

# How Facial Expressions of Recipients Influence Online Prosocial Behaviors?—Evidence from Big Data Analysis on Tencent Gongyi Platform

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**Abstract:** Cyberspace has significantly influenced people’s perceptions of social interactions and communication. As a result, the conventional theories of kin selection and reciprocal altruism fall short in completely elucidating online prosocial behavior. Based on the social information processing model, we propose an analytical framework to explain the donation behaviors on online platform. Through collecting textual and visual data from Tencent Gongyi platform pertaining to disease relief projects, and employing techniques encompassing text analysis, image analysis, and propensity score matching, we investigate the impact of both internal emotional cues and external contextual cues on donation behaviors. It is found that positive emotions tend to attract a larger number of donations, while negative emotions tend to result in higher per capita donation amounts. Furthermore, these effects manifest differently under distinct external contextual conditions.

**Key words:** online prosocial behavior; donation behavior; facial expression; big data; image analysis

## 1 Introduction

Prosocial behavior encompasses a wide range of meanings and forms, including cooperation, sympathy, helping, and donating<sup>[1]</sup>, which holds paramount significance in the realm of social communication, drawing attention from diverse fields such as psychology, sociology, economics, and neuroscience. Examining the factors influencing individual prosocial behavior within the context of the modern digital age and China’s “tertiary distribution” policy holds both contemporary and theoretical significance.

In his book *Modernity and Self-Identity*, Giddens<sup>[2]</sup> astutely observed that modernity has the profound effect of liberating time from its confinement to

specific spaces, while space itself becomes disentangled from a fixed sense of place. This transformation results in what he termed “time-space distanciation”. The advent of the Internet has played a pivotal role in detaching social relationships from the constraints of limited space and time, reconfiguring and extending them within an uncertain and borderless temporal and spatial realm. This broadening of the time-space continuum has had a significant impact on prosocial behavior. Interactions extend beyond the bounds of relatives and acquaintances within one’s immediate social circle, encompassing individuals, entities, and concepts situated at an indeterminate distance. Individuals transcend the constraints of “presence” in their communications, enabling them to engage in altruistic acts like donations and cooperation unhindered by the limitations of time and space, that is, the “absence”. The rise of online fundraising platforms and the development of foundations diversify and streamline the charitable fundraising landscape, amplifying the extension and abstraction of relationships between contributors and beneficiaries.

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This progression results in a dilution of the relationship, rendering online donations more inclined toward a “pure” manifestation of pro-social conduct.

With the rise and evolution of the Internet, the processes of information generation, retrieval, and processing have undergone transformation, leading to a further expansion of the human information landscape. In the realm of online donations, the power of information is particularly evident. Today, individuals can easily grasp the predicaments and needs of strangers located thousands of miles away with a simple click of a mouse or a swipe of a screen. They can swiftly gain insights into the details and developments of various charitable projects. Apart from projects initiated by close acquaintances within their social circles, people in the online realm primarily make donation decisions based on the information available on the web pages of charity projects. Given this context, this paper adopts the social information processing theory from cognitive theory. It constructs an analytical framework for comprehending individual donation behaviors within the online space, and we propose some hypotheses on how the internal emotional cues and external contextual cues within online fundraising projects collectively mold donation behavior within the online sphere. Then our research is carried out with the dataset collected from Tencent Gongyi platform. We collect textual and visual data from 1763 fundraising projects related to diseases on this platform. Subsequently, we employ image analysis to extract faces from the images, assessing their emotional tendencies. Further, integrating theme scores extracted from the textual analysis of project descriptions and other pertinent information, we employ propensity score matching to align the experimental group with the control group. Ultimately, our analysis scrutinizes the impact of diverse emotional cues on donation behavior and explores how external situational factors influence this process.

## 2 Literature Review

Having established the significance of online prosocial behavior in the introduction, we now delve into a comprehensive literature review. This section begins by examining online prosocial behavior and subsequently introduces the social information processing model, based on which we put forward our

theoretical framework.

### 2.1 Online prosocial behavior

The study of prosocial behavior began to take shape in the 1960s and has since become a significant topic in the realm of social psychology<sup>[3]</sup>. The academic community has yet to establish a universally accepted definition for prosocial behavior, and consensus remains elusive regarding the presence of selfish motivations underlying such behavior. However, a general agreement has been reached on the notion of altruism within prosocial behavior, that is, emphasizing the aspect of individual actions benefiting others, groups, or society as a whole<sup>[4–6]</sup>. In this paper, the concept of prosocial behavior primarily aligns with the classic definition proposed by Eisenberg and Miller<sup>[7]</sup> in 1987: it entails voluntary and purposeful actions that are beneficial to others; the motives driving such behavior can be ambiguous and may encompass both positive and negative motivations.

The evolution of information technology has prompted researchers to differentiate between offline prosocial behavior and online prosocial behavior, leading to a deeper examination of the characteristics, categories, and influencing factors associated with online prosocial behavior<sup>[8]</sup>. To begin, online prosocial behavior exhibits several distinctive characteristics, including convenience, universality, and diversification. The availability of user-friendly search engines and feature-rich media platforms simplifies and diversifies individuals’ capacity to offer assistance. Moreover, the online environment tends to alleviate the psychological burden associated with making donation decisions<sup>[9]</sup>. In contrast to many offline prosocial behaviors, which are often relational and directed at specific individuals<sup>[10]</sup>, online prosocial behaviors tend to have a broader impact, benefiting a wider public audience<sup>[11]</sup>. The advent of mobile technology has further enriched the landscape of prosocial behaviors. In their work, Wright and Pendergrass<sup>[8]</sup> cataloged various online prosocial behaviors, including prosocial behaviors based on open-source software and wikis, online support groups, digital mentoring, online fundraising, crowdfunding, virtual volunteerism, and other prosocial behaviors based on other technologies such as social networking sites and online games<sup>[8]</sup>. Regarding influencing factors, some scholars have delved into the connection between

offline face-to-face communication and online prosocial behavior through the lens of the co-construction theory<sup>[12]</sup>. Additionally, Erreygers et al.<sup>[11]</sup> posited that factors such as the online anonymity, rapid dissemination to a large audience, the public nature of digital platforms, and the absence of nonverbal cues in text-based digital interactions may all impact people's motivations and actions in online prosocial contexts.

Overall, despite the progress made, research on online prosocial behavior remains in a developmental phase. Most existing studies rely on self-report scales to measure online prosocial behavior<sup>[9, 13]</sup>, often lacking real-world data analysis and an in-depth exploration of the cognitive processes underlying individual online prosocial behavior.

## 2.2 Social information processing model

Social information on the online platform is the core of online fundraising. The enactment of China's Charity Law in 2016 mandates that charitable organizations engage in public fundraising on designated charity information platforms over the Internet, as directed by the Ministry of Civil Affairs. On these online fundraising information platforms, details like project names, descriptions, progress updates, and fundraising status are presented through a combination of text and images. This presentation format allows potential donors to gain a visual and intuitive understanding of project specifics and readily access convenient donation links. The donors' engagement involves selecting relevant projects on the information platform, comprehending essential project attributes, and ultimately making donation decisions. Importantly, this process occurs without the need for direct dialogues with recipients, interactions with project implementation teams, or communication with Non-Governmental Organizations (NGOs). Instead, it relies on the donor's personal information processing and the attribution of meaning.

The social information processing theory proves pivotal in comprehending prosocial behavior, providing a framework to analyze the input, processing, and output of donor information within the context of online donations. Therefore, this study adopts the social information processing theory as its analytical framework to delve into the cognitive process of donors within the realm of online interactions. Dodge<sup>[14]</sup>

introduced the social information processing model to elucidate children's social behavior in 1986, drawing upon theories by Flavell, Newell, Simon, and Hayes. This model establishes a connection between social cognition and social behavior, emphasizing the pivotal role of information. While initially applied to analyze children's aggressive behavior, the social information processing model can be expanded to encompass various other social cognitive processes, including the examination of prosocial behavior. In the social information processing model, the journey from information reception to behavior execution is divided into five distinct steps: encoding process, representation process, response search process, response decision process, and enactment process. Building upon Dodge's work, these steps can be condensed into two primary stages:

- **First stage comprising Steps 1 and 2:** Individuals direct their attention towards specific contextual cues, encoding these cues. Subsequently, they construct an understanding of the context based on the information gleaned from these cues.
- **Second stage encompassing Steps 3–5:** Individuals, guided by their desired goals, formulate potential behavioral responses within this context, employing their memory and rule-based knowledge. They then assess and ultimately execute the chosen behavior.

