



# Designing a Medical Crowdfunding Website from Sense of Community Theory

JENNIFER G. KIM, Georgia Institute of Technology, USA  
ROBERT E. KRAUT, Carnegie Mellon University, USA  
KARRIE KARAHALIOS, University of Illinois, USA

290

A sense of community is important in encouraging people to contribute to a variety of causes and the communities that support them. Researchers have identified website design features that can engender a sense of community on sites to promote contributions. However, most findings about design features are based on observational empirical research testing single features at a time or on standard practice and rarely use integrated theories to provide rationale for their design suggestions. This work investigates ways to re-design an entire website—with a simulated medical crowdfunding interface entitled Community Journey—informed by Sense of Community Theory to increase site visitors' sense of community and contributions. A between-subjects experiment revealed that the Community Journey interface increased potential supporters' sense of community and their overall willingness to contribute via monetary donations, campaign shares, personal messages, and offline support. Think-aloud interviews identified the interface features responsible for the overall increase in willingness to contribute. Finally, we suggest theory driven design implications for creating websites to build a strong support community and to encourage various contributions.

CCS Concepts: • **Human-centered computing** → **Collaborative and social computing systems and tools**.

Additional Key Words and Phrases: Crowdfunding, Sense of Community Theory, Contributions

## ACM Reference Format:

Jennifer G. Kim, Robert E. Kraut, and Karrie Karahalios. 2022. Designing a Medical Crowdfunding Website from Sense of Community Theory. *Proc. ACM Hum.-Comput. Interact.* 6, CSCW2, Article 290 (November 2022), 25 pages. <https://doi.org/10.1145/3555181>

## 1 INTRODUCTION

Online crowdfunding sites such as GoFundMe have democratized philanthropy [3, 51]. The sites allow fundraisers to easily create a personal webpage and describe their reasons for raising funds. The webpage then can be shared with a large number of people to ask for donations (Fig. 1). Among various fundraising categories, medical costs are the dominant reason for using crowdfunding [51]. Especially in the United States where approximately 62% of bankruptcy cases are due to illness or injury [17], medical crowdfunding has revolutionized the way patients receive money to alleviate their medical expenses. On the GoFundMe crowdfunding site alone, more than 250,000 medical crowdfunding campaigns are created each year, and those campaigns have raised more than 650 million dollars [13]. Despite the potential impact of medical crowdfunding campaigns, reaching

---

Authors' addresses: Jennifer G. Kim, Georgia Institute of Technology, Street, Atlanta, GA, USA, [jennifer.kim@cc.gatech.edu](mailto:jennifer.kim@cc.gatech.edu); Robert E. Kraut, Carnegie Mellon University, Street, Pittsburgh PA, USA, [robert.kraut@cmu.edu](mailto:robert.kraut@cmu.edu); Karrie Karahalios, University of Illinois, Street, Urbana-Champaign IL, USA, [kkarahal@illinois.edu](mailto:kkarahal@illinois.edu).

---

Permission to make digital or hard copies of all or part of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. Copyrights for components of this work owned by others than the author(s) must be honored. Abstracting with credit is permitted. To copy otherwise, or republish, to post on servers or to redistribute to lists, requires prior specific permission and/or a fee. Request permissions from [permissions@acm.org](mailto:permissions@acm.org).

© 2022 Copyright held by the owner/author(s). Publication rights licensed to ACM.

2573-0142/2022/11-ART290

<https://doi.org/10.1145/3555181>

out to a large number of potential supporters and soliciting donations from them still remain a burden for patients and their families [14, 20, 28, 58]. Moreover, patients and their families often struggle with feelings of embarrassment due to a perceived social stigma of asking for money [28].

The community gathered around a medical crowdfunding plays an essential role in relieving not only the financial burden but also the emotional distress of a patient as they spread the word about a campaign on behalf of the patient, donate money, and organize offline support such as serving meals [28]. These community activities can in turn attract new supporters, in a virtuous spiral. For example, seeing a community of people speak highly about a patient or make an effort to support the patient establishes the credibility and empathy for the patient [25, 27]. Furthermore, when people feel more connected to a community, they will be more likely to make a contribution [31]. However, these community activities are not often visible on crowdfunding sites, but scattered across different sites because supporters promote a campaign on various social media sites and organize offline support through external sites like MealTrain [26]. Therefore, only people who have a direct connection to the patient as friends or acquaintances via in-person or online friendship are able to access these community actions. Those who do not have personal connections to the patient miss out on the benefit of feeling part of or connected to the community. However, in medical crowdfunding, it is important to attract strangers who do not personally know the patient because a patient's personal social network often has resources that are limited to achieve the goal amount. Therefore, this work investigates how surfacing the community effort that is already part of a crowdfunding ecosystem on the campaign interface may help strangers feel more belonging within a crowdfunding community and more willing to make contributions.

Our study contributes to the existing research on sense of community online [8, 9, 16, 30, 31, 35, 48, 50, 56, 59, 62]. Researchers have empirically shown that a strong sense of community is associated with increased contributions and have identified website design features that promote members' sense of community [31]. However, most conclusions about the important design features are based on observational empirical research examining single features at a time or on standard practice and rarely are they based on integrated theories of social behavior. Some research and design recommendations have been based on attachment theory [9, 48, 49] which focuses on increasing members' attachment either through promoting interpersonal bonds (e.g., by helping members develop stronger relationships with others), or promoting group identity (e.g., by helping members feel more connected to the common interests of a community such as travel). However, in addition to these factors, members' sense of community can be established with other factors. Especially in a community like crowdfunding where newcomers provide contributions to make a difference in a patient's medical progress, or well-being [28], their sense of community can be developed when the altruistic needs are met and/or when their contribution would make the most influence on the patient's progress.

We chose McMillan and Chavis' Sense of Community Theory to re-design medical crowdfunding sites as the four community elements of this theory broadly define a sense of community that can meet the needs of crowdfunding visitors: (1) *membership* – a feeling of identification with a community, (2) *fulfillment of needs* – a member's belief that their community will be able to fulfill their needs, (3) *influence* – a mutual impact between members and the community, and (4) *emotional connections* – a feeling of bonding rooted in the community members [36]. For example, the *influence* element provides ways to enhance a sense of community of medical crowdfunding newcomers by showing their possible influences on a patient's medical progress. The *emotional connections* element can be highlighted on medical crowdfunding by highlighting background information about a patient and existing supporters so that newcomers can find more commonalities between themselves and the patient. Such background information is often shared by supporters on social media when they promote a campaign to others (e.g., by describing the patient's warm personality)

or when they share their in-person help with others (e.g., posting pictures of them visiting the patient's hospital room) [25, 28]. Therefore, presenting various diverse support activities on medical crowdfunding platforms has the potential to build a sense of community for newcomers.

In this study, we specifically target a crowdfunding audience of strangers—people who do not personally know the patient but who encountered the crowdfunding campaign when it was shared by one of their friends on social media. This work makes three major contributions. First, we designed an entire simulated crowdfunding webpage called the Community Journey by incorporating interface features inspired by McMillan and Chavis's Sense of Community Theory [56]. Second, using a between-subjects online experiment, we show that the Community Journey interface increased participants' sense of community with a crowdfunding campaign and their overall willingness to contribute via monetary donations, campaign shares, message writings, and offline support. Specifically, we found that participants exposed to the Community Journey interface were significantly more willing to share and write messages than those exposed to the existing interface. Third, using think-aloud interviews, we conducted a more detailed investigation of the features of the Community Journey interface that were responsible for the overall increase in contributions. For example, we found three Community Journey interface features made participants more attracted to the patient and his/her community and increased their willingness to contribute: 1) background information about the patient and the team, 2) highlighting varieties of contributions, and 3) medical updates connected with various types of support.

## 2 SENSE OF COMMUNITY & CONTRIBUTIONS

In this section, we first explain the importance of building a sense of community and the reason for difficulty in promoting it in crowdfunding. We then describe factors that are shown to increase contributions in crowdfunding, explained by other theories of persuasion.

### 2.1 Sense of Community in Crowdfunding

Understanding the impact of a sense of community on promoting participation has been studied in the context of other types of online communities [16, 30, 35, 50, 56, 59, 62]. Research has found that community members who feel a strong sense of community are likely to provide valuable contributions such as responding to questions in online health support groups [50, 59, 62], contributing reviews in movie rating systems [48], and making edits in Wikipedia [30]. However, there is little research examining how online community website features designed based on well-established theories can engender a sense of community and encourage participation of potential supporters who visit the online communities for the first time and have few connections with existing members.

