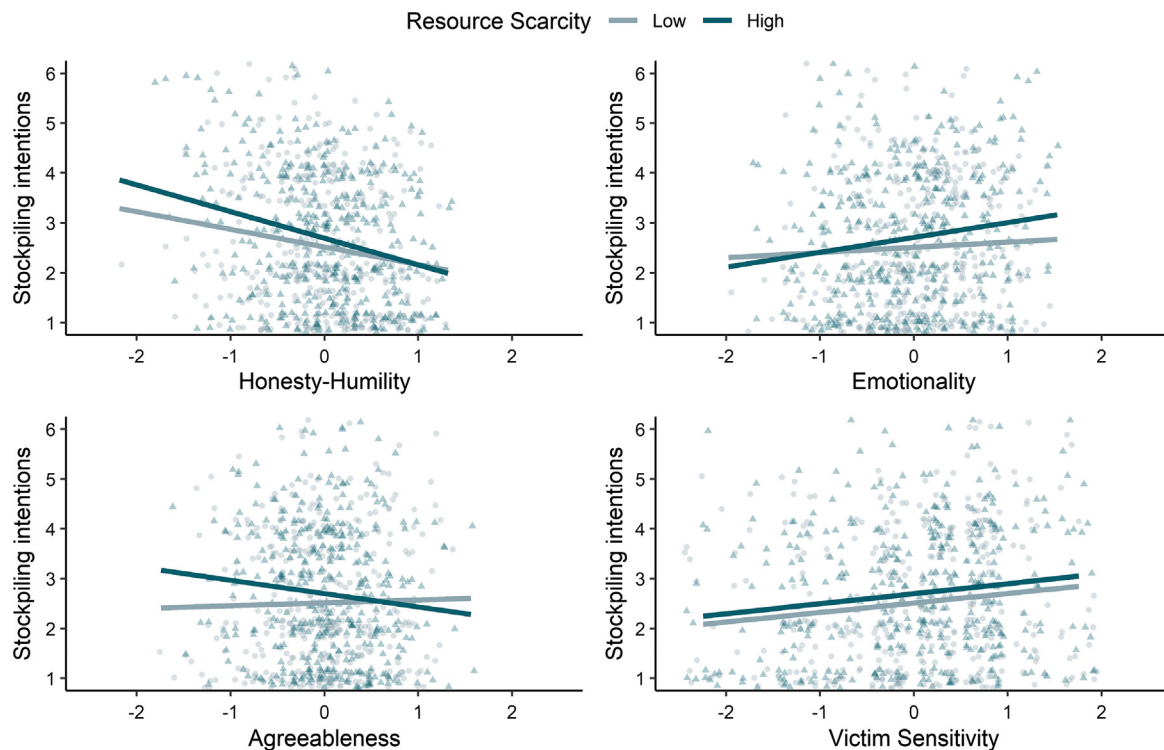
Fig. 1. Prediction of stockpiling intentions by personality under high and low resource scarcity. Personality dimensions were mean centered. Circles represent observations in the *low resource scarcity* condition, rectangles represent observations in the *high resource scarcity* condition.

Table 2
Linear Regression Analyses for Stockpiling Intentions.

Honesty-Humility					Emotionality					Agreeableness					Victim Sensitivity				
Predictor	*B*	*SE*	95% CI		*p*	Predictor	*B*	*SE*	95% CI		*p*	Predictor	*B*	*SE*	95% CI		*p*	Predictor	*B*	*SE*	95% CI		*p*
			LB	UB					LB	UB					LB	UB					LB	UB	
Intercept	2.61	0.05	2.52	2.70	<0.001	Intercept	2.61	0.05	2.52	2.70	<0.001	Intercept	2.61	0.05	2.52	2.70	<0.001	Intercept	2.61	0.05	2.52	2.70	<0.001
RS	0.09	0.05	0.00	0.18	0.058	RS	0.10	0.05	0.01	0.19	0.034	RS	0.09	0.05	0.00	0.18	0.049	RS	0.09	0.05	0.00	0.18	0.047
HH	−0.44	0.08	−0.59	−0.30	<0.001	EM	0.20	0.07	0.06	0.34	0.006	AG	−0.11	0.09	−0.27	0.06	0.225	VS	0.20	0.05	0.10	0.29	<0.001
HH * RS	−0.09	0.08	−0.24	0.06	0.237	EM * RS	0.10	0.07	−0.05	0.24	0.181	AG * RS	−0.16	0.09	−0.33	0.01	0.060	VS * RS	0.01	0.05	−0.09	0.10	0.917
F	13.46				<0.001	*F*	4.68				0.003	*F*	2.85				0.037	*F*	6.44				<0.001
R^2	0.05		0.02	0.08		R^2	0.02		0.00	0.04		R^2	0.01		0.00	0.02		R^2	0.02		0.00	0.04	

Note. RS = resource scarcity (effect-coded, −1 = *low*, and 1 = *high*); HH = Honesty-Humility; EM = Emotionality; AG = Agreeableness; VS = Victim Sensitivity; CI = confidence interval; LB = lower bound of CI; UB = upper bound of CI. HH, EM, AG, and VS were mean centered. Degrees of freedom are v_1 = 3 and v_2 = 793 for all four models.

resource scarcity were non-significant in both models, $B = -0.09$, $p = .237$, and $B = -0.09$, $p = .134$, respectively (see Tables 2 and 3).