Concurrently, there exists a "data base", encompassing individual experiences, social knowledge, acquisition rules, and more, which exerts an influence throughout the entire process of encoding, interpretation, representation, and action. It is essential to note that the social information processing model serves as an abstract analytical framework for comprehending individual social cognition and behavior. To apply it effectively to specific scenarios and behaviors, further integration and adaptation are required, drawing from relevant fields of knowledge. This study mainly refines the model from two aspects: cues and behavior.

Firstly, Crick and Dodge<sup>[15]</sup> differentiated cues into two distinct categories: external cues involving an individual's interpretation of specific social contextual information, and internal cues rooted in the individual's emotional reactions to events. In the realm of psychology, donation appeals are often divided into image valence and message valence<sup>[16, 17]</sup>. For online

fundraising projects, the most prevalent modes of presentation are text and images. When contrasted with intricate, content-rich textual narratives, facial expressions conveyed through images have a direct visual impact, transmitting emotions to readers in an immediate manner. At the same time, concise textual descriptions can provide more comprehensive project information. Consequently, this study classifies cues available to donors on online fundraising platforms into two categories: internal emotional cues drawn from project images and external contextual cues derived from project descriptions. We presuppose that during the behavior construction and evaluation stages, internal emotional cues assume a pivotal role in shaping the stage of response construction, influencing initial behavioral preferences; then, external contextual cues come to the forefront during the stage of response decision, affecting an individual's assessment of the effectiveness of various behaviors and ultimately influencing behavioral execution.

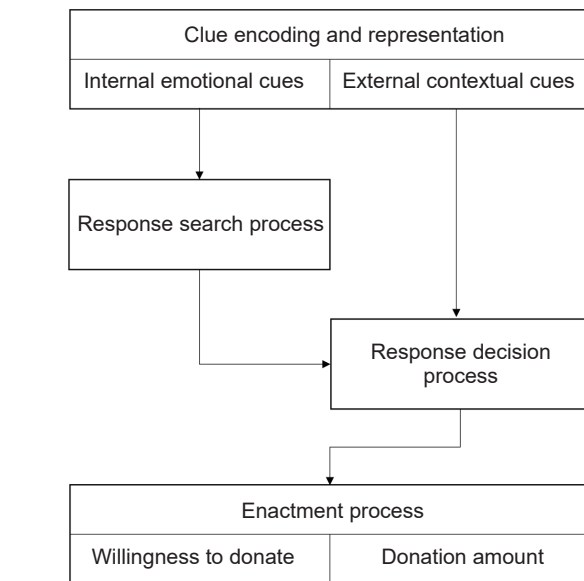
Secondly, Dickert et al.<sup>[18]</sup> introduced a two-stage model of donation decisions, dividing prosocial behavior into two distinct stages: the decision of whether to help and the determination of the extent of assistance. Borrowing from their model, we segment donation behavior into two dimensions: willingness to donate (the decision to donate or not) and donation amount. And we construct our theoretical model (Fig. 1), which sets the stage for formulating research hypotheses. Specifically, we examine how internal emotional cues and external contextual cues contribute to online prosocial behavior in next section.

### 3 Research Hypothesis

This section builds on the concepts of online prosocial behavior and the social information processing model discussed earlier. We will propose our hypothesis on the relationship between internal emotional cues and donation behavior and how it will be further affected by external contextual cues, including project contextual cues and social contextual cues.

#### 3.1 Internal emotional cue

Within academic discourse, there remains a lack of consensus regarding the impact of positive and negative picture valence on donation behavior. Some studies indicate that images depicting positive emotions



**Fig. 1 Social information processing model of individual online donation behavior.**

might elicit greater donations<sup>[19, 20]</sup>, while other research suggests that negative emotions can bolster the willingness to donate<sup>[21, 22]</sup>. Psychological investigations have revealed that while people may intertwine their decision to act with the extent of their action, their underlying psychological motivations might diverge<sup>[23]</sup>. For instance, within donation research, Andreoni<sup>[24]</sup> posited that altruism guides individuals in deciding why they should give, whereas the influence of warm-flow ultimately determines how much they give. As mentioned above, we discern between positive and negative emotional cues, and formulate our research hypothesis to explore the connection between different emotional cues and online donation behavior.

To start with, positive emotional cues have the potential to entice a greater number of donations to engage in the act of donation, owing to the enhanced emotional experience they offer to individuals. Drawing from the theory of emotional contagion, it is suggested that the emotions conveyed by recipients through images can induce similar emotional states in donors<sup>[25]</sup>. Consequently, projects that emanate a strong sense of sadness and misery might inadvertently deter potential donors, while those that radiate optimism and positivity could be more appealing. Earlier research has identified that the characteristics of negative emotions could prompt donors to develop a tendency to avoid them<sup>[26]</sup>. Concurrently, Liu et al.<sup>[27]</sup> asserted that donors who adopt a self-focused perspective are

inclined to donate with the intention of upholding a favorable self-perception and attaining positive emotional experiences. Based on these considerations, we hypothesize that projects featuring positive emotional cues have the potential to attract a larger audience, prompting more individuals to make donation decisions. Consequently, the following hypothesis is proposed:

**Hypothesis 1:** Projects featuring positive emotional cues will attract a higher number of donations compared to those with negative emotional cues.

Additionally, negative emotional cues might lead to higher per capita donation amounts by enhancing the marginal utility of donations. When compared to images conveying positive emotions, negative images may accentuate the vulnerability of the recipients, portraying them as potentially incompetent, helpless, and dependent<sup>[28]</sup>. McCormick and Seta<sup>[29]</sup> contend that these negative attributes may emphasize the adverse consequences of not donating and underscore the urgency of aiding these recipients. Conversely, when recipients project a positive attitude suggesting self-sufficiency and high self-help capability, individuals might perceive a lower sense of urgency<sup>[30]</sup>. Given these considerations, projects featuring negative emotional cues might manifest a higher marginal utility of donation, potentially motivating donors to contribute more generously.

**Hypothesis 2:** Projects featuring negative emotional cues will get higher per capita donation amount compared to those with positive emotional cues.

### 3.2 External contextual cue

The information processing process of individuals can be significantly influenced by the broader social and cultural environment<sup>[31]</sup>. In general, the exploration of factors impacting individual donation behavior can be categorized into two main strands of literature. The first literature body focuses on internal factors. Scholars, drawing from disciplines such as economics and psychology, explore theories like reciprocity theory and emotional adaptation theory<sup>[32, 33]</sup>. The second literature body centers on social factors, which can be further divided into individual characteristics, project characteristics, and socio-economic factors within the broader social structure. Concerning individual characteristics, numerous demographic factors,

including age, gender, marital status, education level, religious beliefs, economic income, personal social networks, and social capital, may exert influence over individual donation behavior<sup>[34–37]</sup>. As for project characteristics, aspects like the volume of information, the number of likes and comments<sup>[38]</sup>, and the narrative style of the project presentation can all play a role in enhancing project fundraising<sup>[39, 40]</sup>. Furthermore, specific aspects of the social structure, historical, cultural, and institutional factors can also exert influence over individual donations<sup>[41]</sup>.

Given that this study primarily focuses on external contextual cues present in project text on online fundraising platforms and lacks access to specific donor information, we primarily analyze the impact of external contextual cues on donation behavior through two main dimensions: project contextual cues and social contextual cues. Project contextual cues encompass aspects such as the content and presentation format of project text, particularly the project's target amount and psychological distance. Meanwhile, social contextual cues provide insights into the social factors underlying the project text, including the types of executors and the social class of recipients.