Crowdfunding communities share many similarities with other online communities including the challenges of *starting* a new campaign that appeals to many supporters [6, 12, 20, 37], *attracting* newcomers [12, 22, 41, 47], *encouraging commitment* of supporters [12, 15] and *eliciting contributions* [2, 38, 61]. To overcome these challenges, crowdfunding supporters provide diverse types of support such as giving feedback on campaign materials, spreading the word, and providing skill expertise [22] in addition to giving monetary donations. However, several unique characteristics of crowdfunding communities highlight the difficulties in attracting newcomer participation. For example, unlike other online communities, a medical crowdfunding community is organized around many people, including strangers, to achieve a monetary goal in a defined period of time for a specific patient. This provides a unique design challenge as it is difficult for strangers, seeing the patient and others in a community for the first time, to establish a connection to the patient in a relatively short time. Unlike many other online support communities, in which most members lurk before participating [43, 46], potential supporters to a crowdfunding site rarely have time to

grow familiar with the patient or other community members before deciding whether to contribute. Moreover, in other online communities, the sense of community is developed through relatively long term direct interpersonal communication between community members [16, 30, 35, 50, 56, 59, 62]. In medical crowdfunding, however, little is known how potential supporters build connections with the patient or other members. Therefore, understanding what community features derived from Sense of Community Theory can develop crowdfunding potential supporters' sense of community, and how these features can encourage contributions will advance our understanding of encouraging contributions based on the sense of community more broadly.

In this study, we applied one of the most well-established community theories in social sciences, McMillan and Chavis' Sense of Community Theory [36]. Although the Sense of Virtual Community (SOVC) has recently developed slightly more sensitive measures of sense of community for online communities using similar constructs to Sense of Community Theory, we chose McMillan and Chavis's theory because it is more widely used, and the four factor structure proposed by the theory has been also validated in online communities [1]. We thus believe that the Sense of Community Theory can be generally applied to both online and offline communities.

## 2.2 Other Theories to Explain Crowdfunding Contributions

Crowdfunding research has investigated factors that increase contributions using various persuasion theories, such as Social Influence [4], Credibility [55], and the Identifiable Victim Effect [23]. These persuasion theories can provide richer understanding and interpretations of our results because the features added to our interface to promote a sense of community may also elicit the effects predicted by persuasion theories.

Social Influence Theory posits that people imitate behaviors of others when taking action in a given situation [4]. On a crowdfunding page, a number signifying the quantity of supporters or the recognition of donors' contributions encouraged contributions [2, 37, 58, 63]. People also want to join contributions when they find others in crowdfunding who share similarities in culture, geographical distance [3, 40], and social status (e.g., occupation) [11, 40]. In the Community Journey interface, newcomers may find more people in the patient's community sharing commonalities with them since the non-monetary support includes messages describing other supporters' shared hobbies with the patient or schools they went together.

Credibility is one of the important factors that persuades people because people believe messages from those they trust [55]. A crowdfunding campaign's perceived credibility is critical as supporters want to donate to a campaign where their donations will be going to the promised cause. The Community Journey interface has the potential to increase a campaign's perceived credibility because supporters often reveal their identity via non-monetary support on a campaign, such as by posting pictures with the patient showing their friendship by celebrating Christmas together. Seeing the patient's friends and family supporting the campaign could enhance the campaign's perceived credibility as it signals that the campaign is validated by people who know the patient closely in the real world. [27, 29].

The identified victim effect theory emphasizes that individuals are willing to give greater resources to the recipient of a charity appeal that is more personalized than generic [23]. Medical crowdfunding sites recommend that fundraisers post pictures and videos of patients and describe details about their medical situations, such as medical condition, treatment plan, and financial situation [10]. These details are highlighted in the supporters' messages added in the Community Journey interface as the messages describe various aspects of the patient. The summary of updates also makes the patient's medical journey details more visible, which can help newcomers better relate to the patient.

While these theories provide explanations about contributions, they do not suggest ways to effectively leverage or create community. In crowdfunding, the role of community is important as diverse volunteer contributions from the community not only make a crowdfunding campaign more appealing to potential donors but also support lasting relationships with community members after a campaign is no longer seeking financial resources [22, 25]. This centering on community is at the core of CSCW and this perspective is under-explored in crowdfunding research. Our study—understanding ways to engender a sense of community by presenting the community presence and behaviors through the designs of the crowdfunding websites—could advance our understanding of past research findings. With this work, we aim to answer the following research question with the Community Journey interface that is designed around Sense of Community Theory.

**Research Question:** *How does the Community Journey interface, which is designed to engender a sense of community, increase the motivation of potential supporters to participate in a medical crowdfunding campaign?*

### 3 DESIGNING FROM SENSE OF COMMUNITY THEORY

McMillan & Chavis specified four elements that determine sense of community: membership, influence, fulfillment of need, and shared emotional connections [36]. Below, we describe how each of these constructs can be translated into crowdfunding designs. We define the design as website elements that include website look, function, and content.

For this study, we created a simulated medical crowdfunding campaign inspired by a crowdfunding campaign for a 3-month-old girl, Olivia (pseudonym), who had a skull fracture and brain bleeds after being struck by a softball (Figure 2). We contacted the campaign organizer before creating a simulated campaign, but did not get a response. For the simulated campaign, we recreated materials from the original Olivia's campaign by changing all names, rephrasing the story, creating new updates, and replacing pictures with other publicly available pictures on the Internet. To collect non-monetary support data for the simulated campaign, we searched for non-monetary support activities of the campaign including campaign promotions and offline support and added those to the simulated campaign by changing all the names and pictures. During the period we ran our study, Olivia's original campaign website was not publicly available. At the end of our study, we informed participants that the campaign story and data were fabricated for the research. We received IRB approval for this study.

#### 3.1 Membership

The membership element provides a feeling of belonging or identification with a community [36]. Highlighting community identity is important because as peoples' feeling of relatedness to the community identity increase, they they feel more belonging in the community. For example, emphasizing group identity in Wikipedia by highlighting important group goals increases members' performance on these goals [64].

In a medical crowdfunding campaign, community identity can be defined as a "team" of the patient and supporters who come together to help the patient by donating money, promoting a campaign, writing messages, and providing offline contributions. Explicitly highlighting the community identity is especially important in medical crowdfunding because it can provide newcomers, who do not have enough time to develop close relationships with established community members, opportunities to relate to the community identity. However, this community identity is not typically emphasized on existing crowdfunding interfaces (Figure 1). Most interfaces only highlight the need for funding and provide information about the patient. To better emphasize the community identity as that of one team, we first changed the title of the medical crowdfunding campaign from the original "Healing for Olivia" to "TeamOlivia" (Figure 2-c). We then added a description

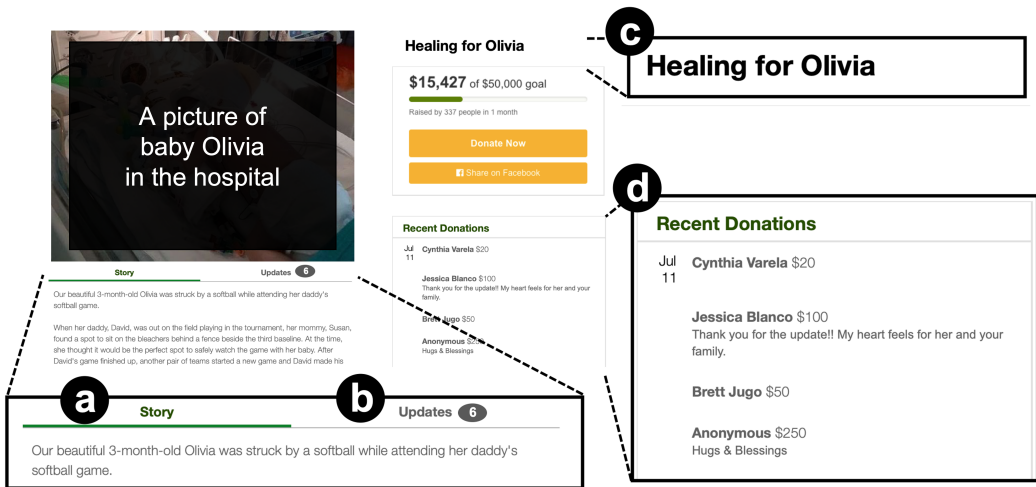


Fig. 1. The control condition interface following the design of an existing crowdfunding interface contains (a) a story describing the reasons for raising monetary donations, (b) updates, (c) a campaign title, and (d) all the donors' names, donation amount, and messages.

clarifying that this team is not only for fundraising, but also for other kinds of support. We further added campaign promotions on our new interface, as the promotions include features that show existing members' effort as a team such as using the team name as a hashtag (e.g., #TeamOlivia) when sharing the campaign on social media. Moreover, the campaign promotions included pictures of community members wearing the TeamOlivia T-shirt. We collected and presented these non-monetary activities in the support activity section of the Community Journey interface (Figure 2-e).

### 3.2 Fulfillment of needs

Needs fulfillment refers to a community member's belief that their community will be able to fulfill their desires or needs [36]. Members' needs can vary and include community success, emotional rewards, or knowledge acquisition [36]. In online communities, receiving recognition (e.g., a star icon) or satisfactory responses from other community members often fulfills members' emotional and informational needs [35]. In the context of pro-social behaviors, one of the needs fulfilled through volunteering is being around people who share similar values [5]. Past crowdfunding studies also found that sharing common values with other supporters causes people to donate more money [7, 25].