For Agreeableness, we predicted a positive relation to justifiability of stockpiling behavior and an interaction with resource scarcity. The zero-order correlation with justifiability of stockpiling behavior was close to zero, $r = 0.04$. Accordingly, and contrary to our predictions, we found neither a main effect of Agreeableness, $B = 0.07$, $p = .336$, nor an interaction with resource scarcity, $B = -0.08$, $p = .251$ in predicting justifiability of stockpiling behavior (see Table 3). Note that Agreeableness was also unrelated to stockpiling intentions, $r = -0.04$.

For Emotionality, we hypothesized a positive main effect and an interaction with resource scarcity on stockpiling intentions. The direction of the respective zero-order correlation was indeed positive, albeit small, $r = 0.10$. Correspondingly, the regression analysis yielded a significant and positive main effect of Emotionality on stockpiling intentions, $B = 0.20$, $p = .006$, thereby confirming our first prediction. Contrary to expectations, however, the interaction with resource scarcity did not reach statistical significance, $B = 0.10$, $p = .181$ (see Table 2). Also, note that Emotionality was unrelated to justifiability of stockpiling behavior, $r = 0.05$.

For Victim Sensitivity, we predicted an interaction with resource scarcity on stockpiling intentions in the sense that Victim Sensitivity should be positively related to stockpiling intentions under high resource scarcity, but less so under low resource scarcity. Across conditions, there was a positive zero-order correlation of Victim Sensitivity with stockpiling intentions, $r = 0.14$. Contrary to our hypothesis, there was no interaction with resource scarcity, $B = 0.01$, $p = .917$. Interestingly, the main effect of Victim Sensitivity was positive and significant, $B = 0.20$, $p < .001$ (see Table 2), indicating that individuals with high Victim Sensitivity expressed more intentions to stockpile in general across both levels of resource scarcity. Of note, Victim Sensitivity was also positively correlated with justifiability of stockpiling behavior, $r = 0.14$.

We also aimed at testing whether the reported effects were robust when taking shared variances with other personality traits into account. For this reason, we entered all six HEXACO dimensions and all four Justice Sensitivity perspectives into the same regression model, separately for both DVs. We also included resource scarcity as a main effect, but no interaction terms with personality given that we did not find any significant interaction effects in the previous analyses.
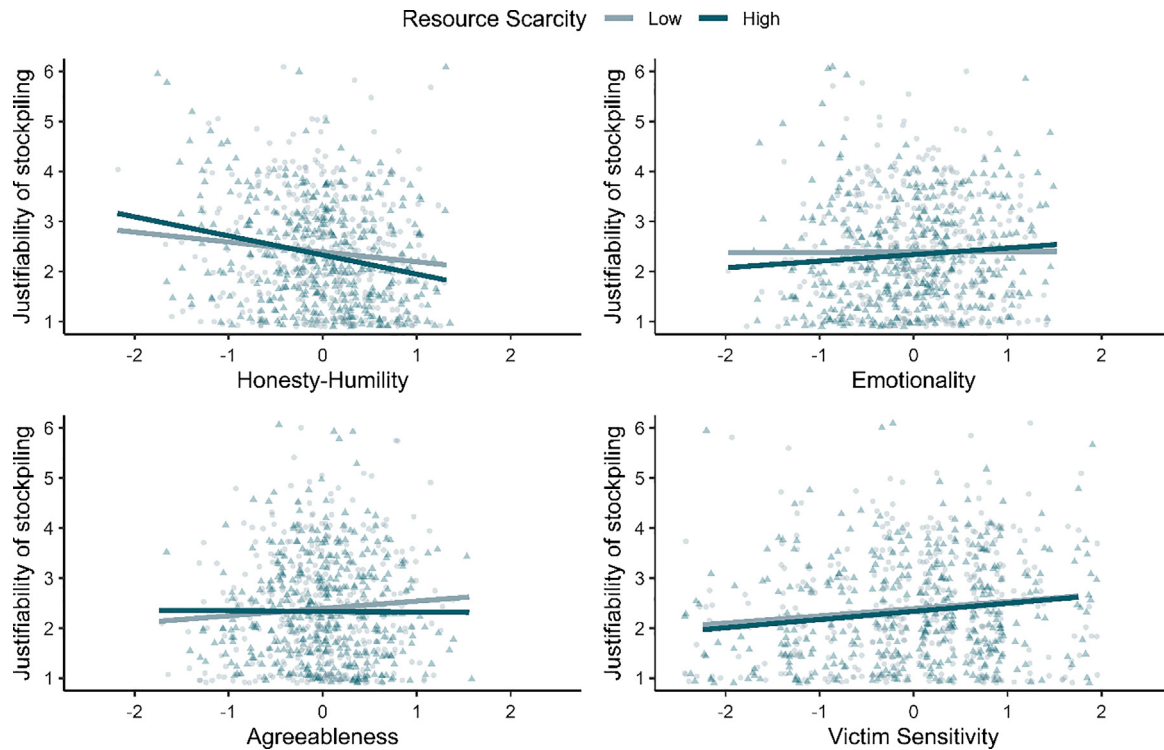
Fig. 2. Prediction of justifiability of stockpiling behavior by personality under high and low resource scarcity. Personality dimensions were mean centered. Circles represent observations in the *low resource scarcity* condition, rectangles represent observations in the *high resource scarcity* condition.