#### 3.2.1 Project contextual cue: Target amount

In the realm of social psychology, emphasizing and framing goals is a crucial compliance—gaining technique<sup>[42]</sup>. Projects that engage in online fundraising often disclose their target fundraising amounts. Economists have identified that donors' anticipated impact on their own contributions is a significant factor influencing their final decisions. When donors are convinced that their contributions can lead to a more substantial increase in public welfare output, they are likely to be more motivated<sup>[43]</sup>. Drawing from the goal gradient theory, Cryder et al.<sup>[44]</sup> found that the rate of charitable donations increased as recipients approached their fundraising goals.

During the process of making donation decisions, individuals may form distinct expectations regarding the efficacy of their donations based on the disclosed target amount for a project. A lower target amount might lead donors to believe that the project is more attainable and that individual contributions will have a more pronounced impact. Therefore, we posit that varying target amounts can influence donors' expectations concerning project fundraising outcomes

and implementation effects, leading to the formulation of Hypothesis 3.

**Hypothesis 3:** The influence of emotional cues on the final donation behavior varies depending on the specific project target amounts.

### 3.2.2 Project contextual cue: Psychological distance

Prior research has indicated that donors tend to exhibit a preference for contributing to recipients who share a psychological closeness to themselves<sup>[45, 46]</sup>. The concept of psychological distance refers to the perceived separation between the self and an object along various dimensions such as in time, in space, in social distance, and in hypotheticality<sup>[47]</sup>. As donors' information is unavailable for measurement, this study adopts the project narrative approach to investigate the psychological distance between recipients and donors as portrayed in the project text. Linguistic analysis has demonstrated that the usage of personal pronouns within text can influence the emotional stance and psychological proximity of cognitive subjects towards cognitive objects in Chinese<sup>[48]</sup>. Upon the release of a fundraising project, sponsors usually craft the introductory section of the project, with many projects adopting a first-person narrative style to elaborate on the project's background and key aspects. This technique is employed to acquaint donors with comprehensive project details. It is postulated that the frequent occurrence of first-person pronouns within the project content narrows the psychological distance between the recipient and the donor, consequently impacting the donor's evaluative discernment when determining their response.

**Hypothesis 4:** The influence of emotional cues on the final donation behavior varies depending on the frequency of first-person pronoun usage.

### 3.2.3 Social contextual cue: Types of executors

The executor of a charity project is the entity that ultimately directly utilizes the fundraising funds. Charity projects launched on Tencent Gongyi platform typically disclose information about the executor, which can be divided into three categories: government background institutions, grassroots background institutions, and individuals. It is found that social information in the project can play a role as a quality signal<sup>[49]</sup>, and this effect is different among different types of institutions<sup>[50]</sup>. Some scholars argue that compared to Government-Organized NGOs (GONGOs),

grassroots NGOs might exhibit more individual characteristics, such as individual motivation, individual discipline, and individual personal gain in Chinese cyberspace, while the former prefer to the institutional aspects, such as efficiency, effectiveness and transparency<sup>[51]</sup>. Furthermore, whether the project implementer is an individual or an organization also influences a donor's final decision<sup>[52, 53]</sup>. An organizational form may provide an endorsement for the project, potentially reflecting its execution capability. Conversely, an individual executor may signify the project's relevance and directness. As a result, it is proposed that different executor types can shape donors' evaluations of project quality and outcomes, thereby causing emotional cues to fulfill distinct functions.

**Hypothesis 5:** The influence of emotional cues on the final donation behavior varies depending on the types of project executors.

### 3.2.4 Social contextual cue: Social class of recipients

In various fields such as sociology and psychology, the "identifiable victim effect" has attracted the attention of scholars<sup>[54, 55]</sup>. Within this realm, certain researchers have unearthed that the attribution of the victim's plight significantly shapes an individual's inclination to extend assistance<sup>[56, 57]</sup>. When an individual's predicament intersects with broader societal structural challenges, a heightened sense of responsibility to offer help can arise. Lu<sup>[58]</sup> introduced a classification of China's social strata, within which agricultural laborers find themselves among those with minimal access to organizational, economic, and cultural resources. This demographic grapples with issues of poverty, limited social security coverage, diminished labor capabilities, and marked vulnerabilities, all of which have spurred both academic inquiry and societal attention. In recent years, owing to the nation's robust investment in poverty alleviation and rural revitalization, public awareness surrounding issues like rural concerns and broader social matters such as social equity and shared prosperity has surged. Within this backdrop, this study contends that the social class of project beneficiaries holds the potential to influence donors' perceptions of their self-assumed responsibility, the degree of project urgency, and the eventual outcomes, thereby influencing the decision-making process concerning emotional cues. Consequently, we propose Hypothesis 6:

**Hypothesis 6:** The influence of emotional cues on the final donation behavior varies depending on the social class of the recipients.

## 4 Method

With our research hypotheses established, the methodology section provides a detailed account of our data sources, data acquisition methods, data analysis method, and variable design. To be specific, after we collected the project data from platform, we used big data methods to analyze the text and image information of projects and then further analyzed the causal effects through propensity score matching.

### 4.1 Data source

This study centers its research on public fundraising projects divulged on Tencent Gongyi platform. The Tencent Gongyi platform, inaugurated by the Tencent Foundation in 2007, stands as one of the pioneer 20 online public fundraising information platforms endorsed by the Ministry of Civil Affairs. Furthermore, it has solidified its position as one of China's largest and most impactful online public fundraising platforms. Two primary data sources underpin this research: one comprises data pertaining to disease relief projects hosted on Tencent Gongyi platform, while the other involves organizational data manually compiled by the author from the websites of charitable organizations and search engine results. Tencent's public welfare platform is divided into "Yue Juan (monthly donation)" and "Le Juan (one-time donation)", with the latter encompassing five major domains: disease relief, poverty alleviation, education assistance, environmental conservation, and miscellaneous sectors. Within these domains, three fundraising statuses exist: fundraising, ongoing, and completed. Disease relief projects distinguish themselves by exhibiting more portrait images, greater homogeneity among projects, and the highest project count compared to other domains. Additionally, both ongoing and completed disease relief projects have successfully met their fundraising goals. Considering the relationship between the emotional characteristics of project images and donation outcomes, ongoing and completed disease relief projects align most closely with the research objectives, thus being chosen as the primary data sources. Through web crawling, information pertaining to 1971

ongoing and completed disease relief projects was successfully retrieved from the platform. This encompassed the acquisition of 1971 list page images and 12 300 detailed page images. Following thorough cleaning and meticulous organization, the analysis incorporated a total of 1763 projects. In consideration of the distinct supporter and executor backgrounds among diverse projects, the author, utilizing online research, exercised judgment to ascertain organizational backgrounds, drawing from information sources like organizational introductions and council profiles.

### 4.2 Data acquisition

In the initial phase of this study, we acquired the data of online fundraising projects on the Tencent Gongyi platform through web crawling. The primary data can be categorized into two main subsets. The first subset encompasses project information, comprising details such as project names, target amounts, fundraising durations, cumulative donation sums, the number of donations, and project images. The second subset comprises information regarding the organizations or individuals involved in the projects. This subset includes the names of the project executors and supporters. It is noteworthy that the images obtained via the web crawler were sourced from the webpage structure. Subsequently, the author systematically downloaded these images by accessing their respective image links. Furthermore, a manual review process was undertaken for these images, with the aim of eliminating irrelevant images (such as Quick-Response (QR) codes). Additionally, images directly associated with relevant certifications, such as hospital treatment reports, were segregated for separate analysis. The remaining images were earmarked for subsequent analytical use. Figure 2 illustrates how we extracted data from both the list page and the detail page, including images and related datasets.

