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“Do I have enough food?” How need for cognitive closure and gender impact stockpiling and food waste during the COVID-19 pandemic: A cross-national study in India and the United States of America

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ABSTRACT

Food waste is considered to be one of the biggest issues affecting individuals around the globe. The COVID-19 pandemic, with the consequent lockdown processes, has recently triggered individuals to stockpile foodstuffs. Recent data shows, however, that individuals have not consumed a good proportion of the stockpiled food, resulting in increasing amounts of products ending up wasted. Using a cross-national survey conducted in the United States and India, we investigate how individuals' levels of need for cognitive closure (NFC) relate to food stockpiling and waste during the COVID-19 pandemic. Through a sequential mediation model, we show how individuals high in NFC did not perceive to have enough food at home, ending up buying more food than usual and, eventually, wasting more. Individuals' gender and country of residence moderate such phenomenon, with the effect being more pronounced among Indian (rather than American) women. We discuss how gender roles in different countries can correlate with the stockpiling and food waste processes. We conclude the manuscript by suggesting how public communication and policy making could develop targeted programs to mitigate such issues.

1. Introduction

On the 11th of March 2020, the [World Health Organization \(2020\)](#) declared a pandemic triggered by the coronavirus disease (COVID-19 caused by the novel coronavirus SARS-CoV-2).

In the absence of a specific treatment or vaccination, one-third of the world was recommended to stay at home to limit the spread of the contagion. During the lockdown, a change was noted in the individuals' behavioral patterns. According to [Harper et al. \(2020\)](#), the fear of COVID contagion predicted a series of behaviors including limiting social contacts, maintaining social distance, working remotely and purchasing personal protective equipment ([Addo et al., 2020](#)). Furthermore, the lockdown impacted individuals' health behaviors with a change in dietary habits (with increased home-cooking and consumption of snacks) but at the same time inducing a more sedentary lifestyle (for instance, due to the limitation to practice sports and similar physical activities outside; [Arora & Grey, 2020](#)).

This extraordinary change of habits has a dramatic impact also on the natural environment ([Zambrano-Monserrate et al., 2020](#)). These

authors pointed out some positive as well as negative consequences of the forced lockdown. For example, limited use of motor vehicles has resulted in a reduction in NO₂ concentration in countries such as France, Germany and Italy ([European Space Agency, 2020](#)). On the other hand, organic and inorganic waste raised due to the increased use of medical waste (masks and gloves), single-use plastic, and waste related to inappropriate storage and overbuying food ([Jribi et al., 2020](#)).

This study aims at contributing to the literature on individual differences and pro-environmental behaviors by looking at how during an uncertain situation (i.e. the COVID-19 pandemic) individuals with different levels of Need for Cognitive Closure ([Kruglanski, 2004](#); [Kruglanski & Webster, 1996](#)) may engage in a series of thoughts and behaviors that result in damaging the environment (i.e. food waste). Starting from a call for more research in factors influencing food waste by [Porpino \(2016\)](#), we aim at understanding whether individuals with a high (vs. low) need for cognitive closure react to the uncertainty brought by COVID-19 by perceiving having less food and therefore stockpiling more than needed, in turn producing also higher waste.

We also test two moderating factors: whether such an outcome is

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more pronounced in women or men, and if there are differences in countries with different levels of food waste. We selected India and the United States based on two considerations: first, according to recent statistics (Statista, 2019), India has one of the lowest food waste rates per capita (51 kg), while the United States has one of the highest (278 kg) rate in the World. Second, both countries were under lockdown when we conducted our research, providing a natural setting to test our hypotheses.

In the sections that follow, we provide a summary of the literature on food waste, mainly focusing on studies on the topic during the COVID-19 pandemic. We then present a brief overview of the Need for Cognitive Closure and its effects on individuals' perceptions and behaviors. Finally, we introduce the role of gender and country of residence as moderators and present our hypotheses and our conceptual model.