Medical crowdfunding potential supporters have a variety of needs [28]. One of their needs is recognition. Kim et al. found four ways – monetary donations, campaign promotions, messages, and offline support – that medical crowdfunding supporters can be recognized by supporting the patient's financial and mental well-being [28]. However, in a typical crowdfunding campaign, only monetary donors are recognized on the campaign interface with their names and donation amount. Non-monetary support activities such as campaign promotions, messages, and offline support are not visible on the campaign interface [25, 28]. Therefore, in the Community Journey interface, by placing four icons that represent each support activity on the same row (Figure 2-d), we recognized both monetary and non-monetary support activities. When clicking each icon, actual support

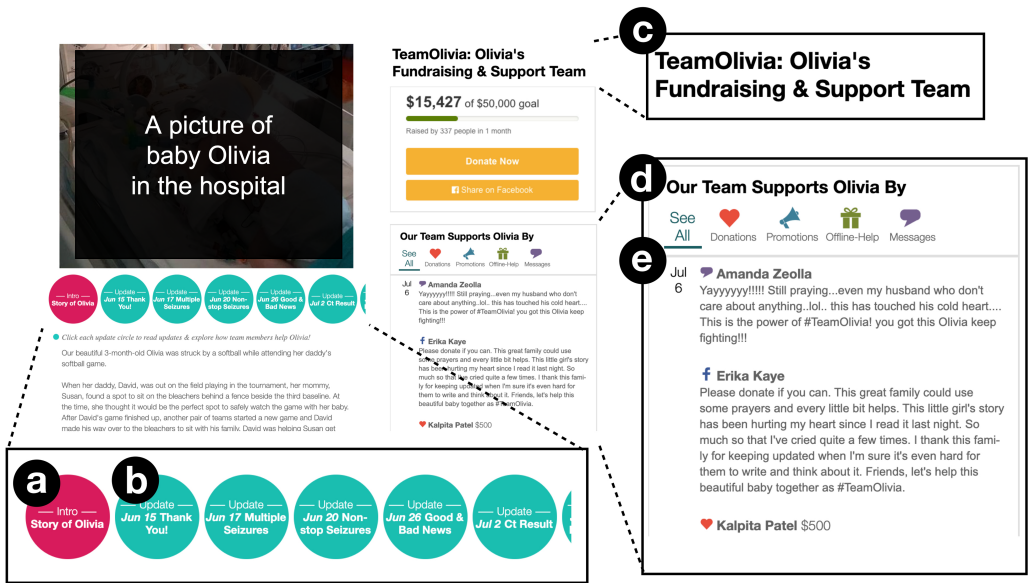


Fig. 2. The Community Journey interface designed for the experiment condition. (a) The patient’s photo and the campaign story are identical to the control condition. However, three major changes were made from the control version interface. These were (b) the design of updates, (c) the campaign title, and the support activity section, where (d) non-monetary contribution types such as campaign promotions and offline contributions and (e) details of non-monetary contributions such as names, messages, photos were added.

activities were shown. Non-monetary supporters’ detail contributions were equally presented (Figure 2-e). This interface may help potential supporters who want to provide non-monetary support perceive that their needs for recognition will be met if they contribute.

We made several design iterations to ensure that the interface can equally recognize both monetary and non-monetary support activities. In an early version of the interface, we placed the different types of support activities in one single column. However, the design did not allow viewers to easily discriminate between contribution types. It was difficult for viewers to distinguish different ways they can be recognized with contributions. Therefore, we changed the interface design by adding icons representing each type of support and explicitly state that "Our Team Supports Olivia by Donations, Promotions, Offline-Help, and Messages" (Figure 2-d).

### 3.3 Influence

The influence element is the mutual impact between members and the community where they belong [36]. Individuals are attracted to communities where they can make a difference, and communities can also influence members to conform to community practices [36].

In medical crowdfunding, emphasizing possible impacts that newcomers can make on the patient’s medical progress is important as the newcomers’ primary motivation for contributions is to make a positive influence on the life of the patient [28]. One possible way to highlight the potential impact of newcomers’ contributions is to emphasize how a variety of past contributions have made a difference in the patient’s medical progress or well-being. In the design of the Community Journey interface, we first emphasized the patient’s medical progress by summarizing the content of each

update on the front page of the campaign interface (Figure 2-b). We then connected each update (Figure 2-b) to the variety of support activities that members provided since the update (Figure 2-e). When each update is clicked, users can see activity details that supporters have provided since the previous update. This design allows newcomers to better estimate how their contribution would influence the patient if they contribute.

Furthermore, the team can also influence newcomers. In medical crowdfunding, newcomers are often motivated to help the patient when they see other supporters spend their time, energy, and money to support the patient's medical journey [25, 27]. Therefore, to make more peoples' efforts visible on the Community journey interface, we presented a variety of support activities and connected them to the patient's medical journey. Furthermore, people can be influenced by a group with members who see, feel, and understand the things in the same way as themselves. The update interface connecting members who support the same stage of the patient's medical journey could provides more opportunities for newcomers to engage in a group of supporters that are more similar to them.

### 3.4 Emotional connections

Emotional connections indicate a belief that members have shared or will share history or similar experiences [36]. Members feel greater emotional connection to a group when they share positive experiences. In medical crowdfunding, although newcomers often do not have shared direct bonding experiences with existing members, emotional connections can be developed indirectly by seeing other members' shared experiences with the patient. For example, medical crowdfunding supporters often share messages and photos to show their relationship with the patient, the patient's personality, or their memorable experiences with the patient [25, 27]. The Community Journey interface highlighted such shared experiences in the support activity section (Figure 2-d).

We expect that highlighting these four elements derived from Sense of Community Theory on the Community Journey interface will increase newcomers' sense of community and subsequent contributions. This leads us to the main hypothesis of this work:

**Hypothesis:** *The Community Journey interface, which was designed based on Sense of Community Theory, will increase potential medical crowdfunding supporters' feelings of connection to the crowdfunding beneficiary and, in turn, will increase their willingness to make a variety of contributions.*

## 4 METHODS

This section describes a simulated medical crowdfunding campaign and the design of two different websites used in an experiment to test the value of Sense of Community Theory as the basis of design. The first interface was created as a control condition and was based on the existing interface for Olivia's GoFundMe campaign (Figure 1). The second interface, called Community Journey, was created as a experimental condition and was based on Sense of Community Theory (Figure 2).

### 4.1 Campaign & Contribution Data

Olivia's campaign was selected based on the following two inclusion criteria. First, we searched for a campaign that had at least four campaign updates describing the patient's medical progress. The updates were important, based on Sense of Community Theory, to show the impact of contributions. Olivia's campaign had six updates explaining her medical situations from the time she had seizures during her treatment in the hospital to the time she became seizure free. Second, we looked for a campaign that had at least 20 publicly available campaign promotions and offline contributions. The non-monetary contributions were crucial to operationalize the Sense of Community elements of need fulfillment, influence, and emotional connections. While these offline and online non-monetary contributions are commonplace in medical crowdfunding campaigns [12, 20, 28], such interaction



data is difficult to obtain from public sources (e.g., Facebook, Twitter) because campaign supporters often promote a campaign on their own social media and provide offline contributions face-to-face. Therefore, we searched for Olivia's campaign URL on Google, popular social media sites (e.g., Instagram, Twitter, Facebook etc.), and online communities, and found campaign promotions. For offline contribution data, we found a public Facebook page where Olivia's parents and supporters posted pictures and messages about offline contributions that they received and provided, such as an offline fundraising event, gifts, and cards. We recreated non-monetary support activities by changing the name of each supporter and replacing the photos with other publicly available photos on the Internet.

#### 4.2 Control Condition: An Existing Crowdfunding Interface

We designed the control condition interface by closely following the design of the crowdfunding campaign webpage on the popular crowdfunding website, GoFundMe. As shown in Figure 1, this control version interface contains all the core features of a real crowdfunding campaign. For example, on the left side of the interface, a campaign profile picture, story, and updates are presented. On the right side, campaign title, fundraising goal amount, currently raised donation amount, and individual donors' information are displayed.

#### 4.3 Experimental Condition: Community Journey Interface

On the Community Journey interface (Figure 2), we used the same campaign information as in the control version. However, in comparison to the control condition, we made two major changes. First, we added non-monetary contribution data including campaign promotions and offline contributions. Second, as explained in the Designing from Sense of Community Theory section, we added and changed interface features based on the four elements defined in McMillan and Chavis's Sense of Community Theory: community membership, influence, fulfillment of needs, and shared emotional connections.

### 5 EXPERIMENTAL EVALUATION

We conducted an online, between-subjects, random-assignment experiment to evaluate the impact of the Community Journey interface on two outcomes: participants' feeling a sense of community with the Olivia campaign and their contribution behaviors towards it. Participants were randomly assigned either to the control or the experimental (i.e., the Community Journey) interface. Both the control and experimental condition interfaces were fully functional, so participants could explore Olivia's campaign as if they were exploring an existing online campaign outside of our study. After exploring the assigned campaign interface, participants were asked to complete an online survey measuring four dependent variables: 1) the sense of community, 2) willingness to contribute, 3) the perceived interface influence on their willingness to contribute, and 4) the perceived interface influence on sympathy. Below, we describe the details about our participants and the online experiment, including the campaign interface exploration and dependent variables, and results.