### 4.3 Text analysis

When confronted with vast amounts of unstructured textual data, automatic text analysis proves to be an effective strategy. In this context, topic modeling emerges as a text mining technique rooted in unsupervised machine learning. This method enables the reduction of textual dimensions in a manner akin to uncovering latent themes hidden within the text<sup>[59]</sup>. In

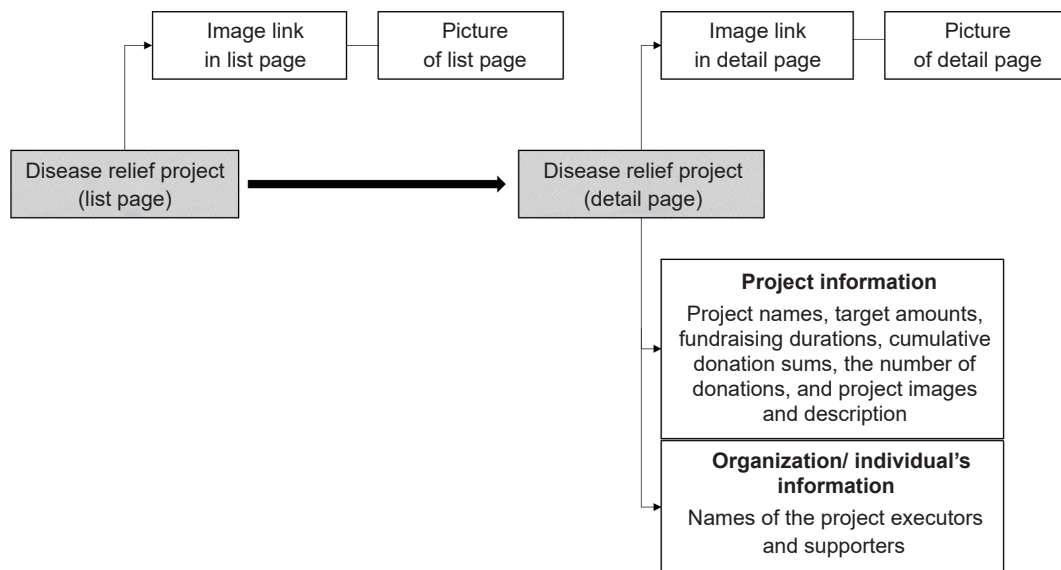


Fig. 2 Data collection logic of Tencent Gongyi platform's project.

this study, the collected text data from 1963 fundraising projects underwent a process of refinement and classification. Here is a step-by-step breakdown of the approach:

**Text segmentation and preprocessing:** The text content of the gathered fundraising projects was subjected to segmentation and part-of-speech recognition utilizing the Python-based “jieba” tool. Concurrently, in conjunction with the vocabulary from the Harbin Institute of Technology, stop words were eradicated. This preliminary preprocessing serves to enhance the subsequent analysis of textual themes.

**Transformation into word vectors:** Following segmentation and preprocessing, the unstructured project text was transformed into word vectors. This serves as a foundational step for subsequent analysis.

**Application of Latent Dirichlet Allocation (LDA) topic model:** The fundraising project text, represented as word vectors, was subjected to an LDA topic model. Through this, the text was grouped into ten distinct themes. Additionally, each fundraising project's score under each theme was calculated, elucidating the prominence of each theme in the given project.

#### 4.4 Image analysis

Deep learning, rooted in neural networks, represents a machine learning algorithm that abstracts input data through the utilization of deep architectures. It possesses potent feature learning capabilities and finds application in fields like speech recognition and image

analysis. Within the realm of image analysis, Convolutional Neural Networks (CNN) stands out as a prevalent supervised learning algorithm, grounded in convolution and sub-sampling layers. The image analysis phase in this study primarily relied on the Baidu PaddlePaddle AI Studio platform, as image analysis often demands substantial computational power. The processing of images from the Tencent platform fundraising projects unfolded across two principal steps: face recognition and expression classification. Here is a concise overview of these steps:

**Face recognition:** The initial step employed TinYOLO, a target recognition method, to identify the facial regions within the project images. This serves as a precursor to the subsequent expression analysis.

**Expression classification:** Subsequently, a CNN model, specifically ResNet, was brought into play. This analysis was conducted in conjunction with a well-established and labeled dataset for facial expressions, the Real-World Affective Faces Database (RAF-DB) developed by Beijing University of Posts and Telecommunications<sup>[60]</sup>. RAF-DB is a comprehensive facial expression database comprising nearly 30 000 images, categorizing expressions across seven dimensions. The model was trained using seven fundamental expression categories found within RAF-DB. Then project images featuring identified facial components were subjected to prediction. This yields prediction scores for each image across various dimensions of expression.



### 4.5 Propensity score matching

Within the framework of counterfactual causal inference analysis, this paper adopts the Propensity Score Matching method (PSM) to dissect the impact of emotional attributes embedded within diverse project images on the contributions made by donors. By employing matching, PSM effectively addresses endogeneity issues stemming from sample self-selection and other variables<sup>[61]</sup>. The procedural steps for PSM analysis unfolded as follows:

**Covariate selection:** First, pertinent covariates  $X_i$  were chosen, drawing insights from pertinent literature. These encompassed fundamental project attributes and the traits of project executors and contributors.

**Propensity score estimation:** The logit model was employed to estimate the propensity score associated with negative emotional attributes in project images. **Matching:** Utilizing the “psmatch2” command within STATA, coupled with diverse matching techniques such as one-to-one matching, nearest neighbor matching, radius matching, and kernel matching, the samples within the treatment group were effectively matched with corresponding samples in the control group.

**Calculation of Average Treatment effect on the Treated (ATT):** Lastly, the ATT was computed, encapsulating the net influence of emotional attributes on donation outcomes within the treated group.

### 4.6 Variable design

Table 1 provides an overview of the variables used in this study along with their descriptions. The dependent

variable under scrutiny in this study pertains to the donation outcomes, specifically encompassing the number of donations and the per capita donation amount. The key independent variable is the emotional attributes of images, represented as a binary variable. Here is an outline of how the emotional characteristics of images were labeled in this study.

The initial training set incorporates seven fundamental facial expressions: anger, disgust, fear, sadness, neutral, happiness, and surprise. Utilizing the training model, the images analyzed in this study were subjected to prediction, resulting in scores across each dimension. These scores encapsulated the emotional disposition exhibited by each image. When analyzing images containing multiple faces, we calculated individual scores for each face and subsequently compute the average score. Importantly, the cumulative score for each dimension across all faces within the image always sums to 1. Each project consists of two types of images: list page pictures and detail page pictures. To holistically gauge the emotional attributes of a project, we averaged the scores across all detail page pictures across the seven dimensions, summed the average picture score of detail page images with the score of list page images, yielding a comprehensive score across all seven dimensions. Then we compared the differences between the average scores in dimensions associated with negative emotions (anger, disgust, fear, sadness, and neutral) and the average scores in dimensions linked to positive emotions (happiness and surprise). If the former is higher, the

**Table 1 Table of variable design.**

Type	Name	Explanation
Dependent variable	donationnum	Numbers of donation
	donationper	Average donation per capita
Independent variable	emotion	Emotional types of images, negative for 1, and positive for 0
	goaldonation	Target amount of the project
	beginyear	Year in which the project fundraising commenced
	raisingday	Duration of the project fundraising in days
	executor	Categorization of the executor (individual, enterprise, government, or grassroots)
Covariate variable	supporter	Categorization of the supporter (government, grassroots, or CCAFC)
	photodetail	Number of images on the detail page
	photoverify	Number of verifying images photo verification on the detail page
	bioemotion	Dual emotions for 1, single for 0
	distance	Number of occurrences of “I” and “We” in project text
	class	Presence or absence of words “farmer”, “worker”, “migrant worker”, and “rural area” in project text
	topic1-topic10	LDA scores in ten topics

project is marked as “1”; if the latter is higher, the project is marked as “0”.

When considering covariates, a comprehensive selection of pertinent variables is crucial to satisfying the two fundamental hypotheses of propensity score matching: Firstly, unconfoundedness: select variables that may influence donation outcomes and emotional attributes but are not directly affected by them. Secondly, common support region: ensure a substantial overlap in the distribution of propensity scores between the treatment and control groups. Therefore, to robustly examine the impact of emotional cues on donation outcomes, we controlled for other variables that may concurrently influence both emotional cues and donation outcomes. It is worth noting that the China Charities Aid Foundation for Children (CCAFC) exhibits a notably higher volume of funded projects in the actual dataset, setting it apart from other organizations. Consequently, even though it is also a foundation with grassroots background, we distinguished it separately during the coding process.