2. Theoretical background

2.1. The impact of food waste during the coronavirus outbreak

Food waste is a global issue for both developed and developing countries. An impressive amount of food that we buy goes from our fridge to our bin. According to the Food and Agriculture Organization of the United Nations (FAO, 2019), approximately one-third of the food produced at the global level (i.e., 1.3 billion tons) is wasted every year. The effect of food waste has high problematic environmental, economic, and social consequences such as environmental pollution, market inefficiencies and social inequality (Rockström et al., 2009) to name a few. Consumers -and their habits - are mainly responsible for food waste. During normal times, a consumer engages in specific behaviors around food consumption such as meal planning, purchasing, storing, preparing, consuming and, eventually, store leftover and/or waste the remaining food. During the COVID-19 pandemic, our habits changed due to the recommendations given by the government to stay at home. For example, the amount of time that people could go to the supermarket were limited and people had more time for cooking. At the time of our research, the effect of the lockdown on the food waste habits had been investigated in a few studies presenting contradictory findings. According to Jribi et al. (2020) in a study conducted in Tunisia on consumer awareness, attitudes, and behaviors during the pandemic, respondents reported better shopping planning. On the other end, however, the authors found an increase in overcooking, inappropriate storage and overbuying of food that affects the food waste. In another study, Dou et al. (2020) found how people in the USA and China reported having changed their food purchase behavior in favor of more takeout and delivering orders, wasting less food during the pandemic. A positive attitude around food waste seemed to stem from consumers' awareness of limited supply and stocking of food and a perceived uncertainty of finding food in the future.

Overall, these studies gave a first picture of the impact of household wastage during the COVID-19. However, they mostly overlooked the psychological variables involved in the food waste process to have a clearer picture of why and when individuals have the perception of not having enough food and engage in more stockpiling behaviors despite their food security is not affected (FAO, 2020). An exception relies on the study by Ling and Ho (2020) where the author proposed that panic buying and hoarding issues are the results of how uncertainty and self-interest behaviors of most individual prevailed over collective interest.

By aiming at expanding these results, in this study we investigate the role need for cognitive closure (Kruglanski, 2004) and gender play in shaping food waste across different countries.

2.2. Need for cognitive closure, uncertainty, and COVID-19

Need for cognitive closure (NFC) has been defined as “the individual's desire for a firm answer to a question, any firm answer, as opposed to confusion and/or ambiguity” (Kruglanski, 2004, p. 6).

Individuals with a high chronic NFC prefer order, predictability, avoid uncertainty, and they are intolerant to ambiguity (for a review Roets et al., 2015). A common characteristic of individuals with a high NFC is the tendency to make judgments without considering additional information, preserving or “freezing” their past knowledge. For such reason, for example, individuals with a high NFC prefer to avoid risky situations. Research on individual differences has demonstrated how chronic NFC is positively related with a high level of intolerance of uncertainty (Berenbaum et al., 2008), anxiety (Roets & Hiel, 2008) and risk avoidance (e.g. Disatnik & Steinhart, 2015).

Schumpe et al. (2017), propose how individuals with a high NFC express lower willingness to take an immediate and prolonged risky decision compared to people with a low need for closure. Koscielniak et al. (2016) report similar results showing how NFC mediated the effect of low-risk aversion for older participants. The COVID-19 pandemic creates a natural setting of uncertainty, risk, and anxiety that together with a direct impact on physical and mental health (e.g. Liu et al., 2020) also induces economic uncertainty (Baker et al., 2020; Mann et al., 2020), and impacts environmental behavior (Zambrano-Monserrate et al., 2020).

The current study aims at understanding how individuals with high (vs. low) chronic NFC behave in this global instability. Specifically, we propose that individuals with high NFC engaged more in stockpiling behaviors to deal with the uncertain and risky situation of being without food, even if this may have entailed higher levels of food waste – in line with their tendency of exhibiting lower pro-environmental behaviors. We hypothesize that individuals high in NFC have a higher perception of lacking food in their household, which also leads them to stockpile more and, therefore, to waste higher amounts of foodstuff. More formally, we expect a sequential mediating effect of the perception of lacking food and the higher stockpiling on the relationship between NFC and level of food waste.