#### 5.1 Participants

We recruited participants by posting the link of the online experiment to local Facebook groups and sending emails to campus-wide mailing lists for faculty, university staff, and student communities. One hundred and forty participants took part in the experiment and completed the survey remotely. Five were removed for failing the verification questions, leaving 135 participants: 106 women (78%) and 29 men (22%) aged between 19 and 63, with a mean and median of 34; 67 and 68 participants were assigned to the control and the experimental conditions respectively. The experiment took

about 20 minutes to complete. Participants who successfully completed the experiment received a \$5 Amazon gift card or cash. In addition, participants were told that one in 50 participants would be randomly selected to receive an additional \$50 bonus prize.

## 5.2 Medical Crowdfunding Campaign Interface Exploration

In the online experiment, we first asked participants to imagine that one of their friends shared a link to a GoFundMe campaign on their Facebook News Feed to ask for support. Then, participants were asked to explore the campaign and decide whether to support the campaign. To ensure that participants explored the core interface features of both the control or experimental interface – campaign title, updates, and support activity section – we built tooltips that walked participants through each interface feature. Once participants completed the campaign feature exploration using the tooltips, they were asked to closely read all the information about the campaign and decide whether and how they would support it. At the end of the campaign exploration, we included three verification questions about the campaign story, updates, and support messages written on the campaign to check if participants had read all the information and tried all the features. Only participants who correctly answered all of the three questions were allowed to complete the rest of the online experiment.

## 5.3 Dependent Variables

After the campaign interface exploration, participants were asked to fill out an online survey measuring the following four dependent variables.

*5.3.1 Sense of Community (12 items,  $\alpha=0.89$ ).* The sense of community was measured using McMillan & Chavis's existing sense of community index [36]. To help participants answer the sense of community questions more accurately, the survey included "If I support Olivia and join this Olivia support group," before asking the specific questions. Then, the membership construct in sense of community was measured using questions such as "*I expect to feel at home in this group.*" The questions measuring the fulfillment of needs included "*Members and I want the same thing from this group.*" The influence construct was measured with questions such as "*I have no influence over what this group is like (reversed).*" The questions measuring the shared emotional connections construct included "*Members in this group generally get along with one another.*"

*5.3.2 Willingness to Contribute (5 items,  $\alpha=0.63$ ).* Participants' willingness to contribute was measured with the question, "*How likely would you be to make each of the following types of contribution to this campaign?*" For each type of contribution – making a monetary donation, sharing the campaign, writing a message on the campaign, and making an offline contribution – we asked participants to rate their willingness to contribute on a 7-point Likert scale ranging from 1 (Very Unlikely) to 7 (Very Likely). Finally, the monetary donation amount was measured by asking participants how much they would agree to donate to Olivia's campaign if they are selected for the additional \$50 bonus prize. Because the donation amounts were highly skewed, we used log-transformed values in all analyses. As is standard practice, we added 1 to all donation amount values before performing the log transformation because the log of zero is undefined. We then applied a linear transformation to normalize the log-transformed values to values between 1 and 7 to match the scale of the other contribution elements.

*5.3.3 Perceived Interfaces Influences on Sympathy (3 items,  $\alpha=0.79$ ).* We measured how much participants thought that each core interface feature on both control and experimental conditions – the updates (Figure 1-b & Figure 2-b), the support activities (Figure 1-d & Figure 2-d), and the details of support activities (Figure 1-d & Figure 2-e) – influenced their sympathy toward the

campaign's cause using a 7-point agreement Likert scale ranging from 1 (Strongly Disagree) to 7 (Strongly Agree). To remind participants of each interface feature, we showed them a screenshot of each feature. For the control condition interface, we requested Likert responses to the statements such as "*Seeing donations from many supporters led me to sympathize with the cause.*" For the Community Journey condition, the same statement was slightly modified to reflect the newly added interface features. For example, we included the statement, "*Seeing various types of support activities (promotions, offline support, and messages) from many team members in addition to monetary donations led me to sympathize with the cause.*"

**5.3.4 Perceived Interfaces Influences on Willingness to Contribute (3 items,  $\alpha=0.82$ ).** We also measured how much participants thought that each core interface feature influenced their contribution behaviors using a 7-point agreement Likert scale ranging from 1 (Strongly Disagree) to 7 (Strongly Agree). For example, we included the statements such as "*Reading Olivia's medical progress on the Updates section made me want to contribute.*"

## 5.4 Results

For the sense of community scale, we averaged all the values of survey elements and reported as a single value ( $\alpha=0.89$ ). For the overall willingness to contribute scale, we averaged all the values for donations, shares, messages, offline support, and donation amount to a single value to represent the overall contributions ( $\alpha=0.63$ ).

**5.4.1 Sense of Community & Contributions.** Our hypothesis was that the Community Journey interface would increase participants' sense of community with Olivia's family and supporters and would increase contributions. Results, summarized in Table 1, show positive effects of the Community Journey interface on the overall contributions and two of the specific contributions – campaign shares and messages.

Compared with the control condition, participants in the Community Journey condition felt a stronger sense of community ( $p < .001$ ). In addition, they were more willing to contribute overall to Olivia's campaign ( $p < .05$ ). Looking at distinct types of contributions, those in the Community Journey condition were more willing to share a campaign ( $p < .01$ ) and write a message on a campaign ( $p < .05$ ). These activities are important because they are likely to indirectly increase monetary contributions by spreading word of a campaign to other potential donors. Furthermore, for the patients and families who worry about others' judgement towards them regarding asking for money, seeing the support of campaign shares and messages could relieve their distress [28].

Although participants in the Community Journey interface condition expressed more willingness to donate money and to donate more money if they received the \$50 bonus, none of these results were statistically significant. For example, participants pledged an average of \$1.9 USD (11.9%) more in the Community Journey interface condition than the control condition, but because of the large variance, this increase in contribution was not statistically significant ( $p=.56$ ;  $p=.22$  for log transformed values). Furthermore, the Community Journey interface did not increase participants' willingness to contribute offline support. Indeed, the willingness to provide offline support was slightly decreased in the Community Journey condition although the result did not approach significance ( $p=.83$ ). We will explore this result further in the Discussion section.

To further understand whether the Community Journey interface influenced overall contributions through creating a sense of community, we conducted a mediation analysis. The path diagram is presented in Figure 3. The results indicate that the Community Journey interface directly influenced Sense of Community ( $A = .68, p < .0001$ ) and indirectly influenced overall willingness to contribute through its influence on sense of community ( $AB = .37, p < .005$ ). Increases in sense of community accounted for 70% of the Community Journey interface influence on overall contribution, and

	<i>Control Mean (SD)</i>	<i>Experiment Mean (SD)</i>	<i>p value</i>
<b>Sense of Community</b>	3.09 (1.11)	3.77 (1.12)	0.000 ***
<b>Overall Contributions</b>	2.94 (1.28)	3.46 (1.33)	0.022 *
<b>Specific Contributions</b>			
Donate	3.22 (1.82)	3.60 (1.99)	0.251
Share	2.55 (1.76)	3.60 (2.13)	0.002 **
Message	2.10 (1.60)	2.81 (1.91)	0.021 *
Offline	3.18 (2.20)	3.10 (2.03)	0.830
Donation Amount	\$16 (20)	\$17.9 (18)	0.563
Transformed Donation Amount	3.64 (2.52)	4.17 (2.43)	0.216
<b>Perceived Interface Influence on Sympathy</b>			
Update	4.67 (1.73)	5.60 (1.39)	0.000 ***
Support	3.24 (1.78)	4.31 (1.72)	0.000 ***
Support Details	3.31 (1.76)	4.21 (1.77)	0.003 **
<b>Perceived Interface Influence on Contributions</b>			
Update	3.69 (1.84)	3.90 (1.95)	0.520
Support	2.85 (1.73)	3.50 (1.84)	0.037 *
Support Details	2.57 (1.57)	3.18 (1.69)	0.031 *

Table 1. Descriptive and inferential statistics testing differences between the control condition (existing crowdfunding interface) and the experiment condition (Community Journey interface) on measures of sense of community, contributions, and perceptions of the influence of the interface on sympathy and contributions. The 2-tailed t-tests were used.

once the sense of community index was included in the model, the Community Journey interface had no direct effect on overall willingness to contribute ( $C = .15$ ,  $p = .47$ ). This result shows the mediating role that a sense of community can play in encouraging various types of contributions to a crowdfunding campaign.

**5.4.2 Perceived Interface Influence on Sympathy & Contributions.** For the perceived interface influence on sympathy scale, we averaged all the values for update, support, and support details ( $\alpha = 0.79$ ). The same analysis was applied to the scale of the perceived interface influence on willingness to contribute ( $\alpha = 0.82$ ). Compared with participants in the control condition, those exposed to the Community Journey condition reported that the website's interface had a greater influence on their feelings sympathy to Olivia ( $p < .001$ ). Although the averaged perceived influence of the Community Journey interface on willingness to contribute was not significant ( $p = .06$ ), the two specific interface features showing various types of support activities and presenting support messages increased the participants' willingness to contribute. The next section uses think-aloud interviews to explore in more detail what interface features on the Community Journey interface had an impact on contributions.

