Investigation of interpersonal-affective motivation in prosocial behavior

Teerawat Monnor 1,2, Kerstin Preuschoff 2,3 and Giuseppe Ugazio 3

1 Faculty of Psychology and Educational Sciences, University of Geneva, Geneva, Switzerland

2 Swiss Center for Affective Sciences, Geneva, Switzerland

3 Geneva Finance Research Institute, Geneva, Switzerland

1. **Abstract**

Emotion plays a critical role in shaping prosocial behavior. Witnessing a person experiencing stress can encourage people to help. This interpersonal effect of emotion is, however, complex and not fully understood. People can give up helping because realizing that their effort might just be inefficient or because not feeling motivated enough, and individual differences (such as in compassion and altruistic attitude) can play a critical role. This project aims to shade more on this topic using a multi-componential approach to emotion, stating that emotion elicits in a multimodal fashion, including the appraisal, motivational, physiological, feeling and action ones. We want to empirically show that compassion leads to motivation to help and hypothesize that this effect should be stronger in participants with higher altruistic and empathic traits.

The participant (the empathizer) will be asked to perform a task, adapted from the computer-based slider task, to help another participant not be given electric shocks. In different trials, the empathizer experiences different levels of potential stress in their counterpart (induced by different strengths of the electric shock) and different levels of task difficulty. While performing the task, the skin conductance and heart rate are measured (the physiological component). Other emotional components are assessed from performance and by subjective rating. These multimodal responses then get analyzed at both conditional and group levels. Furthermore, the participant will perform the same task, but to obtain monetary rewards. Their responses and performances for the two goals can be compared between the higher- and lower-altruistic group.

1. **Introduction**
	1. *Emotion: A drive of a person and society*

Emotion is known as powerful in modulating behavior, and vital for human beings to live and survive. (Brosch et al 2013, Lerner et al 2015, Tyng et al 2017, Ugazio et al 2012) At the most fundamental level, it is crucial for adapting to novel and dynamic environments, by allocating psychological and physiological resources in efficient manner. (Bach & Dayan 2017, Šimić et al 2021) To prepare humans (and likely animals) for potential threats and danger, emotion has also proposed to be pre-programed such that the most viable course of action or option can be chosen promptly. (Bach & Dayan 2017, Nesse 1990) These rapid and potent modulations of behavior can be through shaping cognitive processes, such as learning, memory, perception, attention and decision-making. For instance, emotionally arousing stimuli tend to be more memorable (Qasim et al 2023, Tyng et al 2017), and more effective in motivating individuals (Løvoll et al 2017).

Not only playing the key roles in modulating behavior of a person, but emotion shapes interpersonal connections and social interactions, and interestingly in several ways. For instance, on one hand, sharing positive affective experiences can increase well-being (Major et al 2018) and marital satisfaction (Otero et al 2020), and promote prosociality (Zhou et al 2022), as can be accounted by positivity resonance theory (Major et al 2018). On the other hand, sharing negative emotions, such as anger and fear, can be monumentally powerful in urging collective actions and social movements, such as in climate activism (Kleres & Wettergren 2017). (DeCelles et al 2019) However, the interactions and collective effects of personal experiencing of emotion(s) among individuals can be more complex. For instance, witnessing an individual experiencing distress can lead many to empathize and in turn experience stress/distress. (Guendelman et al 2022, Müller-Pinzler et al 2017) It can be automatic in the immediate instant, but how individuals would choose to pursue next could be more complex and altered by many factors. (Ferguson et al 2020) Those factors include, for example, results from cost-benefit analysis (Contreras-Huerta 2023, Ferguson et al 2020, Lockwood et al 2022), individual differences in willingness to help and moral preferences (Crockett et al 2017, Hein et al 2010, Jie et al 2021) and psychiatric traits (Contreras-Huerta 2023).

Hence, it is inevitably affirmative that emotion is a powerful catalyst on both individual and collective levels, but the understanding of how emotional functions and experiences are constructed is in developing for both levels. In this project, we aim to shed some light on the interpersonal influences of emotion on one's affective experience and motivation to help others.