## 5 Result

With our methodology elucidated, this section presents a stepwise analysis, which includes descriptive statistics, common support region and balance tests, and detailed results exploring the influence of internal emotional cues and external contextual cues on donation behavior. After that, in the sensitivity analysis section, we delve deeper into the impact of binary and continuous variables on the estimation of the emotion variable, considering the implications for causal estimation.

### 5.1 Descriptive statistical analysis

This section provides a descriptive overview of the variables considered in this study. It reveals significant variations in fundraising outcomes across different projects (Table 2). While some projects have garnered no donations since their release, others have received a remarkable number of donations—143 937. The average per-project donation amount stands at 23.71 RMB, with the highest recorded value being 396.30 RMB. Regarding the emotional attributes of images, the average emotional score falls below 0.5, signifying that, overall, project images tend to exhibit more positive emotional characteristics.

### 5.2 Common support region and balance test

To ensure the quality of matching and the reliability of

**Table 2** Descriptive statistics.

Variable	Mean	SD	Min	Max
donationnum	13 544	13 115	0	143 937
donationper (RMB)	23.71	22.97	0.06	396.30
emotion	0.39	0.49	0	1
goaldonation (RMB)	453 429	872 863	4000	12 000 000
beginyear	2016	0.99	2012	2018
raisingday	88.94	124.80	1	1661
photodetail	4.77	2.20	1	21
photoverify	0.73	1.01	0	6
bioemotion	0.54	0.50	0	1
distance	7.57	10.70	0	73
class	0.31	0.46	0	1
executor_individual	0.40	0.49	0	1
executor_enterprise	0.01	0.11	0	1
executor_government	0.15	0.36	0	1
executor_grassroots	0.44	0.50	0	1
supporter_CCAFC	0.33	0.47	0	1
supporter_government	0.46	0.50	0	1
supporter_grassroots	0.20	0.40	0	1

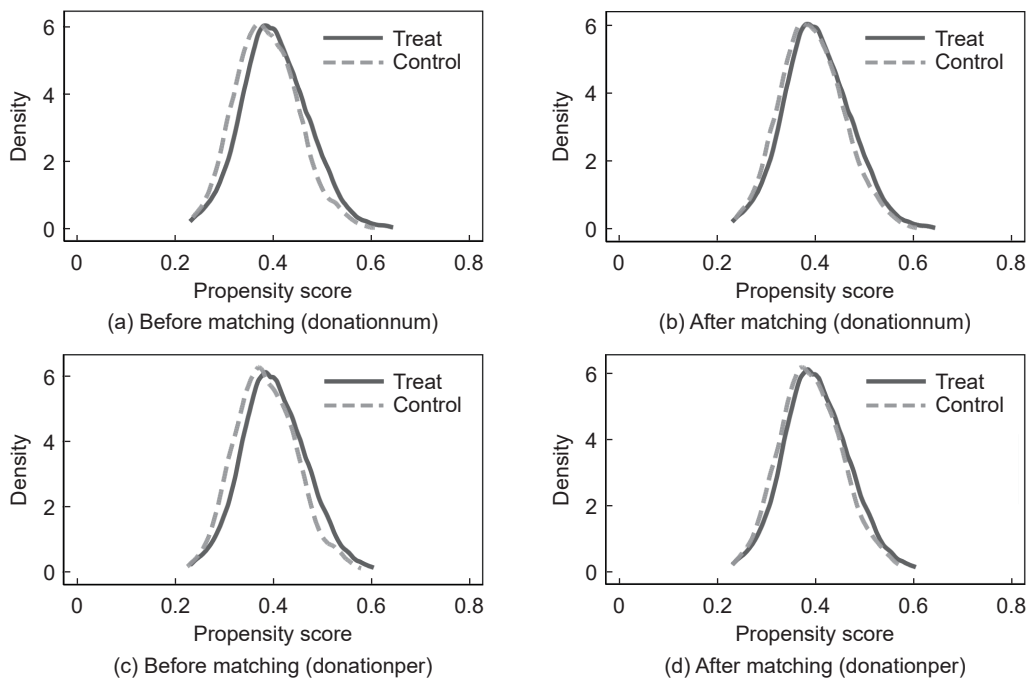
estimation results, we calculate the propensity scores for project images based on the aforementioned covariates and generated kernel density function diagrams for both the treatment and control groups (note that due to space constraints, only the results for the kernel matching method are presented here).

Figure 3 illustrates that there is significant overlap in the propensity scores of the samples in both the matched treatment and control groups. This suggests that the majority of observed values fall within a common range, meeting the common support hypothesis. Moreover, as indicated in Fig. 4, the standardized percentage deviation of each covariate before and after matching experiences a substantial reduction, and the standardized deviation of all variables after matching is less than 5%. These results imply that the matching process has been effective in achieving balance among the covariates.

### 5.3 Basic results: Influence of internal emotional cues on donation behavior

This section examines the impact of emotional cues on donation behavior by employing various matching methods for the treatment and control groups. The counterfactual estimation of propensity score matching yields the following findings.

The outcomes of the propensity score matching



**Fig. 3** Density function diagram before and after matching.

analysis in Table 3 demonstrate that positive emotional cues in project pictures lead to more than 1606 additional donations per project when compared to pictures with negative emotional cues. This result supports Hypothesis 1. Additionally, the matching results across different methods consistently suggest that negative emotional cues might elicit a higher per capita donation amount than positive emotional cues, by around 2.5 RMB on average.

This finding corroborates Hypothesis 2. The results highlight that the mechanism of emotional cues is multifaceted, affecting different dimensions of donation behavior through distinct mechanisms. Furthermore, the empirical outcomes unveil the distinct roles of positive and negative emotions. Positive emotional cues in pictures potentially underscore the recipients' virtues, such as determination and optimism, thereby attracting donors<sup>[30]</sup>. This process enhances donors' subjective feelings of pride, accomplishment, and efficacy, encouraging greater participation in donation efforts<sup>[62, 63]</sup>. Conversely, Batson's<sup>[64]</sup> empathy-altruism hypothesis posits that individuals experience emotions like empathy, sympathy, and pity when confronted with others' difficulties. Sad emotional cues may amplify these emotions, emphasizing the severity of illness and the urgency of the recipients' need for assistance. This, in turn,

amplifies the marginal utility of donations, sparking a stronger altruistic motivation to alleviate the recipients' predicament and leading to higher per capita donation amounts.

#### 5.4 Heterogeneity analysis: How do external contextual cues play a role?

Having established basic results concerning the impact of internal emotional cues, our attention turns to the nuanced exploration of external contextual cues. This includes an analysis of project contextual cues such as target amount and psychological distance, as well as social contextual cues like types of executors and the social class of recipients.

##### 5.4.1 Influence of target amount as a project contextual cue

To begin with, we choose the target amount as a critical indicator of project contextual cues. We divide the project target amounts into high and low categories based on the upper and lower quartiles of the distribution. The lowest 25% of samples represent projects with a low target amount, while the highest 25% represent projects with a high target amount. The outcomes of grouping matching are as follows (Table 4):

Results obtained from the nearest neighbor matching and kernel matching indicate that for projects with a high target amount, positive emotional cues can lead to approximately 3200 additional donations compared to