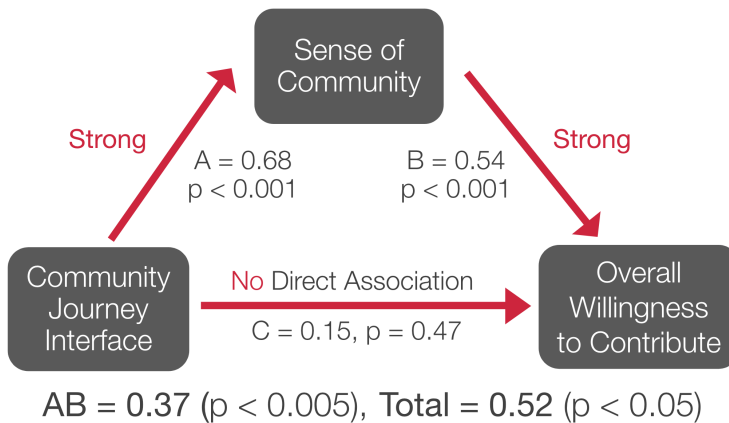


Fig. 3. Mediation analysis showing that the Community Journey interface had an indirect effect on overall willingness to contribute through its impact on sense of community.

## 6 INTERVIEW STUDY

The experimental evaluation showed that the Community Journey interface increased participants' sense of community with the campaign and overall willingness to contribute to it. However, the Community Journey interface was a complex, "kitchen sink" manipulation, in which many of its elements were designed based on Sense of Community Theory. To more precisely determine the important features of the interface, we used think-aloud interviews to determine what features of the Community Journey interface increased participants' sense of community with the campaign and motivated them to contribute more.

### 6.1 Participants

Seventeen participants (9 female) who did not participate in the experimental study were recruited through local online communities and university-wide mailing lists. Participants were aged between 19 and 57, with a mean of 31. The interviews took about 60 minutes and were conducted via Skype or Google Hangouts. After the interviews, participants were compensated with a \$15 Amazon gift card.

### 6.2 Think Aloud Interviews

Participants were asked to explore Olivia's campaign on the Community Journey interface. Similar to the experimental evaluation, using tooltips, participants first walked through the core interface features on the Community Journey interface. Then, while exploring the campaign, they were asked to say everything they were thinking from first seeing the Community Journey interface until they decided whether to support Olivia's campaign. After the think-aloud session, we asked follow-up questions regarding participants' beliefs about how each interface design feature influenced their decision to support or not support this campaign and their opinion about Team Olivia.

All interviews were audio recorded and transcribed. To analyze the transcribed data, we used Nvivo [41] and conducted inductive coding [36]. To understand how the Community Journey interface features influenced participants' sense of community and contribution behaviors, we first coded each interface feature that participants mentioned during the campaign exploration and how

Jul **f** Lisa Corbett  
 11 Susan and David are the most amazing couple I have ever met. I still vividly remember the day when they finally became parents to a beautiful baby girl Olivia after going through multiple rounds of fertility treatments. I was overjoyed with them. For weeks, Susan and David barely left their home to ensure no harm came to their baby Olivia. Tragically, when they finally ventured out for the first time, their worst fear came true... I can't imagine what they are going through right now. This is a picture of Olivia when she was born. So adorable. Please consider donating for this amazing family. #TeamOlivia ❤️

Fig. 4. Details of non-monetary support including supporters' names and messages.

the feature influenced participants' decision to support or not support Olivia's campaign. We then grouped the codes based on common interface features. Below, we report the analysis results.

### 6.3 Interview Results

Our interview results revealed three major community interface features unique to the Community Journey interface—showing background information about the patient and the team (Figure 4), highlighting various types of support and opportunities (Figure 2d), and a medical updates summary connected with various types of support (Figure 6)—made participants feel more connected to Olivia and her support community, and influenced participants' decision to contribute. In this section, we explain each feature in detail and describe how they influenced participants' sense of community and contribution decision.

*6.3.1 Background Information about the Patient and the Team.* On the Community Journey interface, after reading the background stories of Olivia and her family described in the campaign promotions, offline-help, and messages (Figure 4), participants pictured Olivia and her family as "real people (P13)" who could be their friends or neighbors, not "random people (P2)." For example, Lisa in Figure 4 shared on the campaign that Olivia's parents went through multiple rounds of fertility treatments to conceive Olivia. Another supporter wrote the message on Olivia's campaign, "My co-worker David [Olivia's dad] is one of the most genuine and kind-hearted guys I know." Participants reported in the interview that such messages describing the supporters' relationships with the patient (e.g., close friend or neighbor) and their past history with the patient reminded them of their own family, friends, or neighbors having similar characteristics. One of our interview participants said, "The fact that [the supporters] are saying David [Olivia's dad] is a plumber and talking about Susan [Olivia's mom] and just the little things that they know about them. The little things painting a picture of who these people are. I'm able to view them and get an idea of who they are, what they do, what they look like, what their life might be like. [...] Just because you see a lot of sad images online all the time, [...] it's not going to move me unless there's a more of the picture painted." - P7. This finding also supports the identified victim effect that describes presenting details about the beneficiary can promote greater contributions [23].

Some participants said that they felt connected to Olivia's community when reading messages written on the campaign from other supporters who are stranger to Olivia. They were able to identify with the supporters, who like themselves, didn't know Olivia personally. Those messages on Olivia's campaign included, "I have no idea who this family is, but I love following their story and see how truly great human nature is #TeamOlivia"

On the other hand, participants were not attracted to Olivia's support community and were even repelled from it when they found that the existing members of the community did not share their values. Three of our interview participants expressed discomfort when reading the religious messages shared by the patient's family and supporters (e.g., asking for prayers or people saying they believe in prayers). Furthermore, participants who did not have children, or had different cultural backgrounds didn't feel a connection to Olivia's support community. The lack of connection sometimes prevented the participants' willingness to donate money. Three participants who were not willing to donate money to Olivia's campaign said they felt like a stranger. Later in the discussion section, we address how we could better highlight the community features so more people can feel like a part of a crowdfunding support community.

In addition to evoking a sense of community, the Community Journey interface gave greater credibility to the campaign. Participants perceived the campaign credible after reading the detailed story about Olivia and her family shared by many supporters because it is difficult to fabricate all the different details about her and her family. For example, P12 said, "*Seeing all the support like so many people being on her side, definitely lends to the credibility of the crowdfunding. Not only the fact that many people support [the campaign], but also [seeing all the] detailed messages and pictures that they are sharing.*"

Similar to the finding in Kim et al. [27], campaign promotions on supporters' social media were perceived as trustworthy because participants believed that sharing the campaign with their social network implied that the sharer had confidence about the credibility of the campaign. Ensuring the credibility of the campaign was the biggest decision factor for more than half of participants to contribute, because they had read about fraud in some medical crowdfunding campaigns.

**6.3.2 Highlighting Varieties of Contribution.** The highlighting of different icons in the support activity interface feature of the Community Journey interface (Figure 2d) explicitly shows alternative ways of helping Olivia. Participants who had a desire to help Olivia but did not have enough monetary means to contribute showed interests in helping Olivia non-monetarily since the interface showed various ways they could be helpful. For example, P14 said, "*Sometimes I feel helpless looking at what's going on and I can't donate financially. But I think I could do more in this [interface]. It's like, 'oh, I could send a card.'*" Showing the varieties of support opportunities fulfilled the altruistic needs of the participants.

Furthermore, participants were willing to contribute when they found unique and creative ways they could be helpful to the patient (e.g., promoting a campaign to an online community where the campaign hasn't been shared or donating a special homemade cake). In these cases, participants expressed interest in presenting their unique and creative non-monetary support activities on the campaign interface so that their support could motivate others' support.