* 1. *Emotion: A personal and multimodal elicitation*

With its significant influences on human lives, emotion has been one of the central topics in psychological sciences and adjacent fields like neuroscience and sociology, where the understanding of emotion has been further applied in various disciplines, ranging from communication and advertisement (Otamendi & Sutil Martín 2020) to artificial intelligence (Cominelli et al 2018). Multiple theories/models have been proposed to explain the emergence and existence of emotion (see, for example, Scherer (2000) and PS and Mahalakshmi (2017) for reviews). (Bach & Dayan 2017, Lazarus 1966, Moors et al 2013, Nesse 1990, PS & Mahalakshmi 2017, Scherer 1999, Scherer 2000) Among the most influential ones, Lazarus' appraisal theory (Lazarus 1966) (and its descendants and variant interpretations as detailed in, for example, Moors et al. (2013)) emphasizes the emergence of emotion as based on cognitive processes, driven by one’s preferential and experiential attributes. (Moors et al 2013, Scherer 1999) The theories posit that an emotional experience is individualistic, meaning that even though being set to achieve the same goals within the same environment, individuals can develop distinct emotional experiences and consequential responses. In addition, appraisal theories consider the elicitation of an emotional episode to be made up of multiple subsystems, including appraisal, motivational, physiological, expression and feeling components. (Meuleman et al 2019, Sander et al 2018, Scherer 2005) The subsystems coordinate to elicit a certain episode of emotion. Thus, appraisal theories allow emotional experiencing to be investigated objectively, in multiple modalities and with consideration of different preferential values among individuals.

* 1. *Empathy: Connects people emotionally*

Although an emotional experience is personal, according to appraisal theories, ones could understand, feel or share, others' unique experiences with empathy. (Batson et al 2002, Håkansson Eklund & Summer Meranius 2021) Empathy is generally defined as the ability to comprehend the psychological states of others. (Dohrenwend 2018, Gutsell & Inzlicht 2012, Jeffrey 2016, Preston & de Waal 2002). Those states extend over affective ones, and further include cognitive and motivational ones (Batson et al 1997, Khalid & Dickert 2022, Marsh 2018). Although it is still debated on the definite definition of empathy. (Håkansson Eklund & Summer Meranius 2021, Murphy et al 2022), it is consensual that empathy is vital for people to develop healthy relationships and social interactions (Batson et al 2002, Zahavi 2014). Also, it is widely agreed that empathy itself is a multi-componential construct, and it should also be acknowledged and investigated as such (not as a unitary psychological capability). (Dohrenwend 2018, Gibbons 2011, Murphy et al 2022) Those components include, for example, *the self-other differentiation*, as one should be able to distinguish between their own mental states and others’ (Decety & Meyer 2008, Murphy et al 2022), and *the empathic concern (or compassion)* defined as an intense sharing of others’ emotional distress which could lead to motivation to help and prosocial behavior (Cameron et al 2022, Davis 1980, Strauss et al 2016). Particularly in the philanthropic and prosocial context, the empathic concern dimension of empathy or compassion could be a great focus.

Although a body of research has long shown that empathizing experience of another/others under stress or in distress leads to more motivation to help (Batson 2010, Decety et al 2016, Xiao et al 2021), recent work has revealed more complex relationships between empathy (and compassion) and the motivation. For instance, Sassenrath et al. (2017) have shown that having compassion for only a sad, but not angry or disgusted, an individual increases helping motivation, compared to control. (Sassenrath et al 2017) Also, in a more intense situation, individuals could avoid empathizing, due to emotional and cognitive costs (Cameron et al 2019, Lockwood et al 2017), which could inevitably lead to disengagement in helping behavior. In addition, other than empathizing (or empathically concerning), the task that the empathizers have to perform to help others, specifically how effortful it is, also influence their motivation. (Lockwood et al 2017) Hence, while it has been shown that empathy has a central role in encouraging people to help others, recent evidence converges that the empathic construct is more complex and multiple factors/processes get involved, and we have yet to fully understand the underlying mechanisms. (Brethel-Haurwitz et al 2020, Erlandsson et al 2015, van Kleef & Lelieveld 2022)

* 1. *Aims and hypotheses*

This project aims to contribute to the understanding of how the interpersonal influence of emotion/affect can lead to motivation to help. Particularly in the philanthropic context, we focus on the negative affective experience called stress, which can promote prosocial and altruistic decisions and acts (Buchanan & Preston 2014, Hovnanyan et al 2022, Nitschke et al 2022, van Kleef & Lelieveld 2022) (but see Nitschke et al. (2022)). Stress can be defined as a psychological state urging an individual to adapt in a situation perceived to be threatening or challenging, where their potential to cope with such a situation might be compromised. (Lazarus 1966) Stress responses include an array of negative affective experiences, such as anger and anxiety (but see, for example, Folkman (2008) and Gloria and Steinhardt (2016) for discussions about the possible roles of positive emotions on stress responses). (Biggs et al 2017, Du et al 2018, Folkman 2008, Gloria & Steinhardt 2016) With empathy as a tool, stress can be imparted among individuals.