As summarized in Fig. 3 and consistent with our hypotheses, the multiple regression for stockpiling intentions revealed significant effects of resource scarcity, $B = 0.11$, $SE(B) = 0.05$, 95% CI [0.02, 0.20], $p = .021$, Honesty-Humility, $B = -0.35$, $SE(B) = 0.10$, 95% CI [-0.52, -0.17], $p < .001$, and Emotionality, $B = 0.22$, $SE(B) = 0.08$, 95% CI [0.06, 0.37], $p = .006$. Beyond predictions, we also found a significant effect for Beneficiary Sensitivity, $B = -0.18$, $SE(B) = 0.06$, 95% CI [-0.30, -0.07], $p = .002$. The effect of Victim Sensitivity was non-significant in this analysis, $B = 0.10$, $SE(B) = 0.06$, 95% CI [-0.01, 0.22], $p = .076$, which is not compatible with the analysis in which Victim Sensitivity was included as single personality predictor. None of the other personality traits were significantly related to stockpiling intentions in this analysis, B's < 0.12, all p's > 0.116. Overall, this regression model explained 7% of the variance in stockpiling intentions, $F(11, 785) = 5.70$, $p < .001$, $R^2 = 0.07$, 95% CI [0.04, 0.11].

Fig. 4 summarizes the results from the multiple regression for justifiability of stockpiling behavior. As predicted, there were significant effects of Honesty-Humility, $B = -0.20$, $SE(B) = 0.07$, 95% CI [-0.34, -0.05], $p = .007$, and Agreeableness, $B = 0.19$, $SE(B) = 0.07$, 95% CI [0.05, 0.33], $p = .007$. Of note, the significant effect of Agreeableness in this multiple regression is somewhat at odds with the regression results when Agreeableness was included as single personality predictor. We further delve into this finding in the exploratory analyses. Moreover, the regression model yielded significant effects of Victim Sensitivity, $B = 0.14$, $SE(B) = 0.05$, 95% CI [0.05, 0.23], $p = .002$, and Beneficiary Sensitivity, $B = -0.16$, $SE(B) = 0.05$, 95% CI [-0.25; -0.06], $p = .001$, both of which were not hypothesized. The effects of all other predictors – including resource scarcity – were non-significant, with all B's < 0.10, all p's > 0.118. Together, these predictors explained 6% of the variance in justifiability of stockpiling behavior, $F(11, 785) = 4.84$, $p < .001$, $R^2 = 0.06$, 95% CI [0.03, 0.10].

3.4. Exploratory analyses

We followed four lines of exploratory analyses: First, we elucidated why our manipulation of resource scarcity had only weak effects on the DVs. Second, we explored why Agreeableness was only related to justifiability of stockpiling behavior when controlling for the shared variance with other personality traits. Third, we investigated whether gender differences had an influence on stockpiling intentions and justifiability of stockpiling behavior, as well as controlled for gender in some of our analyses to account for the unequal gender distribution in our sample. Fourth, we examined the amount of variability in the DVs that was accounted for by different pictures within experimental conditions.

