COGNITIVE BIASES: DO THEY IMPACT INSTANT DECISION-MAKING BASED ON ETHNIC SIMILARITY?

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Abstract

Motivation: Due to recent media coverage (war coverage of Ukraine vs. Palestine vs. Congo), religious phobia-based issues during World Cup 2022, or lack of exposure to other(s), the authors' curiosity was triggered to examine how potential cognitive biases might impact decision making concerning global environmental issues. Since the effects of the biases are not fully understood nor fully valued, this paper is exploring the topic further.
Objectives: The paper illustrates the mediating effect of cognitive biases on decision-making (DV = dependent variable) based on global environmental issues concerning natural disasters (IV = independent variable in the form of flooding). Natural disasters from three continents are displayed and bio-sensory data was collected to measure participants' biological responses to the video clips shown. The decision-making (DV) following these displayed events (IV) is mediated by possible cognitive biases present during the decision-making process (here how personal or public funding is distributed in a simulation). Based on these situations evaluated merely centered around media coverage, subjects make decisions on relief funding, similar to how UN decision-makers are appropriating emergency response funds. Ultimately, the study shows that the personal impact perceived by individuals and their respective nations through natural disasters or crises is moderated by cognitive bias.
Methodology (what was done, how was it done) and validation: The study is based on a between-subject design of three groups of participants including subjects from Asia, Africa, and Europe. Utilizing different biosensors (eye tracking, facial expression analysis, and galvanic skin responses), biodata visualizations and statistics are collected and their correlation to decision-making was examined. Subjects are composed of a convenience sample of tertiary education students in southern Bavaria, aged 18-35 years. Validation takes place based on standard quality criteria measures.
Major results: Decision-making is based on a perceived needs basis (social security, economy, and support system in the country) and mediated through cognitive biases based on similarity to own cultural, ethnic, and geographical background.
Conclusion: Research shows that cognitive bias is omnipresent with an ethnocentric focus on decision-making.

Keywords: Cognitive bias, decision-making, bio-sensory data, global environmental issues, ethnocentricity.

1. Introduction

While the perspectives of media coverage of the ongoing crisis situations during the last years sparked the interest of the authors, the research question arose of how different human subject groups might perceive suffering and the need for humanitarian relief based on their own cultural and ethnic background. In particular, the authors considered a student population from three continents as a basis for analysis who were from different socio-economic backgrounds, ethnicities, and nations, therefore reflecting broad population segments. Some of the students had been affected to differing degrees by similar situations, whether flooding, earthquakes, or other natural disasters. Some of them also shared real-life personal stories after the experiment that may have impacted on their decision-making processes.

2. Theory

Psychological distance plays a vital part in the perception of others and situations perceived and is defined as the perception of where and when an event occurs, but also to whom it occurs (Trope

& Liberman, 2010). Similarly, the quality of the judgments made by humans is influenced by their preconceived notions, biases, and abilities (Gigerenzer & Gaissmaier, 2001). Knowledge, beliefs, and expectations about certain social groups are contained in the form of cognitive structures called stereotypes (Landy & Sigall, 1974). Additionally, the context of situations plays a role in social perception, either more positively or negatively (Plessner, 1999). Furthermore, social identity theory (Tajfel & Turner, 1979) postulates that self-identity is formed based on the definition individuals assign to themselves based on social group membership. The outcome then is one's identification with a collective, usually infused with positive aspects (Turner, Hogg, Oakes, Reicher, & Wetherell, 1987).

In the context of social identity theory, cognitive biases (Tversky & Kahneman, 1974) refer to the systematic decisions and judgments heuristically taken without employing major cognitive abilities (Wilke & Mate, 2012) and then leading to preferential treatment of the own in-group, called in-group bias (Everett, Faber, & Crocket, 2015; Axt, Moran, & Bar-Anan, 2018).

The authors particularly looked at potentially ethnocentric subconscious roots for heuristics based on social distance or proximity, which base in social identity and in-group bias. These biases and the reasoning provided for decisions taken need to be examined further, leading to the following hypotheses:

H_1: Participants show greater arousal displayed in Facial Emotion Analysis (FEA) when watching a video sequence of a disaster concerning their own in-group.