2.3. Gender and food waste

There is not a general agreement about the relationship between individuals' gender and food waste. Some studies provided evidence that single women produce more food waste compared to single men (Koivupuro et al., 2012; Silvennoinen et al., 2015). On the contrary, other studies found that young people produce the same amount of food waste regardless of their gender (Principato et al., 2015). Regarding the level of awareness and concern about food waste, Cantaragiu (2019) found that, at any age, women tend to express higher concerns than men about the negative impact of food waste in social equity and family budget. Furthermore, Lyndhurst (2007a, 2007b) found that, when women are responsible for cooking and feeding their own family, reported a high level of guiltiness if waste food. An explanation of these findings can be found in the increased responsibility of women in the household when they are older and live with their own family, and a consequent rise in concern about food waste (Lyndhurst, 2007a, 2007b).

In this study, we investigate the moderating role of gender on the relationship between the NFC and the perception of lacking food in the household during the COVID-19 pandemic. Males and females may differ in their roles concerning household management. This is particularly true in certain countries more than in others. For example, in countries like India, women are more often responsible to provide sustenance for their own family (Sudershan et al., 2009) and be more concerned about the amount of food waste compared to other countries like the USA. Such a difference is further heightened by the access women have to employment, with a rate of 65% in the USA compared to the 26.97% of full-time employed women in India (The World Bank, 2020).

Based on this assumption, we hypothesize a moderation effect of gender and country of residence on the relationship between the NFC and the perception of lacking food in the household. Specifically, we

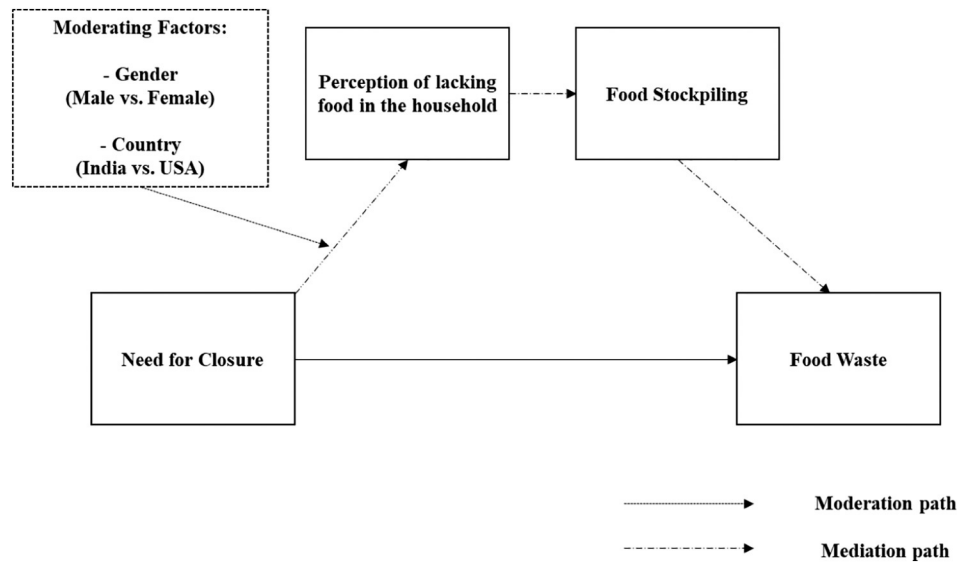


Fig. 1. Conceptual model.

believe that the relationship between high NFC and the perception of lacking food would be stronger for Indian women compared to their USA counterparts. Fig. 1 graphically represents our conceptual model.

3. Method

3.1. Participants and procedures

We recruited five hundred and ninety respondents (52.5% males, $M_{Age} = 36.86$, $SD = 11.39$) through Amazon Mechanical Turk in exchange of a \$0.70 compensation. Only participants that had completed more than 1000 MTurk tasks with greater than 98% lifetime approval were recruited. Each participant voluntarily participated in the survey providing a written informed consent that included information about anonymity, data use and storage and no risk of harm of the study. Within the sample, two hundred and sixty-four respondents were resident in India (53.8% males, $M_{Age} = 31.75$, $SD = 8.16$) and three hundred twenty-six respondents were resident in the United States (51.5% males, $M_{Age} = 40.99$, $SD = 11.98$).