One possible explanation for the small effects of the resource scarcity manipulation on the DVs is that individuals generally perceived supermarket shelves as relatively empty at the time the study was conducted. If this were true, asking participants to imagine encountering full supermarket shelves might have been perceived as unrealistic; instead, imagining a shopping scenario might have automatically elicited an imagination of resource scarcity. Indeed, inspection of the two control questions included in the survey supported this idea: Participants judged the situation in the *low resource scarcity* condition as less plausible ($M = 4.68$, $SD = 1.44$) than participants did in the *high resource scarcity* condition ($M = 5.18$, $SD = 1.26$). Levene's test for homogeneity of variances suggested that these variances were heterogenous, $F(1, 795) = 8.04$, $p = .005$. We therefore applied Welch's t-test (one-sided) and found this mean difference to be significant, $t(781.41) = -5.18$, $p < 0.01$, $d = -0.37$, 95% CI [-0.51, -0.23]. Correspondingly, and irrespective of condition, participants also indicated that supermarket shelves were relatively empty at the time ($M = 3.78$, $SD = 1.53$; on a response scale ranging from 1 to 6). These findings suggest that our manipulation of resource scarcity might have been too subtle to systematically affect the perception that others stockpile and thereby exploit those who cooperate. Interestingly, the perception that the supermarket shelves were relatively empty at the time of the survey was influenced by personality: Victim Sensitivity was positively associated with perceiving supermarket shelves as empty, $r = 0.08$, whereas Honesty-Humility was negatively associated with such perceptions, $r = -0.12$. This is compat-

ible with evidence showing that victim sensitive individuals often expect malevolence (Gollwitzer et al., 2013), whereas individuals high in Honesty-Humility often expect benevolence in others (Thielmann & Hilbig, 2014; Thielmann, Hilbig, & Zettler, 2020).

We next turned to the effect of Agreeableness on justifiability of stockpiling behavior. Recall that we hypothesized that Agreeableness should be positively related to justifiability of stockpiling behavior (i.e., a main effect) and that it should interact with resource scarcity in the sense that the positive association of Agreeableness should be stronger under high (versus low) resource scarcity. The linear regression analyses including only Agreeableness as trait predictor supported neither of these hypotheses (see above and Table 2). By contrast, Agreeableness did positively predict justifiability of stockpiling when the shared variance with other personality dimensions was statistically controlled for (see Fig. 4). A potential explanation for this inconsistency is the relatively high correlation between Agreeableness and Honesty-Humility in our data (r = 0.20; see also Moshagen, Thielmann, Hilbig, & Zettler, 2019, for corresponding meta-analytic estimates). A recent meta-analysis demonstrated that controlling for the shared variance of these two dimensions in particular allows a more unique mapping of Agreeableness and Honesty-Humility on theoretically-related outcomes (Zettler, Thielmann, Spadaro, & Balliet, 2020). Following this reasoning, we extended the pre-registered regression model including Agreeableness, resource scarcity, and their interaction as predictors of justifiability of stockpiling by a main effect of Honesty-Humility. In this model, the effect of Agreeableness was indeed positive and significant, B = 0.14, $SE(B)$ = 0.07, 95% CI [>0.00, 0.28], p = .048. The interaction between Agreeableness and resource scarcity remained non-significant, B = −0.07, $SE(B)$ = 0.07, 95% CI [−0.20, 0.07], p = .334. Taken together, higher levels of Agreeableness were associated with higher justifiability of stockpiling behavior when controlling for the shared variance with Honesty-Humility, but there was no evidence for an interaction with resource scarcity whatsoever.

Our sample consisted of substantially more women (n = 597) than men (n = 197). Interestingly, females descriptively reported lower levels of stockpiling intentions than men in both the *low resource scarcity* (M_{female} = 2.47, SD_{female} = 1.29 versus M_{male} = 2.70, SD_{male} = 1.44) and the *high resource scarcity* condition (M_{female} = 2.64, SD_{female} = 1.31 versus M_{male} = 2.86, SD_{male} = 1.35) but both mean differences were non-significant in two-sided t-tests, $t(395)$ = −1.45, p = .148, d = −0.17, 95% CI [−0.41, 0.06] and $t(395)$ = −1.53, p = .128, d = −0.17, 95% CI [−0.40, 0.05], respectively. Similarly, females judged stockpiling as descriptively less justifiable than men in both the *low resource scarcity* (M_{female} = 2.34, SD_{female} = 1.09 versus M_{male} = 2.57, SD_{male} = 1.33) as well as in the *high resource scarcity* condition (M_{female} = 2.27, SD_{female} = 0.96 versus M_{male} = 2.51, SD_{male} = 1.19) but these trends were again non-significant in two-sided tests, $t(395)$ = −1.76, p = .080, d = −0.21, 95% CI [−0.45, 0.03] and Welch's $t(159.67)$ = −1.85, p = .067, d = −0.23, 95% CI [−0.45, −0.01], respectively.[7] Nevertheless, these descriptive trends (but not the non-significant inferential results) are in line with meta-analytic evidence showing that women tend to cooperate more than men in resource dilemmas (Balliet, Li, Macfarlan, & Van Vugt, 2011). Due to these descriptive gender differences, we also considered it important to replicate our main confirmatory findings when statistically controlling for gender. More specifically, we extended the