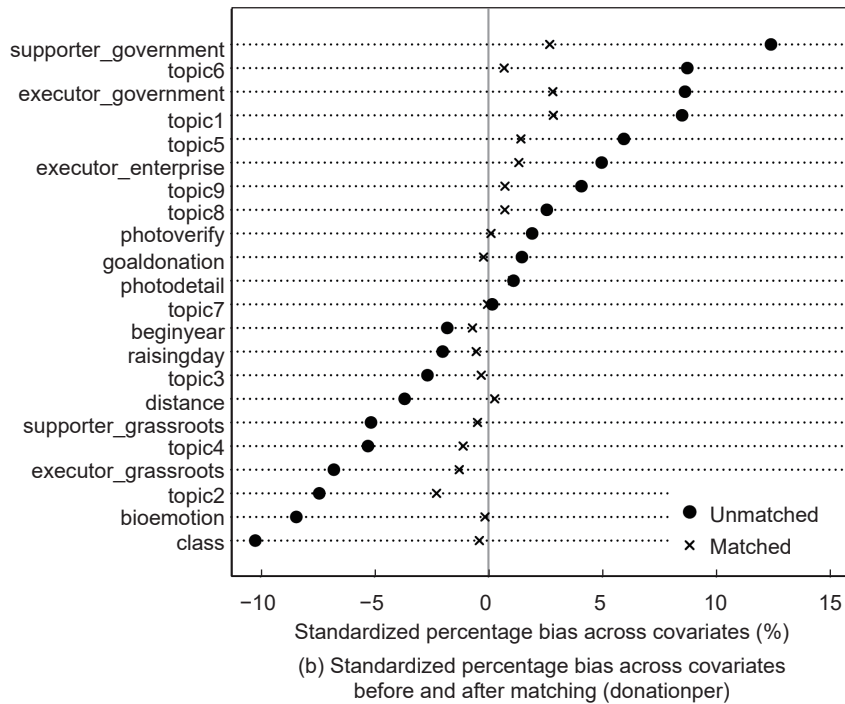
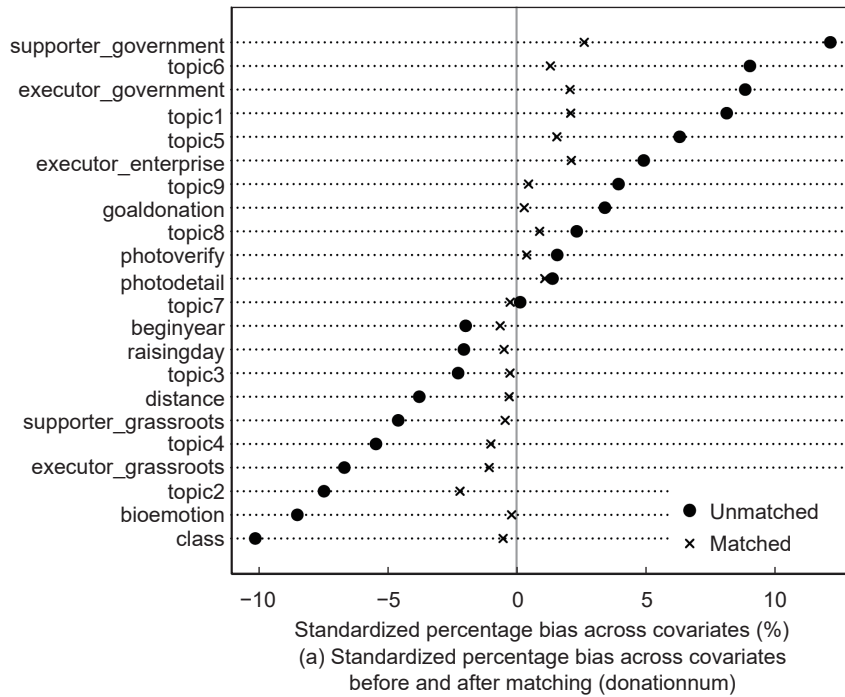


Fig. 4 Percentage deviation of covariate standardization before and after matching.

negative emotional cues. The impact of negative emotional cues is not statistically significant. Conversely, the results from one-to-one matching and radius matching reveal that for projects with a low target amount, negative emotional cues have a significant effect on increasing the per capita donation amount by around 2 RMB, whereas the impact of positive emotional cues is not pronounced.

These findings underscore that the different levels of fundraising target amounts influence the decision-making process of donors. A higher fundraising target amount may signify the severity of the disease. Despite this, recipients can convey optimism and resilience. This portrayal might encourage people to participate in donations, believing their contributions can still make a difference. When viewing it from the perspective of

**Table 3 Processing effect of PSM.**

Matching technique	donationnum			donationper		
	ATT	SE	T	ATT	SE	T
One-to-one matching	<b>-2545.35***</b>	924.09	-2.75	<b>3.73***</b>	1.45	2.57
Nearest neighbor matching ( $k = 4$ )	<b>-1704.02**</b>	678.17	-2.51	<b>2.49*</b>	1.30	1.92
Radius matching	<b>-1675.83**</b>	677.78	-2.47	<b>2.53*</b>	1.30	1.94
Kernel matching	<b>-1606.04***</b>	612.66	-2.62	<b>2.53**</b>	1.23	2.06

Note: \*\*\*, \*\*, and \* indicate that the estimated results are significant at the level of 1%, 5%, and 10%, respectively. SE is standard error, and T is T-value.

**Table 4 Processing effect of PSM after grouping target amounts (ATT).**

Matching technique	Low target amount		High target amount	
	donationnum	donationper	donationnum	donationper
One-to-one matching	-1342.24	<b>2.67*</b>	-2294.90	4.31
Nearest neighbor matching ( $k = 4$ )	-847.63	2.01	<b>-3150.19*</b>	5.08
Radius matching	-931.51	<b>2.27*</b>	-3155.45	5.96
Kernel matching	-813.61	1.84	<b>-3199.35*</b>	5.66

Note: \* indicates that the estimated results are significant at the level of 10%.

goal achievement, projects with lower target amounts likely witness a larger proportion of individual donations relative to the overall donations. Consequently, donors perceive a higher marginal utility in terms of self-donation. This aligns with the logical implications of negative emotional cues. Consequently, in scenarios where the project’s target amount is lower, negative emotional cues can attract a higher per capita donation amount.

**5.4.2 Influence of psychological distance as a project contextual cue**

Then we focus on the impact of psychological distance, as the second project contextual cue. We employ the frequency of the pronoun “wo (I)” and “wo men (we)” in the project statement to measure psychological distance and categorizes samples into two groups: those with a near psychological distance and those with a far psychological distance, based on the median. The outcomes after grouping and matching are presented in Table 5.

The results indicate that both positive and negative

emotional cues have a significant impact on projects with close psychological distance, but their influence becomes non-significant when the psychological distance is far. This supports Hypothesis 4, confirming that psychological distance plays a pivotal role in the relationship between emotional cues and donation behavior. The processing effects reveal that when the psychological distance is close, positive emotional cues can increase the average number of donations for a single project by approximately 2000, while negative emotional cues can lead to per capita donations ranging from 2 to 4 RMB.

By employing a first-person narrative approach, project narratives can effectively reduce the psychological distance between recipients and donors. This, in turn, enhances the empathy process and facilitates the influence of both types of internal emotional cues on donor behavior. Thus, the narrative style of project text is a crucial contextual clue that shapes donors’ decision-making processes.

**Table 5 Processing effect of PSM after grouping psychological distance (ATT).**

Matching technique	Far psychological distance		Near psychological distance	
	donationnum	donationper	donationnum	donationper
One-to-one matching	-1912.01	1.46	<b>-2677.93**</b>	<b>4.21***</b>
Nearest neighbor matching ( $k = 4$ )	-423.27	1.93	<b>-2178.43**</b>	<b>2.55*</b>
Radius matching	-358.58	1.70	<b>-2069.66**</b>	<b>2.68*</b>
Kernel matching	-1016.94	1.96	<b>-1965.68**</b>	<b>3.09**</b>

Note: \*\*\*, \*\*, and \* indicate that the estimated results are significant at the level of 1%, 5%, and 10%, respectively.

### 5.4.3 Influence of types of executors as a social contextual cue

In this section of analysis, we delve into whether the influence of emotional cues varies across different types of project executors, as one type of social contextual cues, including government-organized, grassroots, and individual. The results in Table 6 suggest nuanced results based on the type of executor. When the executor organization is government-organized, emotional cues' impact on donation behavior is not significant. For projects executed by organizations with grassroots backgrounds, negative emotional cues exhibit an effect on per capita donation amounts, resulting in an increase of around 4 RMB per donation, while positive emotional cues do not show a significant impact. In the case of projects led by specific individuals as executors, positive emotional cues, after nuclear matching, lead to a significant increase of about 2532 donations compared to negative emotional cues.

The empirical outcomes reveal several insights. Firstly, different types of executors do not significantly affect whether individuals choose to donate under the influence of positive emotional cues. However, when the executors are individuals, positive emotional cues might have a discernible impact. Comparatively, in instances where the project is executed by an entity with a grassroots background, negative emotional cues play a role in driving higher donation amounts. This could be due to the recipient's perceived lack of

resources, making the influence of negative emotional cues more pronounced in motivating donors to contribute.