In this project, the focus is a dyadic interpersonal scenario. We measure empirically how one’s stress influences the empathizers’ experience and motivation to help. Also, we will further our discussion and deeper understanding of the interpersonal-affective motivation in prosocial behavior by comparing the empathizers’ experience and motivation in such a moral task with that in a financial task (with an goal to gain money), More details about the goals and hypotheses are shown below.

*AIM1: Capture the interpersonal influence of stress.*

* Stress in the empathizer is positively correlated with that in the empathized individual.
* The empathizer’s motivation to help the individual with stress is positively correlated with the intensity of their empathic stress.
* The empathizer perceives tasks to be more challenging/effortful when having to be responsible for ameliorating stress in another person.

*AIM2: Compare motivation for helping another person in need with that for financial gains.*

* The financial (obtaining a monetary gain) and moral (relieving others from danger/threat) incentives increase affective experience and motivation in individuals.
* Both the task difficulty and incentives modulate an affective experience, perception of the task challenging level and motivation to succeed in the task (the interaction effect).
* Empathic stress and motivation to help increase with incentive increasing (obtaining more money or helping someone from more intense stress).

*AIM3: Determine whether the interpersonal influences of stress across individuals can be explained by altruistic and empathic traits.*

* The empathic concern/compassion dimension of empathy explains better the variation of motivation to help another with stress, compared to other empathic dimensions.
* Compassion and altruistic traits are positively correlated.
* Individuals with higher altruistic traits/compassion have higher motivation to help another person with stress.
* Individuals with higher altruistic traits/compassion show higher motivation when helping others compared to when achieving personal gains.
* Individuals with higher altruistic traits/compassion report to feel more rewarded for succeeding in helping another person.
* Individuals with higher altruistic traits/compassion are more sensitive to the increase of another person’s stress.
1. **Materials and methods**
	1. *Participants*

We aim to recruit female participants with no histories of neurological and psychological disorders. The recruitment of only female participants is solely scientifically based, since the gender factor has shown to vary empathy and the female population tends to empathize more. (Christov-Moore et al 2014, Löffler & Greitemeyer 2021) This is meant to maximize the effect size, based on the current estimation of sample size.

The sample size, *N = 48*, is estimated using G\*Power (Faul et al 2009) for the repeated measured MANOVA analysis, with a conservative effect size of 0.10, α = 0.05, power = 0.8, number of measurements = 18 (for a 3x3x2 factorial design, more details on this in section 3.2).

**Figure 1.** A screenshot of the slider task, composed of 12 sliders that the participant has to complete. The participant has to complete one slider before attempting to complete the next one. To complete each slider, they have to move the thumb (indicated in the figure) to the designated position (indicated in the figure). In the middle of the screen, there is an image of a person. On one hand, in the moral task, it will be an image of another person, who would be administered an electric shock given that the empathizing participant fails to complete the task. On the other hand, in the financial task, it will be an image of the empathizer themselves. Note that the photo used here is just for demonstration, and it is taken from <https://www.freepik.com/>.

* 1. *Task design*

The task is computer-based, as shown in Fig. 1. This task is adapted from a task used in economics research to study effort (Araujo et al 2016, Gill & Prowse 2019). In each trial, the participant (i.e. the empathizer) is asked to try to complete all sliders on screen in order either to stop an electric shock from being given to another person or to gain some monetary credits. Completing one slider at a time, the empathizer must move a thumb (indicated in Fig. 1) on a slider track to a designated position. All the sliders are placed radially, surrounding a picture of another person, who would get an electric shock given that the empathizer fails to complete all the sliders. Note that the fraction of the shock/monetary reward will be weighted by the number of successful sliders in each trial. For example, if the empathizer completes 10 (out of 12) sliders, the other participant will get 2/12 of the full strength of the shock in the moral task or the empathizer will receive 10/12 of the full monetary credit in the financial task. The empathizer will have a limited time in each trial, which is similar across all trials.