3.2. Measures

Respondents filled in the fifteen items NFC scale (Roets & Van Hiel, 2011). Example items of the scale include: “I don't like situations that are uncertain”, “I find that a well-ordered life with regular hours suits my temperament”, or “I enjoy having a clear and structured mode of life.” (on a seven-point Likert scale – 1 = strongly disagree to 7 = strongly agree). The NFC scale demonstrated very good reliability in both subsamples (Cronbach α India = 0.93; Cronbach α United States = 0.95). Next, participants were presented with the mediating and dependent variables. We randomized the presentation order of this set of questions to reduce response bias. Respondents assessed whether during the COVID-19 lockdown they had the perception to lack food in the house (“During the COVID-19 pandemic I had the perception the quantity of food/groceries you had at home was insufficient”). Participants also assessed whether they had bought more food than usual (“I bought more food/groceries than usual during the COVID-19 pandemic”) and if they had the perception to have wasted more food during the lockdown (“I wasted more food/groceries than usual during the COVID-19 pandemic”). All measures were on a seven-point Likert scale (1 = strongly disagree to 7 = strongly agree). We then asked participants to fill a series of demographics: gender (male or female); age (as an open-ended question); nationality (as an open-ended

question); employment status (as a categorical variable with six options: employed part-time, employed full time, unemployed seeking for occupation, unemployed not seeking for occupation, retired); and income. As this latter variable may be particularly sensitive, we provided for each subsample the median income of the country where they are residents, asking them to report whether their income is above or below that figure on a seven-point Likert scale (1 = far below to 7 = far above). Respondents were then thanked and received their compensation.

4. Results

We proceeded to amalgamate the two datasets for the final analysis. The descriptive statistics and the correlations for all the variables are available in Table 1.

First, we tested our propositions through sequential mediation model (PROCESS Model 6; 95% Confidence Intervals, 10,000 bootstrap resamples; Hayes, 2013) using the NFC as our predictor, the perception of lacking food at home and the purchase of extra food as mediators, and the perceived increase in food waste as the dependent variable. The model indicated a significant positive relationship between the NFC and the respondents' perception of lacking food at home during the COVID-19 lockdown ($B = 0.46$, $SE = 0.06$, $p < .001$). Similarly, the NFC positively influenced individuals' tendency of stockpiling food ($B = 0.18$, $SE = 0.06$, $p < .01$). As expected, also the relationship between the perceived lack of food and stockpiling is positive and significant ($B = 0.52$, $SE = 0.04$, $p < .001$). NFC had also a positive impact on perceived food waste during the COVID-19 lockdown ($B = 0.28$, $SE = 0.08$, $p < .001$) and so did the two proposed mediators (perceived lack of food: $B = 0.46$, $SE = 0.05$, $p < .001$; stockpiling: $B = 0.20$, $SE = 0.04$, $p < .001$). The indirect effects suggest a significant sequential mediation (NFC \rightarrow Perceived Lack of food \rightarrow Stockpiling \rightarrow Waste; Total indirect effect = 0.20, $SE = 0.04$, LLCI = 0.12, ULCI = 0.29, $p < .001$). Individuals higher in NFC perceived to have less food in their household, they purchased more food, and therefore they perceive to have wasted more. Fig. 2 visually summarizes the results.

Next, we introduced in the model the two moderating variables, namely gender and country of residence. We performed a moderated sequential mediation model (Model 83, 95% Confidence Intervals, 10,000 bootstrap resamples; Hayes, 2013).

As the PROCESS add-on does not encompass two moderators for a sequential mediation model, we first recoded them into two dummies

Table 1
Descriptive statistics and correlations for all measures.