### 5.4.4 Influence of social class of recipients as a social contextual cue

We focus on the second social contextual cues, the impact of the social class identity of recipients on donor empathy in this section. We categorize projects into two groups based on the presence or absence of words like “farmer”, “worker”, “migrant worker”, and “rural area” in the project content. A grouping test is conducted to analyze the effects. Table 7 illustrates that when the mentioned words are present, positive emotional cues can substantially increase the number of donations, ranging from 1990 to 2797, while the impact of negative emotional cues is not statistically significant. In contrast, for projects without these specific words, both positive and negative emotional cues do not exhibit significant effects.

These findings highlight that the social class description of recipients indeed influences the donation process. When the text in fundraising projects clearly indicates that the recipients belong to socially disadvantaged classes, positive emotional cues can engender empathy in donors, motivating more people to choose to donate. However, in such projects, negative emotional cues may not necessarily lead to higher per capita donation amounts.

## 5.5 Sensitivity analysis

Given the binary nature of our previous treatment of

**Table 6 Processing effect of PSM after grouping types of executors (ATT).**

Matching technique	Government		Grassroot		Individual	
	donationnum	donationper	donationnum	donationper	donationnum	donationper
One-to-one matching	-1792.01	-1.43	-654.48	<b>4.94*</b>	-1192.44	1.24
Nearest neighbor matching ( $k = 4$ )	-2424.90	0.14	-888.80	<b>4.31*</b>	-1655.06	1.35
Radius matching	-656.12	-2.78	-824.47	<b>4.25*</b>	-1738.47	1.20
Kernel matching	1755.41	1.06	-868.06	3.46	<b>-2532.73***</b>	1.60

Note: \*\*\* and \* indicate that the estimated results are significant at the level of 1% and 10%, respectively.

**Table 7 Processing effect of PSM after grouping social class of recipients (ATT).**

Matching technique	Class mentioned		Class not mentioned	
	donationnum	donationper	donationnum	donationper
One-to-one matching	<b>-2797.31**</b>	3.05	-603.21	1.71
Nearest neighbor matching ( $k = 4$ )	<b>-1990.37*</b>	3.61	-1278.81	1.82
Radius matching	-1868.20	1.89	-1278.46	1.78
Kernel matching	<b>-2389.95**</b>	2.97	-1231.57	1.79

Note: \*\* and \* indicate that the estimated results are significant at the level of 5% and 10%, respectively.

the independent variable (emotion), potential data noise exists. Additionally, to further scrutinize the core findings and respond to concerns about data noise, we have introduced the Generalized Propensity Score Matching (GPSM) method to investigate the causal effects of changes in negative-to-positive emotional tendencies in images. In contrast to traditional PSM method, GPSM evaluates the effects of variables that are either multivariate or continuous<sup>[65]</sup>. The main steps of GPSM are as follows:

Firstly, select an appropriate set of covariates to estimate the generalized propensity score  $\widehat{S}_i$ , which represents the treatment intensity. Secondly, construct the conditional expectation model for variable  $Y_i$  based on treatment intensity  $T_i$  and the generalized propensity score  $\widehat{S}_i$ , where  $\alpha_0$  is the intercept, and  $\alpha_1, \alpha_2$ , and  $\alpha_3$  are the regression coefficients.

$$E(Y_i|T_i, \widehat{S}_i) = \alpha_0 + \alpha_1 T_i + \alpha_2 \widehat{S}_i + \alpha_3 T_i \widehat{S}_i \quad (1)$$

Thirdly, estimate the average dose-response function when the treatment variable is  $t$  and the score  $\widehat{S}_i$  is the estimator of the estimated function  $r(t, X)$ .

$$\widehat{E}(Y(t)) = \frac{1}{N} \sum_{i=1}^N (\widehat{\alpha}_0 + \widehat{\alpha}_1 \cdot t + \widehat{\alpha}_2 \cdot \widehat{r}(t, X_i) + \widehat{\alpha}_3 \cdot t \cdot \widehat{r}(t, X_i)) \quad (2)$$

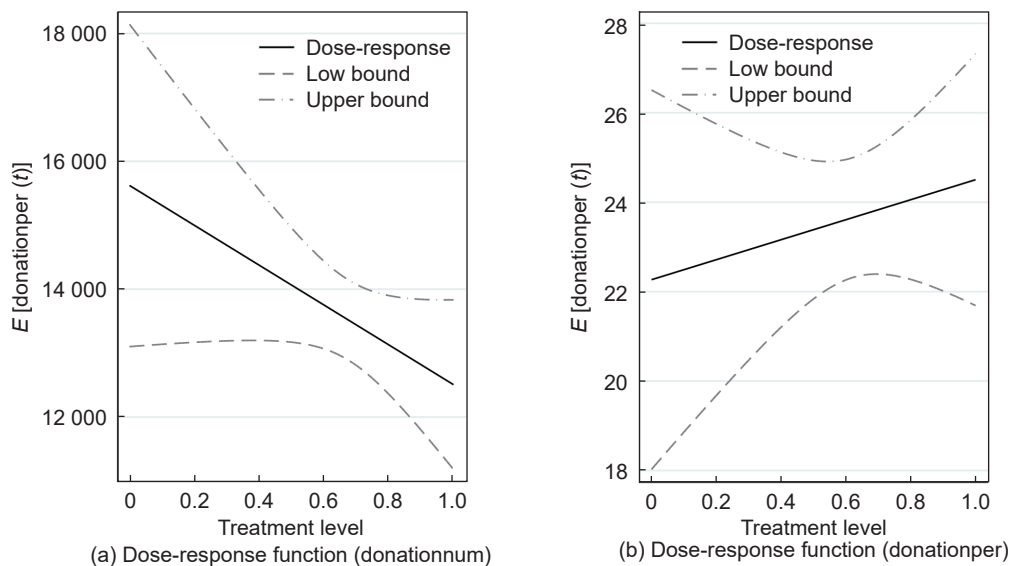
In this case, the covariates are consistent with those we selected during the previous PSM processing. The outcome variable chosen is the difference in scores between negative and positive emotional tendencies (understood as the intensity of negative emotions), and

it undergoes normalization. As the tendency of the outcome variable exhibits a left-skewed distribution, we selected critical values for treatment intensity at 0.528, 0.676, 0.787, and 0.854, respectively, based on the quartiles of the normalized outcome variable. Figure 5 illustrates the relationship between the intensity of negative emotions and the number of donations, as well as the per capita donation amount, obtained through the GPSM method. The average dose-response function graph indicates that, after numerical treatment of emotional variables, the estimation results from GPSM are consistent with those obtained in Section 5.3. This reaffirms that a weakening of negative emotions and strengthening of positive emotions may stimulate an increase in the number of donations, while an increase in negative emotions and decrease in positive emotions may lead to a decrease in the per capita donation amount.

## 6 Discussion and Conclusion

The era of digital technology, marked by the ubiquity of the Internet, has broadened the landscape of charitable engagement. Individuals are no longer restricted to close-knit interpersonal networks within constrained geographical limits. Instead, they are interconnected with diverse and distant individuals in society, thereby expanding the scope and possibilities of philanthropy.