H_2: Participants show greater arousal displayed in Galvanic Skin Response (GSR) when watching a video sequence of a disaster concerning their own in-group.

H_3: The amount of humanitarian relief differs among continents.
    H_{3a}: The amount given to Nigeria (NG) differs among continents.
    H_{3b}: The amount given to Bangladesh (BD) differs among continents.
    H_{3c}: The amount given to Italy (I) differs among continents.

H_4: The reason funding was provided differs among continents.

H_5: The reason funding was declined differs among continents.

H_6: Participants tend to provide financial aid for humanitarian relief to their respective in-group.

3. Methodology

The study was conducted on locations in Erlangen and Weiden, Germany. Participants were invited for the experiment either through personal contacts or via lecturers on campus in Weiden. In a face-to-face setting, participants were introduced to the equipment, were wired with the GSR sensors on their non-dominant hand, and then were provided with instructions to watch the video clip cut together showing major flooding events of 30 seconds each from 2022 in Bangladesh (BD), Italy(I), and Nigeria (NG). To avoid possible ordering effects, the researchers edited three different sequences, showing the respective disasters in alternating routines. General background information concerning each country's population and Gross Domestic Product (GDP) were given prior to each flooding scene. Additionally, participants were asked to take a deep breath prior to each 30 second clip for 5 seconds to establish a baseline and "neutral" setting; during this time, the same relaxing ocean scene was displayed while calm and relaxing music was audible in the background.

The between-subject design of the convenience sample of tertiary education students in Southern Bavaria, Germany, with n=115 respondents was composed of the following subgroups: n=35 from the African, n=50 from the Asian, and n=30 from the European continent. Of the subjects, 40 had experienced flooding or similar natural disasters according to self-report. The group of participants was composed of 41 female, 73 male, and 1 divers individual. With all the subjects, the bio-sensor data of FEA and GSR was collected while watching the clips. After watching the clip, the subjects were asked to fill out a brief paper-pencil questionnaire collecting their demographic data as well as an indication whether they had experienced a flood before themselves, how they would divide emergency relief funding between the three different countries of Bangladesh, Italy, and Nigeria, and what type of reasoning they specify for proving or not providing the amounts they offered.

The collected data was evaluated using the Statistical Package for the Social Sciences (SPSS) as well as visually aggregated reports and graphs generated with the bio-sensory software iMotions, which was also used to collect the bio-sensor data, in particular, their software modules Affectiva AFFDEX for the FEA and Electromyography/Electrocardiography EMG/ECG module for the GSR.

4. Data collected and analyzed

Between the genders, distribution of funds amongst the affected countries did not differ significantly, even though the mean distribution differed by about 5 % for each country.

To test H_1, the FEA data needed to be analyzed. It was not possible to export some of the data taken via GSR or allow for data to be matched to the questionnaire for privacy issues. The aggregated data for the respective continental groups indicate that Africans showed higher emotional involvement with the clip showing Nigeria and also Italy (assumably due to the human cries), but did not show similar involvement for Bangladesh (see Figure 1).

*Figure 1. Affectiva AFFDEX aggregated data for Africans on the emotions Anger, Fear, and Sadness.*
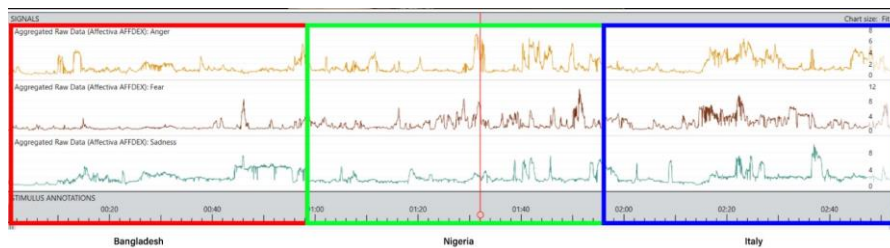
Asians, however, show a higher involvement when it comes to their own continent as well as one particular scene in the Nigerian sequence (old suffering woman), while the arousal in the Italian sequence is ongoing, but not at the same high peak level as the other scenes (see Figure 2).