linear regressions models with single personality predictors (i.e., the analyses reported in Table 2 and Table 3) by a main effect of gender. The results for these models are reported in the Supplementary Online Materials (Table S3 and Table S4). In essence, being male was associated with greater stockpiling intentions and greater justifiability of stockpiling behavior in all models, except for the model in which stockpiling intentions were regressed on Honesty-Humility, B = 0.20, p = .069. All main effects of personality on both DVs replicated the results from the confirmatory analyses, with the exception that Emotionality now also positively predicted justifiability of stockpiling behavior, B = 0.14, p = .027. Again, there was no evidence for significant interactions between the personality variables and resource scarcity.

Lastly, we tested whether variance in our DVs caused by different stimuli (i.e., 10 different pictures of empty vs. full supermarket shelves) within conditions affected the results. Specifically, in our main analyses we did not consider the different stimuli used to manipulate resource scarcity. To address this issue, we extended the pre-registered regression analyses to linear mixed models by adding random intercepts on the stimulus level (*lme4* package; Bates, Mächler, Bolker, & Walker, 2015). The intraclass correlations (ICCs) for the stockpiling intentions models were consistently small (all *ICC*s < 0.01). For justifiability of stockpiling, all ICCs were estimated to be zero, reflecting a singular fit of these models. Together, this indicates that – if at all – only negligible amounts of variance in the DVs can be attributed to the different stimuli used. Consequently, the multiple regression analyses neglecting differences between stimuli are appropriate for the present data structure.

4. Discussion

The present study tested whether well-known predictors of cooperation in game-based social dilemmas can likewise account for stockpiling during the COVID-19 pandemic – a real-life social dilemma. We recruited a large German sample (N = 797) during a time when stockpiling occurred frequently and tested the impact of the HEXACO dimensions and Victim Sensitivity on stockpiling intentions and justifiability of stockpiling behavior under high and low resource scarcity. Hypotheses were based on an affordance perspective (Thielmann, Spadaro et al., 2020) allowing to derive specific hypotheses about which traits should be relevant in the stockpiling situation.

In line with our predictions, Honesty-Humility yielded small to medium-sized (Funder & Ozer, 2019) negative relations with stockpiling intentions and justifiability of stockpiling behavior.[8] This closely replicates recent findings by Columbus (2020) who also found Honesty-Humility to negatively predict stockpiling in the past and intentions to do so in the future in a UK sample. By contrast, Garbe et al. (2020) found no evidence for the role of Honesty-Humility for multiple indicators of toilet paper stockpiling during COVID-19 in a sample of participants from 22 European and North American countries. A potential explanation for this inconsistency – besides differences between samples – is that Garbe and colleagues only used a 24-item short scale to measure the HEXACO dimensions (De Vries, 2013) whereas both Columbus and we used longer scales. Then again, Zettler, Schild, et al. (2020) used both short and longer scales to assess Honesty-Humility across five samples in Denmark and Germany, showing no systematic differences in relations with self-reported hoarding behavior as a function of scale length. Thus, we suspect that the described discrepancies between

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[7] We used Welch's t-test to compare means in justifiability of stockpiling behavior between female and male participants in the *high resource scarcity* condition because Levene's test indicted that these variances were heterogenous, $F(1,395)$ = 5.93, p = .015. Note, however, that this mean difference would be significant when assuming equal variances instead, $t(395)$ = −2.04, p = .042, and that this explains why the 95% confidence interval for Cohen's d does not include zero despite Welch's t-test being non-significant.

[8] The evaluations of effect sizes in this section are based on the zero-order correlations (see Table 1). We followed the recommendation of Funder & Ozer (2019) to interpret $r \geq |0.05|$ as a very small, $r \geq |0.10|$ as a small, $r \geq |0.20|$ as a medium, and $r \geq |0.30|$ as a large effect in psychological research.

Table 3
Linear Regression Analyses for Justifiability of Stockpiling Behavior.