Drawing upon the theory of social information processing, we establish a theoretical framework to



**Fig. 5 Dose-response function of GPSM. (Confidence bounds at 95% level. Dose-response function = liner prediction.)**

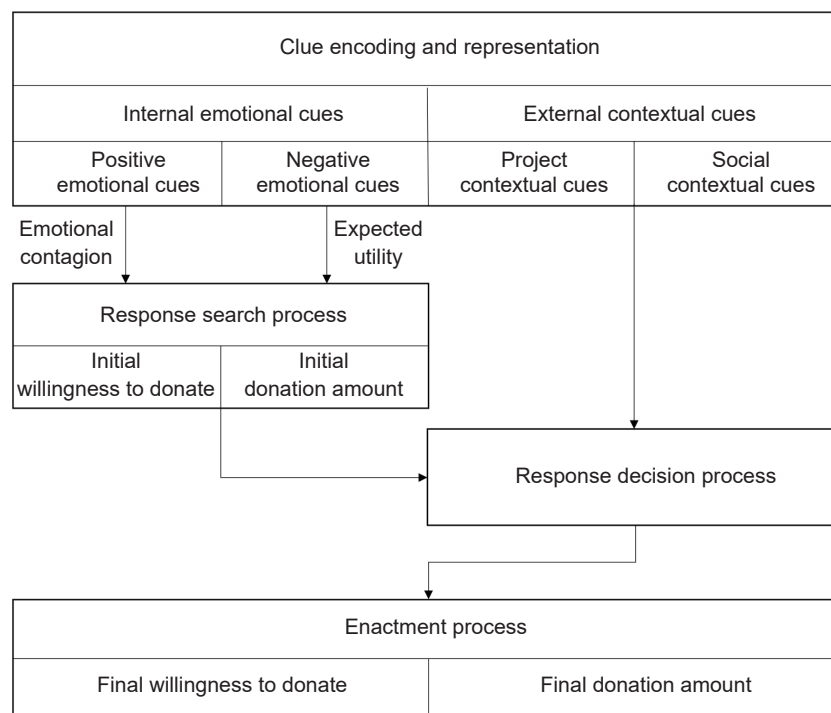
elucidate the link between project information and individual donation behavior. We find that positive emotional cues within project images tend to draw in a larger number of donors, whereas negative emotional cues tend to result in higher per capita donation amounts. To elaborate, positive emotional cues effectively entice donors by cultivating an emotionally positive experience, resulting in more substantial donations to the project, particularly when the fundraising goal is high or when the recipients are marginalized. Conversely, negative emotional cues capitalize on a heightened marginal utility of donation, yielding elevated per capita donation amounts, especially when the project’s target amount is modest, or the executor involves multiple institutions. Notably, when the psychological distance between recipients and donors is reduced, both positive and negative emotional cues can simultaneously yield their respective effects. Building upon the insights gleaned from the findings above, we refine the existing theoretical framework, offering a more nuanced understanding of the interplay between emotional cues, contextual factors, and online donation behavior in the cyberspace (Fig. 6).

The primary contributions of this study can be delineated as follows:

Firstly, it serves as a valuable supplement to the

theory of online prosocial behavior. Despite the abundance of research on prosocial behavior theory, the exploration of online prosocial behavior remains in its nascent stage. There exists a dearth of theoretical frameworks explaining the reasons and cognitive processes underlying online prosocial behavior. This paper specifically delves into individual donations on online platforms as a representative form of online prosocial behavior. It seeks to comprehend the characteristics and influencing factors governing this behavioral process, thereby shedding light on the social psychology and societal changes underpinning online interactions. Simultaneously, given the continual evolution of information technology and the widespread use of online payment systems, the landscape of online philanthropy in China is rapidly evolving. Consequently, the study of online prosocial behavior emerges as a pivotal direction for future academic research.

Secondly, an innovative analytical model for individual online donation behavior is proposed. This paper, rooted in the features of online fundraising, introduces a pioneering social information processing model of individual online donation behavior. Building upon the research by Crick and Dodge<sup>[15]</sup>, this study distinguishes between internal emotional cues and



**Fig. 6 Social information processing model of individual online donation behavior.**



external contextual cues, empirically examining the influence of emotions on donation behavior. Additionally, leveraging the content of online fundraising projects and considering the characteristics of charitable development in China, the paper analyzes the impact of project contextual cues and social contextual cues on donation behavior. It reveals that individual donation behavior is shaped not only by the presentation of project information but also by one's experiences and perceptions of social structure and environment. The study's conclusions underscore the intricacy of individual online donation behavior, emphasizing that the stages of individual response construction, reaction determination, and behavior initiation are collectively molded by emotional and contextual cues.

Thirdly, the research conclusions of this paper actively engage in and contribute to the ongoing debates within the academic community. In 2010, the influential journal, *Nonprofit and Voluntary Sector*, published a pioneering work by Bekkers and Wiepking<sup>[66]</sup>, defining eight crucial factors influencing donation behavior: awareness of need, solicitation, costs and benefits, altruism, reputation, psychological benefits, values, and efficacy. It is evident that in understanding donation motives, both rational perspectives such as cost-benefit analyses and altruistic perspectives involving morality and values exist. This paper posits the need for further differentiation concerning donation scenarios and project traits to better comprehend the motivations behind individual prosocial behaviors. Simultaneously, past debates on the impact of positive and negative emotions on individual donation behavior have been inconclusive. This paper addresses the conflict in existing research by distinguishing different types of dependent variables, highlighting the necessity of discerning between donation intent and donation amount in the analysis of donation behavior.

Lastly, this study innovates in research methodology compared to previous literature. Traditional psychological studies have predominantly been experimental, often distancing themselves from real-world individual behaviors. This paper introduces big data methods for data acquisition and analysis, representing an experimental breakthrough. Laboratory research allows for precise comparisons between

control and experimental groups through clever study designs, facilitating accurate measurements of the impact of a variable. Previous experimental studies focusing on the influence of image features or other fundraising project characteristics on donations have effectively leveraged their advantages, enabling precise measurement of various variables. However, experimental research is limited in its ability to focus on the impact of a limited number of variables, and it introduces errors due to sampling and laboratory environment factors. Big data allow for comprehensive analyses of original behavioral traces, enabling a more systematic exploration by integrating specific information from concrete time and space.

Simultaneously, this study has several limitations in variable measurement, causal inference, and other aspects. Numerous studies in psychology, marketing, and related disciplines have explored various facets of individual donation motivation and behavior. This study represents an exploratory endeavor, employing big data methods and real-world data in research. However, the inherent complexity of the real-world context, coupled with limitations in data acquisition, results in data that may lack cleanliness and access of control, which are typical in laboratory research settings. Given that we capture data at a specific moment, we have to neglect dynamic and procedural factors, such as the ongoing progress of project fundraising, which could impact donors' willingness and donation amounts at various stages. Moreover, the data accessible on fundraising platforms are often project-based, devoid of personal donor information. Individual experiences, social status, and networks may shape donors' cognitions and subsequently influence their propensity to donate. Unfortunately, due to data limitations, our design of measurement indicators for influencing variables relies solely on available data. Taking the proposed psychological distance in this paper as an example, we can only infer the donor's perceived psychological distance from the project's textual content and narrative style. Combining this with real donor information could enhance the accuracy of this variable estimation.

Additionally, the method exhibits limitations in assessing the emotion in pictures, introducing some noise in the recognition process. Real-world project images often lack clarity and standardization compared

to those designed in a laboratory setting. Some images in our acquired data are unrecognizable due to factors such as face occlusion or unclear facial features, impacting the accuracy of expression prediction results. Simultaneously, considering there are seven basic expressions in the initial labeled dataset, each picture is assigned varying scores across these seven dimensions. To streamline our theoretical assumptions, we opt for the simplification of utilizing the method of score averaging. Discrepancies may arise between the cover page and the details page of a project, suggesting that the impact of images might be influenced by the order in which donors view them. However, due to data constraints, we treat them equally.

Furthermore, this study predominantly focuses on facial expressions' impact on donations, primarily collecting data from disease relief projects. However, the operations of non-profit organizations encompass diverse fundraising projects. Visual elements in projects of different types may exhibit distinct characteristics. Notably, an increasing number of nonprofits are embracing video fundraising. With the surge of online philanthropy, the influence of visual products—such as color, themes, and emotions, on donations warrants further attention and discussion in future research.

Fei<sup>[67]</sup> contended that there should be a dedicated sphere within sociological research focused on the study of the human spiritual domain. He pointed out a specialized area could delve deeply into methodological aspects, exploring how to conduct research on the human spiritual realm within the framework and perspective of sociology, thus enriching the academic tradition of the field<sup>[67]</sup>. Naturally, constrained by data availability and other factors, this paper acknowledges limitations in data collection, variable selection, and model application. Consequently, there remains ample room for future research to enhance and refine these aspects, warranting future research to explore further, combining more advanced methods for a deeper investigation.

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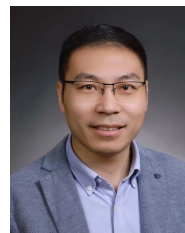
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