*Figure 2. Affectiva AFFDEX aggregated data for Asians on the emotions Anger, Fear, and Sadness.*
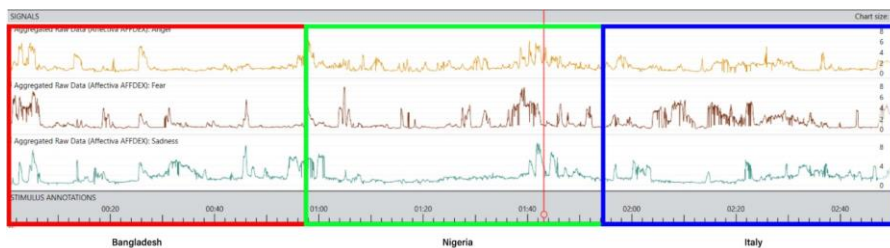
Europeans' aggregated data amounts to a "flat-liner" in most areas, in particular for Italy. More emotion and affect is shown for Bangladesh (one moment depicting children wading through high water), but overall, Europeans display less detectable emotion.

Figure 3. Affectiva AFFDEX aggregated data for Europeans on the emotions Anger, Fear, and Sadness.
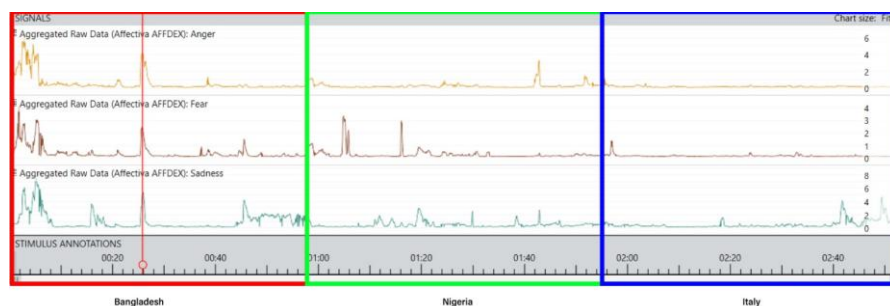
Testing H_2 with the GSR data was also not possible for the same reasons, but wherever the data was collected, it mirrored and/or supported the FEA graphs.

Figure 4. Affectiva AFFDEX overlayed with the heart rate of GSR.
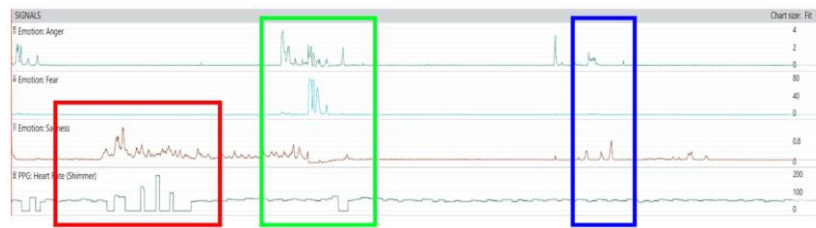
When analyzing H$_3$, the maximum funding amounts do not significantly differ among continents, whereas the analysis for the individual countries (with NG: p=0.103 and I: p=0.665) provides only a significant difference in funding amounts for BD (p=0.041; see Bonferroni Test) between the continents Asia and Europe, with Asian subjects funding BD more. So *H$_{3b}$: The amount given to BD differs among continents* can be accepted, while H$_{3a}$ for Nigeria and H$_{3c}$ for Italy must be rejected.

As for H$_4$: *The reason funding was provided differs among continents*, no significance can be determined using X^2 *(df 6, N = 111) = 8.544, p = .201* for the reasons provided in funding for the respective countries and the hypotheses needs to be rejected.