Honesty-Humility						Emotionality						Agreeableness						Victim Sensitivity					
Predictor	B	SE	95% CI LB	UB	p	Predictor	B	SE	95% CI LB	UB	p	Predictor	B	SE	95% CI LB	UB	p	Predictor	B	SE	95% CI LB	UB	p
Intercept	2.36	0.04	2.29	2.44	<0.001	Intercept	2.36	0.04	2.29	2.44	<0.001	Intercept	2.36	0.04	2.29	2.44	<0.001	Intercept	2.36	0.04	2.29	2.44	<0.001
RS	−0.03	0.04	−0.10	0.04	0.407	RS	−0.03	0.04	−0.10	0.05	0.496	RS	−0.03	0.04	−0.10	0.04	0.429	RS	−0.03	0.04	−0.10	0.05	0.471
HH	−0.29	0.06	−0.41	−0.17	<0.001	EM	0.07	0.06	−0.04	0.19	0.231	AG	0.07	0.07	−0.04	0.11	0.336	VS	0.15	0.04	0.07	0.23	<0.001
HH * RS	−0.09	0.06	−0.21	0.03	0.134	EM * RS	0.06	0.06	−0.05	0.18	0.295	AG * RS	−0.08	0.07	−0.12	0.03	0.251	VS * RS	0.01	0.04	−0.07	0.09	0.812
F	8.59				<0.001	F	1.13				0.338	F	0.98				0.400	F	5.13				0.002
R²	0.03		0.01	0.06		R²	0.00		0.00	0.01		R²	0.00		0.00	0.01		R²	0.02		0.00	0.04	

Note. RS = resource scarcity (effect-coded, −1 = *low*, and 1 = *high*); HH = Honesty-Humility; EM = Emotionality; AG = Agreeableness; VS = Victim Sensitivity; CI = confidence interval; LB = lower bound of CI; UB = upper bound of CI. HH, EM, AG, and VS were mean centered. Degrees of freedom are $v_1 = 3$ and $v_2 = 793$ for all four models.

findings may also simply be due to sampling error or other systematic differences in samples and methods between studies. In any case, the finding that Honesty-Humility negatively predicts stockpiling is compatible with its theoretical conceptualization (Ashton & Lee, 2007) and prior research on the link between Honesty-Humility and cooperation in game-based social dilemmas (Thielmann, Spadaro et al., 2020).

Agreeableness, in turn, was positively associated with justifiability of stockpiling, yielding a small effect size but (unexpectedly) only when controlling for the shared variance with other trait predictors – most prominently Honesty-Humility. Nonetheless, the finding that the unique effect of Agreeableness becomes apparent once accounting for the shared variance with Honesty-Humility is in line with meta-analytic evidence on the unique predictive ability of Agreeableness for theoretically-relevant outcomes (Zettler, Thielmann et al., 2020). That said, these findings should be replicated in the future, as the corresponding analyses were only exploratory in nature. Moreover, it should be noted that Agreeableness did not interact with resource scarcity to predict justifiability of stockpiling behavior, as would have been expected based on the theoretical conceptualization of Agreeableness reflecting forgivingness versus retaliation. Nonetheless, the absence of this effect should also be interpreted with caution given the limited effectiveness of our resource scarcity manipulation.

Further, our results showed a small positive relation between Emotionality and stockpiling intentions. However, we found no evidence for an interaction between Emotionality and resource scarcity in predicting stockpiling intentions. The finding that Emotionality plays a role for cooperation in the stockpiling dilemma is particularly noteworthy because Emotionality is usually unrelated to cooperation in game-based social dilemmas (Thielmann, Spadaro et al., 2020). As reasoned above, situations like a pandemic may elicit feelings of stress, anxiety, and uncertainty and thus afford the expression of Emotionality in uncooperative behavior such as stockpiling. More precisely, individuals high in Emotionality may use stockpiling as a means to reduce fear and stress, which is compatible with the positive associations of Emotionality with anxiety-related outcomes (Zettler, Thielmann et al., 2020). As such, this finding corroborates the notion that emotions may indeed "create social or moral forces that game matrices have not captured" (Murnighan & Wang, 2016, p. 91). Future research is needed to examine whether Emotionality is only relevant in certain social dilemmas in naturalistic settings, for example by directly manipulating whether or not (non-)cooperation can reduce feelings of anxiety. Building on the affordance-based reasoning above, it is conceivable that Emotionality is unrelated to cooperation in less emotionally-charged settings, but negatively related to cooperation when the outcome helps to cope with anxiety or uncertainty.