		α	Mean	SD	1	2	3	4	5	6	7	8	9
1	NFC	0.95	4.87	1.13	–								
2	Lack of food		4.35	1.94	0.27***	–							
3	Food stockpiling		4.10	1.98	0.24**	0.54***	–						
4	Food waste		2.78	2.10	0.27***	0.43***	0.52***	–					
5	Age		36.86	11.39	–0.13***	–0.15***	–0.26***	0.38***	–				
6	Gender				0.15***	–0.08	–0.03	0.01	0.08	–			
7	Country of residence				–0.12**	–0.27***	–0.37***	–0.43***	0.40	0.02	–		
8	Employment status				0.02	–0.06	–0.14***	–0.20***	0.28	0.04	0.06	–	
9	Income		3.76	1.83	–0.02	0.20***	0.15***	0.25***	–0.14***	–0.12***	–0.43***	–0.15***	–

Notes. Gender: 1 = Males; 2 = Females.

*** $p < .001$.

** $p < .01$.

(gender: $-1 =$ males; $+1 =$ females; country of residence: $-1 =$ India; $+1 =$ United States), to then compute an interaction term variable (gender * country of residence) that we used as the moderator. We included gender and country of residence as covariates in the model (Fig. 3).

The results suggest a significant sequential mediation effect (Total indirect effect = -0.04 , SE = 0.03 , LLCI = -0.09 , ULCI = -0.01 , $p < .05$). Notably, the results did not differ when the covariates were not included in the model. Concerning the direct effects of the covariates, gender did not provide any significant impact as a covariate. The country of residence instead significantly impacted on all paths. Importantly, a significant three-way interaction emerged between the NFC and the two moderators (-0.14 ; SE = 0.07 , LLCI = -0.27 , ULCI = -0.01 , $p < .05$) on the perception of lacking food in the household. By looking at the interaction in details, the effect was stronger among Indian women (0.63 , SE = 0.17 , LLCI = 0.31 , ULCI = 0.96 , $p < .001$) and American men (0.51 , SE = 0.13 , LLCI = 0.26 , ULCI = 0.75 , $p < .001$) than among Indian men (0.31 , SE = 0.13 , LLCI = 0.05 , ULCI = 0.57 , $p < .05$) and American women (0.24 , SE = 0.13 , LLCI = 0.06 , ULCI = -0.02 , $p < .1$; Fig. 4).

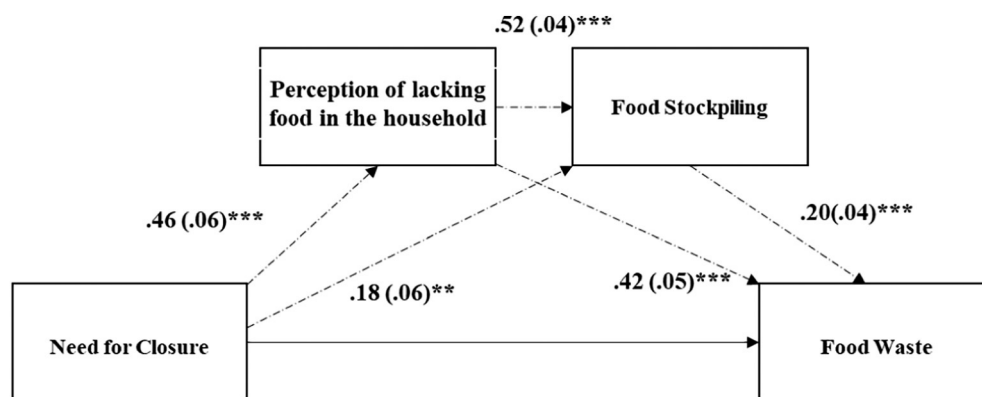
5. Discussion

The current research investigated psychological individual differences behind an important issue impacting the environment: food waste. We found that during the lockdown caused by the COVID-19 pandemic, individuals with a high NFC perceived to waste more food compared people with low NFC. This effect is mediated by the perception of lacking food and buys more food than necessary. Thus, individuals with a high NFC seems to choose the individualistic strategy

of buying more food even if this means leave less food to other people and waste more. By collecting data in different countries (India and the USA) we also found that gender and country of residence moderate the effect. Notably, Indian women perceived to waste more food compared to American women and American and Indian men.