Figure 1 shows an example of a task in which the participant has to rescue another participant from the shock (i.e. the moral task). On the contrary, when the participant performs the task to gain monetary credits (i.e. the financial task), the image at the center will be theirs and the symbol will be a money sign, instead of the shock sign shown in Fig 1.

This task is designed to vary three independent variables in a factorial manner. These variables include *the task difficulty*, adjusted by varying the distances of the designated positions (easy, medium and hard), *the reward type* (saving another person from the shock and gaining monetary credits for themselves) and *the reward magnitude* (low, medium and high).

* 1. *Measures*

*Affective experiences:* The affective experiences are measured using electrodermal activity (EDA) and heart rate variability (HRV).

*Perceived task difficulty and satisfaction from task performance:* The participant will be asked to rate their perception of the task difficulty at the beginning of each trial before being able to move the first slider thumb. Also, after completing that task, they will be asked again about their satisfaction with the outcome.

*Motivation to help another with stress:* The effort mobilization will be determined from task performance, which includes the number of succeeded sliders, reaction time, time spent to complete the sliders and mouse speed.

*Altruistic and empathic traits:* The altruistic traits are assessed by the 9-question Self-Report Altruism scale (SRA) (Manzur & Olavarrieta 2021) and the empathic traits are assessed by the interpersonal reactivity index (IRI) (Davis 1980).

* 1. *Experimental procedure*

In each experimental session, two participants are invited to come to our laboratory. They will be asked to complete the psychological scales (online) at least two weeks prior to the experiment. Upon arrival in the lab, the participants read and sign the consent forms. A photo of each participant (in a neutral emotional expression) will be taken to be used during the experiment and then deleted at the end. The photo focuses on the upper part of the body and the face.

Then, both undergo a standard titration procedure to individually identify uncomfortable levels of the electric shock. The titration is performed for one participant at a time, while the other participant witnesses the process. The electric stimulation is not noxious and dangerous to participants’ health (200 milliseconds, 50 pulses/second, with a maximum of 50 volts). It is given by the electric pulse generator (SD9 Square Pulse Stimulator; norm UL 3101-1, CSA C22.2 No. 1010-1, EN 61010). The shock is given via electrodes placed on the back of the receiver’s non-dominant hand. The titration starts will a very low voltage (20 volts). The reciver then rates their experience from 0 to 10, from "no pain" to "intolerable". The shock intensity is then increased slightly, followed by the rating. This adjustment is repeated until the receiver rates their experience as 6 or that the maximum of 50 volts has been reached. Both participants then get informed that they will go to different rooms.

In two separate rooms, experimenters will set up the Biopac MP160 system (Neurospec AG) to measure the physiologies for the EDA and HRV analysis, with a sampling rate of 100 Hz. The participants are then informed that they will have to perform two kinds of tasks: the moral and financial tasks as detailed in the experimental design section. This means no shock will be given during the experiment, and they will be performing the same set of tasks. They will then go through a training session.

After getting familiar with the procedure, they will start with the data collection, which is composed of 7 blocks, with a one-minute break between blocks but two extra-long breaks (2-minute breaks) after block 3 and 5. One out of the 7 blocks is just the slider task alone with no incentive (i.e. a control with no shock/monetary credits), while the rest are 6 blocks of the conditioned trials. In each conditional block, all trials will be either entirely moral or financial tasks. A sequence of the 7 blocks will be randomized across participants.

1. **Final words**

The experimental protocol for the project is being developed. It will soon be piloted and submitted to be evaluated for ethical approval. Any suggestions or comments are highly welcomed and appreciated.

The authors foresee great developments and adaptations of the presented protocol to be further used for different research questions/topics. Those include, but are not limited to,

* the influences of mutual benefits (or the perception/envisage of benefits to self, in fraction or in full) on motivation to donate or participate in prosocial activities and how individual traits can explain the influences across individuals,
* the interpersonal effects of different emotions/affective experiences (e.g. sadness, happiness, fear and warm glow) in relation to agency, i.e. self or others’ experience, (see van Kleef and Lelieveld (2022), for example, for review) (van Kleef & Lelieveld 2022),
* the applications of the understanding of the interpersonal-affective motivation for more efficient and effective communication in philanthropic campaigning or prosocial promotion (see Brosch (2012), for example, for review) (Brosch 2021),
* the co-regulation between moral and financial preference, which mutually dominate prosocial and philanthropic decision-making (see Ugazio (2019), for example, for ideas) (Ugazio 2019).

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