Finally, Victim Sensitivity was positively associated with stockpiling intentions. However, in contrast to our hypotheses, this association was apparent irrespective of whether resource scarcity was high or low. The theoretical rationale for the hypothesized interaction was based on the SeMi model (Gollwitzer et al., 2013) which proposes that "victim-sensitive individuals react more sensitively to cues of untrustworthiness; thus, the presence of such cues reduces their willingness to cooperate in social dilemmas" (p. 418). However, the operationalization of untrustworthiness cues in form of our resource scarcity manipulation may have been ineffective in eliciting meaningful differences between conditions. The pandemic was a "strong situation" in itself and was likely to suffice for eliciting a suspicious mindset (i.e., expectations that others stockpile) among many individuals (i.e., both people high and low on Victim Sensitivity). This could explain why Victim Sensitivity was positively linked to stockpiling intentions in general, irrespective of resource scarcity.
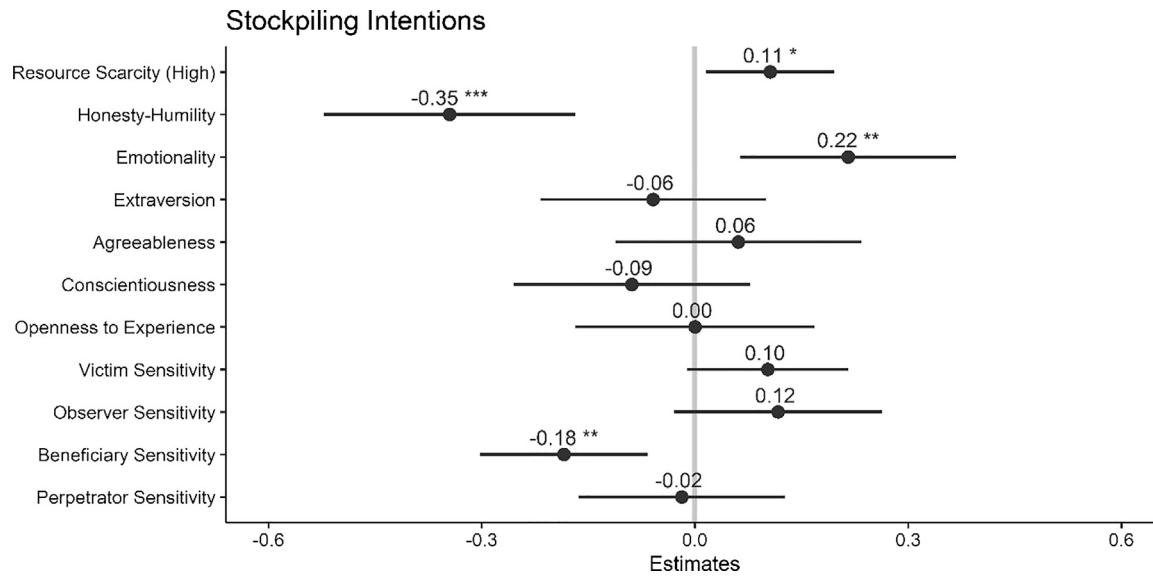
Fig. 3. Multiple regression results for resource scarcity, HEXACO dimensions, and Justice Sensitivity perspectives predicting stockpiling intentions. Estimates are unstandardized regression coefficients. Resource scarcity is coded as -1 = *low* and 1 = *high*. The intercept is omitted in this figure. Personality dimensions were mean centered. Error bars represent 95% confidence intervals. $* p < .05$, $** p < .01$, $*** p < .001$.
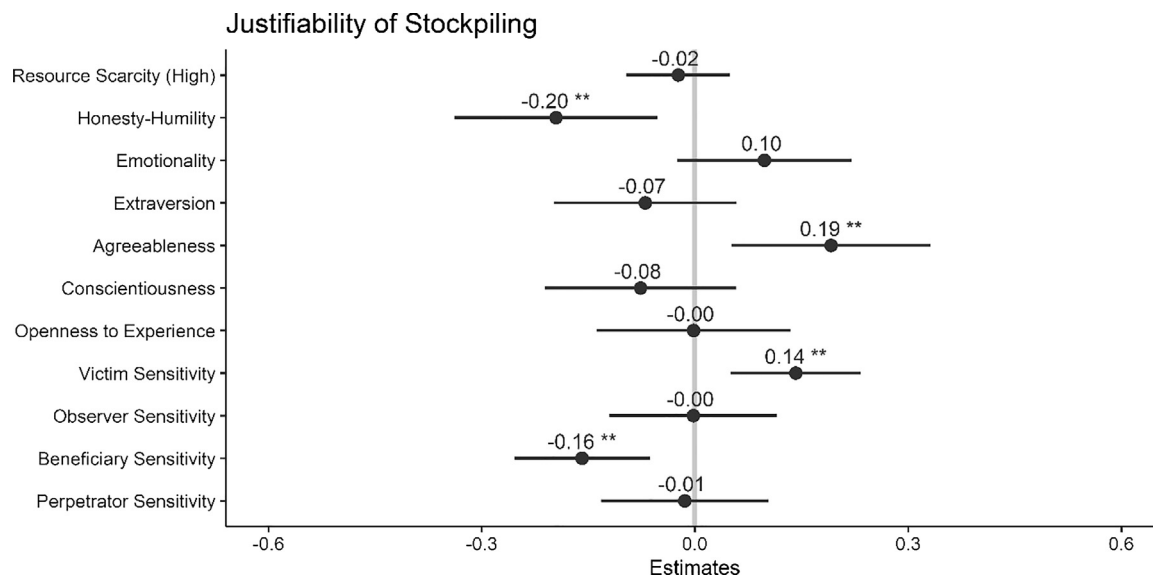

Fig. 4. Multiple regression results for resource scarcity, HEXACO dimensions, and Justice Sensitivity perspectives predicting justifiability of stockpiling behavior. Estimates are unstandardized regression coefficients. Resource scarcity is coded as -1 = *low* and 1 = *high*. The intercept is omitted in this figure. Personality dimensions were mean centered. Error bars represent 95% confidence intervals. $* p < .05$, $** p < .01$.