Our results contribute to previous literature on individual differences by unveiling the role of epistemic motivations as a precursor of pro-environmental behaviors. As research has recently begun to unravel the general relationship between NFC, other individual traits, and environmental behaviors (e.g. Panno et al., 2018), we contribute to this stream of literature by looking at how the NFC affects a specific – yet very impactful and harmful for the environment – behavior. By doing so, we also contribute to the literature on food waste, responding to the call by Porpino (2016) to investigate the influence of psychological variables together with other situational factors (e.g., bulk buying) on food waste. Furthermore, our study introduces two important moderators (gender and country of residence), providing further nuances about which individuals may be more inclined to engage in such behaviors. By doing so, our results also contribute to highlight how gender roles impact the management of the household in different countries, with women being more concerned about food waste especially in countries where their role is still linked to more traditional values.

From a practical point of view, our study offers opportunities for policymakers to create ad hoc communication campaigns. By providing insights on what individual differences impact food waste especially in situations of uncertainty, campaigns may target different individuals highlighting individualistic as well as cooperative benefits to act environmentally. For example, campaigns that address the individualistic benefits of buying only necessary food (for example to save money) could have higher efficacy on people with a high NFC. Conversely,



** $p < .01$; *** $p < .001$

Fig. 2. Mediation effects of the perception of lacking food at home and food stockpiling.

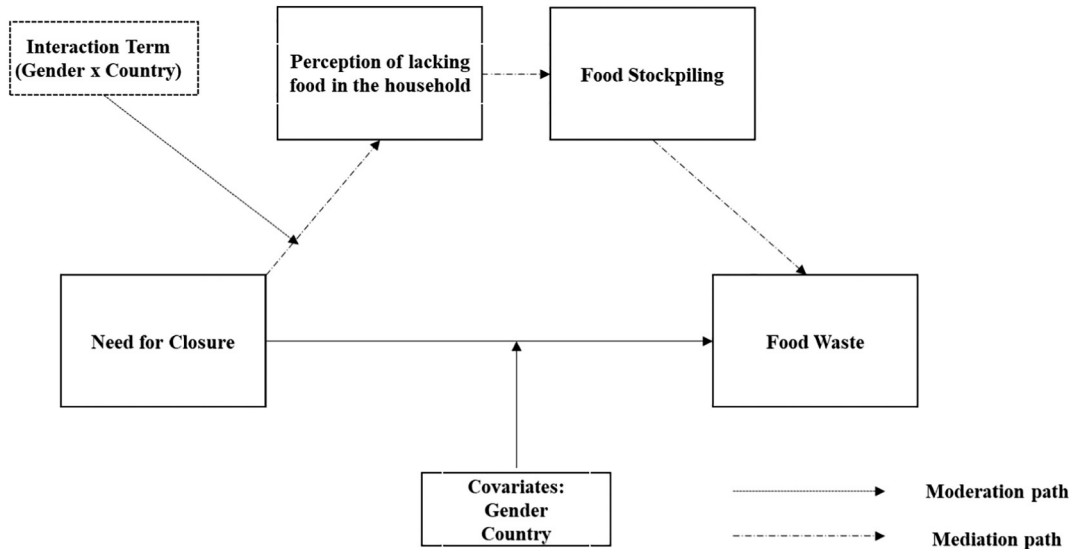


Fig. 3. Moderated Sequential Mediation Model (PROCESS Model 83).

communication campaigns highlighting more cooperative benefits to act environmentally (e.g. to reduce the general carbon footprint) could be more efficient on people with a low NFC. Similarly, as individuals with a high NFC particularly dislike uncertain situations, our results may help designing messages focusing on reassurance rather than highlighting precarious situations. For example, before and during the lockdown, several retailers imposed a limit on the number of food items each customer can purchase. Such restrictions may lead individuals high in NFC to experience feelings of uncertainty even more and engage in stockpiling behaviors by entering the supermarkets several times to stockpile. Communications focused on the reassurance that items are constantly restocked may mitigate such sense of uncertainty and limit food overbuying and waste.