However, when it comes to reasons to decline funding to any country, H$_5$: *The reason funding was declined differs among continents* can be accepted with X^2 *(df 6, N = 69) = 16.412, p=.012*. The prevalence of corruption (27.5%) and weak infrastructure (21.7%) were provided as a determining factor for not allocating emergency relief funds. This did not apply to most of the Asian subjects, even though the differences were not significant. Also, Europeans were the least inclined to respond to the audible complaints of flood victims in the Italian sequence and simultaneously provided less relief funds to Italy; here, the reason given was often that insurances would cover much of the damage, the infrastructure would be a better one, and the economy a more stable one, therefore granting more aid to countries like Bangladesh and Nigeria.

Based on our data, *H$_6$: Participants render financial aid for humanitarian relief to their respective in-group* needs to be rejected due to lack of significance X^2 *(df 6, N = 115) = 6.825, p=.337*.

5. Conclusions

In general, some scenes caused far more arousal than others. In particular, in the face of human suffering (kids wading through hip-high muddy water, an old woman sitting on top of a table in an entirely flooded room, rooftops sticking out from the surface of large, flooded areas, and people screaming when their cars were washed away by the flood streams), the arousal peaked for most subjects.

When it came to the African and Asian participants, most of them gave a justification as to why and how they distributed the funds; on the other hand, hardly any European participants provided a justification, somewhat possibly implying a more privileged position not needing reasoning.

Similarly, it seemed to cause cognitive engagement when reading the introductory slide to each sequence, and it appeared that at least for those individuals (n=7) that distributed the funds equally to the affected countries, the engagement and emotions were highest during the text slides, clearly indicating that the decision was taken more rationally and fact-based.

Interestingly enough, the subjects considered to a significant part that corruption and weak infrastructure would provide justification not allocating relief funds. In the sample scenes chosen, this reason primarily applied to Bangladesh – something mostly in the minds of many subjects since the corruption report of Transparency International was released shortly before the experiment was conducted. This report had been highly covered in the (social) media in Germany and was a much-debated topic amongst students at the university.

5.1. Limitations

Due to the convenience sample, many of the participants belonged to either Germany or Bangladesh, so no balanced distribution of participants existed for the continents of Europe and Asia.

When searching for the video sequences to be used, the researchers were unable to find entirely comparable clips. The intent was to show human suffering, but in one of the nation's clips, more aggravated screams were audible, and the clip was in portrait format, while the other two clips were segments from news reports in landscape format. Furthermore, the clips were rather short to cause emotional connectedness to the suffering depicted. Therefore, future research should utilize longer video sequences.

The 5 second image used to establish a calm base line between the respective flood scenes caused a spike in pulse for several male participants since the scenery looking onto the ocean and surrounding mountains had a female depicted small and from behind, fully dressed and arms stretched out as if taking the view in. While the researchers did not see any reason for arousal, for some of the male subjects it caused increased values in pulse.

Another issue faced were primarily hardware troubles, and even though the researchers were working with Shimmer3-D64D, which is supposed to be a reliable tool, sometimes the Bluetooth connection with the laptop was not working properly, causing loss of data. Additionally, the lab equipment was new and the learning curve big and fast, causing additional tension and stress as well as support calls to the software provider.

Ideally, the experiment would have been conducted in soundproof meeting boxes to eliminate any external influences such as movement or noise generated by other individuals entering the laboratory, since these influences sometimes may have an impact on the results.

5.2. Future research

A larger focus needs to be placed on detailing ingroup preferences in allocating funds and making any type of (declined) support decisions; this, however, would only be possible if the experiment would be limited to a design entailing participants from three different nations on three continents to make the data more distinguishable.

It would be very interesting to further emotionalize the clips by providing viewing on a large TV or even movie screen with surround sound, 3-D, or even Virtual Reality; however, the amount of equipment needed at this point would not be realistic for a small university, and even though GSR data could be collected with the proper amount of GSR devices, the FEA would be impossible to collect in such a setting.

To ensure a better distribution of participants across all nations, one of the simulations offered through the Model United Nations (MUN) with young and inspired leaders in a parliamentary setting could be arranged for future experiments. Because the access to real-life leaders is quite impossible, it would be highly interesting to consider the outcomes from a true leadership perspective through MUN.

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