Emphasizing various contributions illustrated the variety of community involvement activities users could take. For example, photos of supporters wearing the same T-shirt, messages calling themselves TeamOlivia, and campaign shares with the hash-tag #TeamOlivia presented on Olivia's campaign showed that many supporters were working together to help her. Participants liked seeing the community of supporters because they believed their small contributions could make a big impact on Olivia's campaign when combined with contributions from other community members. Furthermore, participants said the photos of a group of supporters holding an offline fundraising event, writing cards together, and supporting Olivia by including their children showed that the community members were good people and they wanted to join them. Seeing the many ways supporters contributed to support the common cause signaled the worthiness of the cause. For example, P2 said "*Seeing the personal messages for the daughter and the parents and all the pictures that they're posting and the drawings and all the gifts that they've been giving them just shows that*

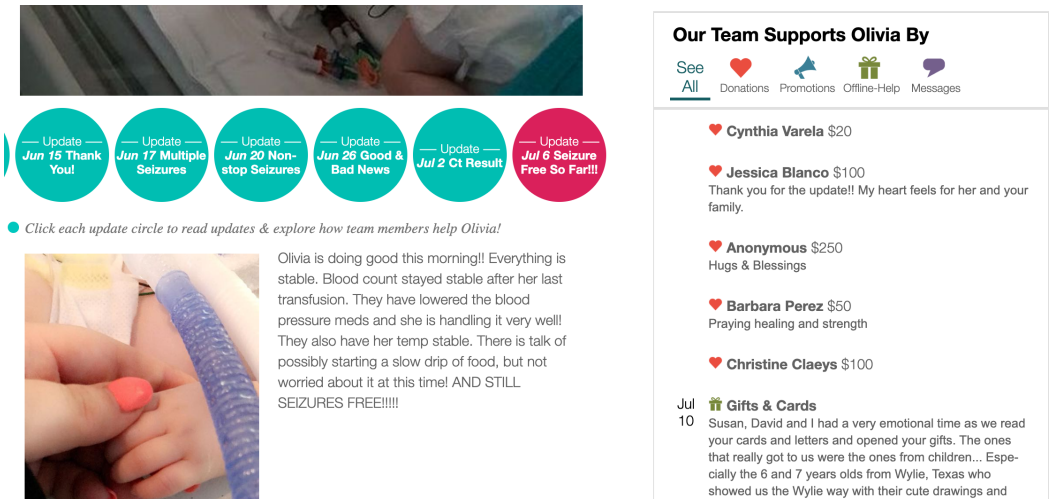


Fig. 5. The summary of updates connected to the support activity interface features showing various types of support.

*this is a bigger cause. It's not just like, 'oh, this is a little baby who needs money.' It's a big deal because a lot of these people care for this child. It just makes me feel more inclined to want to help the child."* This finding is also aligned with social influence [4] as newcomers want to join the contributions of the community that they feel connected to.

Participants often described their desire to feel part of Olivia's community by sharing the campaign using the #TeamOlivia hash-tag because doing so would have allowed them to see more other community members who support her. Furthermore, when participants were asked about their willingness to support this campaign, more than half expressed their interest in buying a Team Olivia T-shirt. Through buying the T-shirts, participants wanted to receive a tangible reward for being part of Olivia's community and to express offline their sense of belonging to the community. P1 said, *"I like this T-shirt fundraising because I kind of get something back from donating. Then my donation isn't just going into some invisible pool of funds. I could wear and show my support to Team Olivia, 'Hey, I am a part of Team Olivia.' Then you can kind of take that from crowdfunding online support to the real world. 'Hey, where did you get that T-shirt? And tell me about Team Olivia.'"*

However, some participants talked about difficulties in providing offline help because the Community Journey interface did not present Olivia's family's specific offline needs (e.g., a ride to the hospital) or possible ways of giving support (e.g., showing the address where supporters can send gifts or cards).

**6.3.3 Medical Updates Connected with Various Types of Support.** Participants liked seeing the summary of campaign updates in each circle followed by the initial campaign description circle (Figure 5) because they could better understand the patient's on-going medical progress at a glance. Furthermore, participants felt that the supporters' contributions were making a difference in the patient's progress when they saw the summary of the patient's medical progress along with the supporters' contributions on one screen (Figure 5). Some participants compared the Community Journey updates to the existing GoFundMe medical crowdfunding updates and said the interactive updates combined with the support activity section made them feel that they, along with other supporters, could influence the patient's on-going medical journey. For example, P2 described



in our interview, *"I think seeing that time lapse and how she [Olivia] is recovering pretty quickly, convinced me that this campaign is really helping her recover a lot quicker. And she's surviving right now because of it. Like we see with physical pictures that she's doing a lot better."*

Participants expressed interest in receiving future updates after contributing to Olivia's campaign. Once they contributed, participants felt more committed to help. Therefore, by tracking Olivia's future medical progress, they suggested they were willing to make additional contributions and desired to see her full recovery.

## 7 DISCUSSION

This research showed that the Community Journey crowdfunding interface was successful. Compared to a more traditional medical crowdfunding website interface which focused on the patient's needs and supporters' monetary contributions, the Community Journey interface, whose design was based on Sense of Community Theory, increased supporters' sense of community and their overall willingness to contribute, measured by averaging all the values for donations, shares, messages, offline support, and donation amount. This work further revealed the mediating role that a sense of community can play by inducing a variety of types of contributions to a crowdfunding campaign.

Here we further discuss the effect of the Community Journey interface on specific contributions, theoretical and design implications, and how sense of community can work as a simplified framework to stitch together other general persuasion principles.

### 7.1 The impact of Community Journey on Contributions

Compared to the control condition, participants were more willing to share the campaign on their social media accounts and write a message on the Community Journey interface. The increase in campaign sharing is important, as crowdfunding fundraisers struggle to promote campaigns to a large audience [12, 20, 28]. Shares from strangers are especially important because they can reach new audiences previously unavailable to the patient and existing supporters. Moreover, encouraging messages from strangers can provide more emotional support to the patient who often struggles with possible social stigma when asking for money [14, 28].

Furthermore, participants pledged an average of \$1.9 USD (11.9%) more in monetary contributions with the Community Journey interface. However, this increase did not lead to a statistically significant increase in the average amount participants pledged. According to Martin and Randal, people have a tendency to match the donation amounts of previous donors [34]. The failure to boost significant average monetary contributions may be because both the control and the Community Journey interfaces present much of the same information about others' monetary donations (e.g., donors' names, donation amount).

The Community Journey interface did not significantly increase participants' willingness to make offline contributions. Participants in the interviews identified a lack of actionable information as an obstacle to making offline contributions (e.g., not having the address to send a gift or not knowing the types of offline support that the patient needs). This limitation of the Community Journey interface—not offering concrete paths to provide offline contributions—may explain why it didn't increase these types of contributions. Regardless of an elevated sense of community, if participants using the Community Journey interface did not know what offline contributions to make and how to make them, the interface would not increase their willingness to contribute offline help.

Overall, the Community Journey interface significantly increased sense of community and increased overall willingness to contribute. Although this study focused on the way a community-oriented interface increases strangers' willingness to contribute to a crowdfunding campaign at a single point in time, a long term impact of community building can be more powerful. While

we cannot say for certain how this interface would fare in the long term, according to the Foot-in-the-Door effect, people are more likely to comply with a larger demand once they have complied to a small request [44]. Consistent with the hypothesis, it is possible that people who contributed messages and shares on the Community Journey interface would make subsequent contributions if they are asked again. In addition, the significant increase in newcomers' shares in the Community Journey interface has the potential to bring more visitors to the community. In future research, we hope to investigate whether the initial contribution of writing messages or sharing a campaign would lead to more people join the community.

## 7.2 Theoretical and Design Implications

Unlike other online health communities (OHCs) where patients exchange emotional and informational support among each other, medical crowdfunding communities are designed to support a particular patient. Therefore, our design features can specifically inform the designs of patient-focused OHCs which are developed to support a particular patient. McMillan and Chavis' Sense of Community Theory informs goals for increasing a sense of community in a crowdfunding interface—membership, fulfillment of needs, influence, and emotional connections—but not how to achieve them [36]. Below, we explain how to better highlight community features based on the Sense of Community Theory in the context of an online crowdfunding and the following two types of patient-focused OHCs: (1) those that coordinate in-person, relationships-based communities seeking instrumental support such as meal serving or transportation to a hospital (e.g., Caring-Bridge, Lotsa Helping Hands, or MealTrain) [33, 53, 54] and (2) social media such as YouTube or blog-based communities designed for patient vloggers and bloggers who publicly share their health conditions, information, and everyday lives with a large audience [19, 32, 42, 57].

**7.2.1 Membership.** To better emphasize membership, we suggest designers create an interface emphasizing team identity (e.g., presenting supporters' messages with their team name and sharing pictures of supporters wearing the team T-shirt). Furthermore, highlighting information that visitors have in common with other supporters (e.g., age, school, hometown, interests) or the patient (e.g., history of a similar disease in the family) can strengthen their sense of community. However, designers should be also aware that some information presented on the site can make visitors feel disconnected from others on the site. For example, we found that having many religious messages (e.g., "I am praying for you") on the site alienated non-religious participants. Future studies should investigate additional types of information that could cause visitors to feel uncomfortable and disconnected from the patient's community. With this information, we can provide community owners with more specific guidance about how to promote a sense of community.

**7.2.2 Fulfillment of Needs.** The Community Journey interface was designed to equally highlight monetary and non-monetary support in order to fulfill the need for recognition for all supporters. We suggest creating a new style of crowdfunding interface with more diverse values, that is, values for community building. Similar to CaringBridge or Mealtrain, crowdfunding sites could allow fundraisers to specify non-monetary needs (e.g., babysitting) and concrete ways for supporters to help (e.g., when and where help is needed). Other patient-focused OHCs can also create a space where supporters can recognize, join, or respond to others' offline support activities. Here, the recognition needs can further be satisfied with interface features to encourage the patient to actively give feedback about the support they received (e.g., expressing gratitude for support, recognizing the most helpful support).