These implications seem particularly relevant for developing countries. While studies indicate that India has one of the lowest amounts of food waste globally, it is also true that the country shares a quarter of the global hunger burden (United Nations, 2018). As our results point out how women in India – who seem to be mostly responsible to look after the household – are also the individuals exhibiting the strongest effects, designing communications targeted to this segment could help alleviate such issue. Therefore, it is important to identify the key individuals responsible to the household food supply and the most

appropriate channels to reach them (e.g., by looking at the type of media these individuals most frequently use).

6. Limitations and future research

This study opens potentially intriguing avenues for future research. While in this study we did not measure pre-existing knowledge about the relationship between food waste and global warming, future research could investigate how individuals would behave with increased access to more information on the consequences of food waste on global warming. A large body of research (e.g. Bulkeley, 2000; Norgaard, 2006), assumes that a lack of information about the causes of global warming is the primary reason to not act environmentally. It is possible to speculate that when people are properly informed by the negative effect that overbuying and food waste have on the environment, they may reduce or correct their inappropriate behavior. Individuals with high NFC generally seek stable information. Therefore, if they receive precise information on how to act in the COVID-19 pandemic, they may also reduce their perception of anxiety and risky avoidance (Schumpe et al., 2017) and adopt environmental strategies.

Additionally, as the correlational nature of this study does not allow any causal claim, future research may test the effects on food waste by

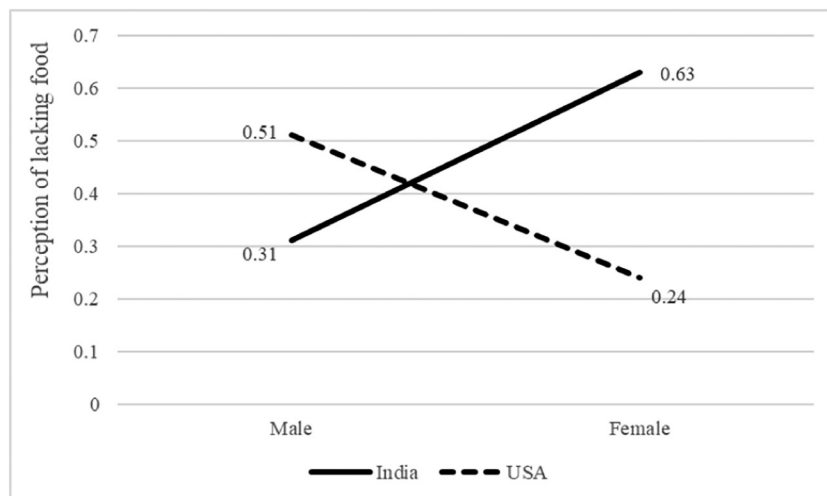


Fig. 4. Interaction effect at different levels of the moderators.

manipulating the NFC and the level of uncertainty of the situation in a more controlled environment. For example, it would be possible to induce a high NFC by using time pressure (De Grada et al., 1999); feelings of uncertainty (Brizi et al., 2016); or cognitive load (Chirumbolo et al., 2014).

Last, while our results rely on self-reported measures of waste – also due to the impossibility to map real behavior caused by the COVID-19 related lockdown restrictions– future research may also map the real level of food waste by implementing more objective measures (e.g., the actual weight of food wasted by different individuals).

CRedit authorship contribution statement

Both authors equally contributed to all the aspects of this manuscript.

Declaration of competing interest

The authors confirm they have no conflict of interest to declare. Authors also confirm that this article adheres to the ethical guidelines specified in the APA Code of Conduct as well as the authors' national ethics guidelines. The authors confirm that the article submitted, to the knowledge of all authors, has not been published elsewhere previously and is not under consideration for publication elsewhere. This submission is approved by all authors and by the responsible authorities where the authors carried out the work. If accepted for publication, this article will not be published elsewhere including electronically in the same form, in English, or in any other language, without the written consent of the copyright-holder.

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