4.1. Limitations and directions for future research

Although our results provide important insights into the personality determinants of stockpiling during a pandemic, some limitations of the present research ought to be acknowledged. First, the experimental manipulation of resource scarcity only had a small effect on stockpiling intentions and no effect at all on justifiability of stockpiling behavior. Moreover, none of the focal personality traits interacted with resource scarcity to predict the DVs, suggesting that this manipulation was too subtle and thus ineffective in triggering differential effects of personality in the two experimental conditions.

Moreover, we argued that empty supermarket shelves may indicate others' engagement in stockpiling. However, this is not

the only plausible interpretation. Empty supermarket shelves may also reflect environmental influences, such as interruptions in delivery of certain products. Arguably, the attribution of resource scarcity as caused by other people versus environmental influences may also impact individuals' willingness to cooperate. Evidence suggests that individuals tend to harvest more from a scarce resource in the commons dilemma when scarcity is caused by group members rather than environmental influences (Rutte, Wilke, & Messick, 1987). However, given that we did not measure participants' construal of the situation, we cannot empirically control for potential differences in this attribution. Future research addressing this issue is desired.

The theoretical rationale of the present study is based on the notion that stockpiling during a pandemic represents a social

dilemma that has conceptual overlap with the commons dilemma. However, whether individuals indeed perceived the situation in a structurally similar way as a (game-based) commons dilemma is an open question. In this regard, it would be informative to investigate whether participants were aware that stockpiling may reduce the availability of certain products for other customers. Future research is needed to examine when and how real-life situations are perceived and interpreted in terms of social dilemmas as modelled in the lab (Columbus, Molho, Righetti, & Balliet, 2020), and to what extent such perceptions may affect the influence of personality on behavior (Columbus, Thielmann, & Balliet, 2019). Moreover, the situational affordances we ascribed to the situation of stockpiling were based on theoretical considerations and were not empirically assessed. For example, we argued that stockpiling represents an opportunity for exploitation in the sense that customers can increase their individual outcome through stockpiling without fearing punishment from other customers or authorities – because no formal sanctioning systems for stockpiling behavior were present. Stockpiling is, however, publicly observable, and thus some customers may have anticipated informal sanctions for stockpiling, for example in form of public criticisms by other customers. Whether or not participants anticipated sanctions for non-cooperation (i.e., stockpiling) is relevant because previous research suggests that the effects of certain personality traits on cooperation in social dilemmas are more pronounced in the absence (vs. presence) of punishment (Hilbig, Zettler, & Heydasch, 2012).

Another limitation is the correlational nature of the study, with the exception of our resource scarcity manipulation. Thus, the study does not allow any causal claims regarding the link between personality and stockpiling. Moreover, our DVs were self-reports and therefore potentially prone to socially desirable responding. Observing actual stockpiling behavior (rather than measuring stockpiling intentions with self-report scales) would have provided a stronger test of our hypotheses. Lastly, our results are specific to real-life social dilemmas during a pandemic and may thus not directly transfer to other real-life social dilemmas. More specifically, we expect our results to generalize to situations in which (i) others' stockpiling of basic goods such as groceries or sanitary products is visible (e.g., through media reports or empty supermarket shelves) and (ii) stockpiling is to some extent driven by expecting that these goods may be unavailable in the near future. We have no reason to believe that the results depend on other characteristics of the participants, materials, or context (cf. Simons, Shoda, & Lindsay, 2017).

5. Conclusion

Most previous research investigated individual and situational antecedents of cooperation in social dilemmas using economic games. The present study demonstrates that particularly the association of Honesty-Humility with cooperation generalizes to the real-life social dilemma of stockpiling, thereby speaking to the robustness of this effect and the validity of economic games as a research paradigm. By contrast, our study also reveals that economic games may underestimate or neglect the importance of other personality traits that become particularly relevant in the presence of specific situational affordances, such as the impact of Emotionality for stockpiling during a pandemic. We hope that our research encourages future work along these lines.

6. Funding

7. Open practices

Study materials, data set, and analysis scripts can be accessed via the following link: https://osf.io/wbxnr/.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

Appendix A. Supplementary material

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jrp.2021.104075.

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