**7.2.3 Influence.** The Community Journey interface that connected supporters' different types of contributions to the patient's medical progress allowed visitors to recognize how others' contributions made the difference in the lives of the patient. This finding contradicts predictions from social loafing theory, which holds that people will contribute less if they see others contributing more [24]. Our study suggests that people contribute most when they see their contributions are needed and recognized. In other OHCs created for a patient, designers can highlight how others' contributions are influencing the goals or value that the community is seeking.

**7.2.4 Emotional Connections.** The patient-focused OHC platforms can emphasize emotional connections by presenting messages and pictures from supporters that show more background information describing the patient's personality or supporters' past history with the patient. Researchers have shown that writing-support technology can improve the quality of comments and help requests [21, 45]. In our context, such technology could suggest supporters to include memories or information about the patient in their comments, so others, even strangers, can have more opportunities to feel more emotionally connected with the patient.

### **7.3 Leveraging Sense of Community Theory to Connect Other Theories**

Our interview results suggest that other theories of persuasion, including theories of social influence [3], credibility [42], and identifiability [41], could explain increases in contributions on the Community Journey interface that promote a sense of community. Here we discuss how a sense of community is likely to be mediated by social influence, credibility, and identifiability.

Many of our findings showed that participants felt connected to the crowdfunding community when they saw other supporters sharing similar values, having commonalities, or feeling an emotional bond. This notion of looking to others for cues to decide how to behave is called social influence [4]. Seeing other people's contributions such as number of donors or acknowledging donors on a crowdfunding webpage has been shown to influence contributions [37, 58, 63]. Our findings extend this by suggesting that feeling more connected to both the patient and the community of contributors through the Community Journey interface increased the community's influence on them and therefore led to the increase of contributions. Moreover, our interviews suggested the potential connection between the sense of community and credibility. The patient's background information shared by others may have increased participants' perceptions that Olivia and her family are "real people (P13)" because fabricating many details is challenging. This finding suggests that the Community Journey interface may further enhance the credibility of the campaign because people are likely to trust messages from the supporters they feel connected to [60]. Finally, our participants felt connected to the patient when they were able to picture the patient and her situation. Presenting the details about the beneficiary can lead to greater altruistic contributions as people prefer more individualized appeals than generic, according to the identified victim effect [23, 52]. Having a community surrounding the patient could boost contributions because the community makes the patient more identifiable. Feeling connected to the patient's community may further enhance the effect.

## **8 LIMITATIONS & FUTURE WORK**

Our work measured participants' self-reported willingness to contribute to a crowdfunding campaign rather than their actual contributions. Although this is a reasonable first step to explore the impact of this crowdfunding interface design on sense of community and contributions, asking participants to give actual contributions would increase the external validity of our results. Nonetheless, the findings about the interface design features that influenced a sense of community and how sense of community caused greater willingness to contribute provide valuable lessons to

the HCI and CSCW community, and the qualitative results offer explanatory insights on how sense of community leads to contributions.

We created a single alternate site informed by Sense of Community Theory and thus our research is subject to the product as fixed-effect fallacy [39]. However, our design is based on the validated theory and some of our findings are consistent with prior work. We believe these first steps will help us grow this fertile new research direction.

The new interface we tested used a "kitchen-sink" intervention and did not pinpoint precisely the interface features responsible for increased willingness to contribute. More research is needed to explore other design instantiations inspired by the sense of community features. It is promising that, despite these limitations, our results showing the impact of the interface designs, especially highlighting commonalities with others in contributors and learning background information about the patient, align with past research findings indicating that these features increased crowdfunding investments [40] and credibility [27, 29]. While more research with additional sense of community designed sites is necessary, this consistency across results from the current experiment and older research holds promise.

Self-selection bias may have influenced the generalizability of our study results. Participants who decided to participate in our online study are likely to value philanthropic communities more than those who did not choose to participate. They may be more likely to feel attached to a community where many members share similar values with them. Moreover, our online study compensation included both fixed (\$5) and lottery rewards. The lottery reward may attract participants who held stronger openness-to-change values [18]. And people who are more open to change are likely to favor a new interface more than those who are not. In future work, we hope to uncover the effectiveness of the Community Journey interface across diverse people with different values.

## 9 CONCLUSION

We developed the Community Journey crowdfunding interface by operationalizing the four elements of the Sense of Community Theory – identity, influence, fulfillment of needs, and emotional connections – in the design of the interface. The experimental evaluation revealed that compared to an existing crowdfunding interface designed as a control condition, the Community Journey interface increased potential supporters' sense of community and their overall willingness to contribute. Furthermore, the think-aloud interviews suggested three different types of information displayed on the Community Journey interface – background information about about the patient and the team, various types of support and opportunities, and medical updates connected with various types of support activities – made potential supporters feel more attached to the patient and his/her community, and increased their willingness to contribute.

## REFERENCES

- [1] Dagmar Abfalder, Melanie E Zaglia, and Julia Mueller. 2012. Sense of virtual community: A follow up on its measurement. *Computers in Human Behavior* 28, 2 (2012), 400–404.
- [2] Tim Althoff and Jure Leskovec. 2015. Donor Retention in Online Crowdfunding Communities : A Case Study of DonorsChoose.org. In *Proc. WWW 2015*. 34–44. <https://doi.org/10.1145/2736277.2741120> arXiv:arXiv:1503.02729v1
- [3] Gordon Burtch, Anindya Ghose, and Sunhil Wattal. 2014. Cultural Differences and Geography As Determinants of Online Pro-Social Lending. *MIS Quarterly* 1 (2014), 1–44. <https://doi.org/10.2139/ssrn.1692661>
- [4] Robert B Cialdini. 1987. *Influence*. Vol. 3. A. Michel Port Harcourt.
- [5] E Gil Clary and Mark Snyder. 1999. The motivations to volunteer: Theoretical and practical considerations. *Current directions in psychological science* 8, 5 (1999), 156–159.
- [6] Sanorita Dey, Brittany Duff, and Karrie Karahalios. 2017. The Art and Science of Persuasion : Not All Crowdfunding Campaign Videos Are The Same Predictors of Crowdfunding Success. In *Proc. CSCW 2017*. <https://doi.org/10.1145/2998181.2998229>

- [7] Sanorita Dey, Karrie Karahalios, and Wai-Tat Fu. 2018. Effects of Socially Stigmatized Crowdfunding Campaigns in Shaping Opinions. In *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems*. ACM, 242.
- [8] Honglu Du, Mary Beth Rosson, John M Carroll, and Craig Ganoe. 2009. I felt like a contributing member of the class: increasing class participation with classcommons. In *Proceedings of the ACM 2009 international conference on Supporting group work*. ACM, 233–242.
- [9] Rosta Farzan, Laura A Dabbish, Robert E Kraut, and Tom Postmes. 2011. Increasing commitment to online communities by designing for social presence. In *Proceedings of the ACM 2011 conference on Computer supported cooperative work*. ACM, 321–330.
- [10] FundraisingTips. 2020. *GoFundMe Fundraising Tips*. <https://www.gofundme.com/c/fundraising-tips/medical>
- [11] Jeff Galak, Deborah Small, and Andrew T Stephen. 2011. Microfinance Decision Making: A Field Study of Prosocial Lending. *Journal of Marketing Research* 48 (2011), S130–S137. <https://doi.org/10.1509/jmkr.48.SPL.S130>
- [12] Elizabeth M Gerber and Julie Hui. 2013. Crowdfunding : Motivations and Deterrents for Participation. *ACM Transactions on Computer-Human Interaction* 20, 6 (2013), 32. <https://doi.org/10.1145/2530540>
- [13] GoFundMe. 2019. *Online Medical Fundraising*. <https://www.gofundme.com/start/medical-fundraising>
- [14] Amy L Gonzales, Elizabeth Y Kwon, Teresa Lynch, and Nicole Fritz. 2016. “Better everyone should know our business than we lose our house”: Costs and benefits of medical crowdfunding for support, privacy, and identity. *New Media & Society* (2016). <https://doi.org/10.1177/1461444816667723>
- [15] Michael D. Greenberg and Elizabeth M. Gerber. 2014. Learning to Fail: Experiencing Public Failure Online Through Crowdfunding. In *Proc. CHI 2014*. ACM Press, 581–590. <https://doi.org/10.1145/2556288.2557110>
- [16] William A Hamilton, Oliver Garretson, and Andruid Kerne. 2014. Streaming on twitch: fostering participatory communities of play within live mixed media. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*. ACM, 1315–1324.
- [17] David U Himmelstein, Deborah Thorne, Elizabeth Warren, and Steffie Woolhandler. 2009. Medical bankruptcy in the United States, 2007: results of a national study. *The American journal of medicine* 122, 8 (2009), 741–746.
- [18] Gary Hsieh and Rafal Kocielnik. 2016. You get who you pay for: The impact of incentives on participation bias. In *Proceedings of the 19th ACM Conference on Computer-Supported Cooperative Work & Social Computing*. 823–835.
- [19] Jina Huh, Leslie S Liu, Tina Neogi, Kori Inkpen, and Wanda Pratt. 2014. Health vlogs as social support for chronic illness management. *ACM Transactions on Computer-Human Interaction (TOCHI)* 21, 4 (2014), 1–31.
- [20] Julie S. Hui, Elizabeth M. Gerber, and Darren Gergle. 2014. Understanding and Leveraging Social Networks for Crowdfunding: Opportunities and Challenges. In *Proc. DIS 2014*. ACM Press, 2083–2088. <https://doi.org/10.1145/2559206.2581289>
- [21] Julie S Hui, Darren Gergle, and Elizabeth M Gerber. 2018. IntroAssist: A Tool to Support Writing Introductory Help Requests. In *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems*. ACM, 22.
- [22] Julie S. Hui, Michael D. Greenberg, and Elizabeth M. Gerber. 2014. Understanding the role of community in crowdfunding work. In *Proc. CSCW 2014*. 62–74. <https://doi.org/10.1145/2531602.2531715>
- [23] Karen Jenni and George Loewenstein. 1997. Explaining the identifiable victim effect. *Journal of Risk and Uncertainty* 14, 3 (1997), 235–257.
- [24] Steven J Karau and Kipling D Williams. 1993. Social loafing: A meta-analytic review and theoretical integration. *Journal of personality and social psychology* 65, 4 (1993), 681.
- [25] Jennifer G Kim, Hwajung Hong, and Karrie Karahalios. 2018. Understanding Identity Presentation in Medical Crowdfunding. In *Proc. CHI 2018* (2018).
- [26] Jennifer G Kim, Ha-Kyung Kong, Hwajung Hong, and Karrie Karahalios. 2020. Enriched Social Translucence in Medical Crowdfunding. In *Proceedings of the 2020 ACM Designing Interactive Systems Conference*. 1465–1477.
- [27] Jennifer G Kim, Ha Kyung Kong, Karrie Karahalios, Wai-tat Fu, and Hwajung Hong. 2016. The Power of Collective Endorsements : Credibility Factors in Medical Crowdfunding Campaigns. In *Proc. CHI 2016*. <https://doi.org/10.1145/2858036.2858289>
- [28] Jennifer G. Kim, Kristen Vaccaro, Karrie Karahalios, and Hwajung Hong. 2017. "Not by Money Alone" : Social Support Opportunities in Medical Crowdfunding Campaigns. In *Proc. CSCW 2017*. <https://doi.org/10.1145/2998181.2998245>
- [29] Yongsung Kim, Aaron Shaw, Haoqi Zhang, and Elizabeth Gerber. 2017. Understanding trust amid delays in crowdfunding. In *Proceedings of the 2017 ACM Conference on Computer Supported Cooperative Work and Social Computing*. 1982–1996.
- [30] Aniket Kittur, Bongwon Suh, Ed H Chi, and Palo Alto. 2008. Can You Ever Trust a Wiki ? Impacting Perceived Trustworthiness in Wikipedia. In *Proc. CSCW 2008*. ACM Press, 7–10. <https://doi.org/10.1145/1460563.1460639>
- [31] Robert E Kraut and Paul Resnick. 2012. “Encouraging Contribution to Online Communities ” in *Building Successful Online Communities: Evidence-based Social Design*. Mit Press, Chapter 2, 21–76.
- [32] Leslie S Liu, Jina Huh, Tina Neogi, Kori Inkpen, and Wanda Pratt. 2013. Health vlogger-viewer interaction in chronic illness management. In *Proceedings of the SIGCHI conference on Human factors in computing systems*. 49–58.

- [33] Haiwei Ma, C Estelle Smith, Lu He, Saumik Narayanan, Robert A Giaquinto, Roni Evans, Linda Hanson, and Svetlana Yarosh. 2017. Write for life: Persisting in online health communities through expressive writing and social support. *Proceedings of the ACM on Human-Computer Interaction* 1, CSCW (2017), 1–24.
- [34] Richard Martin and John Randal. 2008. How is donation behaviour affected by the donations of others? *Journal of Economic Behavior and Organization* 67, 1 (2008), 228–238. <https://doi.org/10.1016/j.jebo.2007.08.001>
- [35] Misa Maruyama, Scott P Robertson, Sara Douglas, Roxanne Raine, and Bryan Semaan. 2017. Social Watching a Civic Broadcast: Understanding the Effects of Positive Feedback and Other Users’ Opinions. In *Proceedings of the 2017 ACM Conference on Computer Supported Cooperative Work and Social Computing*. ACM, 794–807.
- [36] David W McMillan and David M Chavis. 1986. Sense of community: A definition and theory. *Journal of community psychology* 14, 1 (1986), 6–23.
- [37] Tanushree Mitra and E Gilbert. 2014. The Language that Gets People to Give: Phrases that Predict Success on Kickstarter. *CSCW conf.* (2014), 49–61. <https://doi.org/10.1145/2531602.2531656>
- [38] Ethan Mollick. 2014. The dynamics of crowdfunding: An exploratory study. *Journal of Business Venturing* 29 (2014), 1–16. <https://doi.org/10.1016/j.jbusvent.2013.06.005>
- [39] A. Monk. 2004. The product as a fixed-effect fallacy. *Human-Computer Interaction* 19, 4 (2004), 371–375.
- [40] Michael Muller, Werner Geyer, Todd Soule, and John Wafer. 2014. Geographical and Organizational Commonalities in Enterprise Crowdfunding. *Proc. CSCW 2014* (2014), 778–789. <https://doi.org/10.1145/2531602.2531716>
- [41] Michael Muller, Mary Keough, John Wafer, Werner Geyer, Alberto Alvarez Saez, David Leip, and Cara Viktorov. 2016. Social ties in organizational crowdfunding: benefits of team-authored proposals. In *Proceedings of the 19th ACM Conference on Computer-Supported Cooperative Work & Social Computing*. ACM, 1246–1259.
- [42] Bonnie A Nardi, Diane J Schiano, Michelle Gumbrecht, and Luke Swartz. 2004. Why we blog. *Commun. ACM* 47, 12 (2004), 41–46.
- [43] B Nonnecke and J Preece. 2000. *Lurker Demographics: Counting the Silent*. Hague, The Netherlands, 73–80.
- [44] Alexandre Pascual and Nicolas Guéguen. 2005. Foot-in-the-door and door-in-the-face: a comparative meta-analytic study. *Psychological Reports* 96, 1 (2005), 122–128.
- [45] Zhenhui Peng, Qingyu Guo, Ka Wing Tsang, and Xiaojuan Ma. 2020. Exploring the effects of technological writing assistance for support providers in online mental health community. In *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems*. 1–15.
- [46] Jenny Preece. 2004. ETIQUETTE ONLINE : From NICE to NECESSARY. *Commun. ACM* 47, 4 (2004), 56–61.
- [47] Vineeth Rakesh, Jaegul Choo, and Chandan Reddy. 2015. Project Recommendation Using Heterogeneous Traits in Crowdfunding. In *Proc. ICSWM 2015*.
- [48] Yuqing Ren, F Maxwell Harper, Sara Drenner, Loren Terveen, Sara Kiesler, John Riedl, and Robert E Kraut. 2012. Building member attachment in online communities: Applying theories of group identity and interpersonal bonds. *Mis Quarterly* (2012), 841–864.
- [49] Yuqing Ren, Robert E. Kraut, and Sara Kiesler. 2007. Applying common identity and bond theory to design of online communities. *Organization Studies* 28, 3 (2007), 377–408. <https://doi.org/10.1177/0170840607076007>
- [50] Shelly Rodgers and Qimei Chen. 2005. Internet community group participation: Psychosocial benefits for women with breast cancer. *Journal of Computer-Mediated Communication* 10, 4 (2005), JCMC1047.
- [51] Julia Sisler. 2012. Crowdfunding for medical expenses. *CMAJ : Canadian Medical Association journal* 184, 2 (2012), 123–124. <https://doi.org/10.1503/cmaj.109-4084>
- [52] Deborah A Small and George Loewenstein. 2003. Helping a victim or helping the victim: Altruism and identifiability. *Journal of Risk and uncertainty* 26, 1 (2003), 5–16.
- [53] C Estelle Smith, Avleen Kaur, Katie Z Gach, Loren Terveen, Mary Jo Kreitzer, and Susan O’Conner-Von. 2021. What is Spiritual Support and How Might It Impact the Design of Online Communities? *Proceedings of the ACM on Human-Computer Interaction* 5, CSCW1 (2021), 1–42.
- [54] C Estelle Smith, Zachary Levonian, Haiwei Ma, Robert Giaquinto, Gemma Lein-McDonough, Zixuan Li, Susan O’Conner-Von, and Svetlana Yarosh. 2020. " I Cannot Do All of This Alone" Exploring Instrumental and Prayer Support in Online Health Communities. *ACM Transactions on Computer-Human Interaction (TOCHI)* 27, 5 (2020), 1–41.
- [55] Brian Sternthal, Ruby Dholakia, and Clark Leavitt. 1978. The persuasive effect of source credibility: Tests of cognitive response. *Journal of Consumer research* 4, 4 (1978), 252–260.
- [56] Na Sun, Mary Beth Rosson, and John M Carroll. 2018. Where is Community Among Online Learners?: Identity, Efficacy and Personal Ties. In *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems*. ACM, 292.
- [57] S Shyam Sundar, Heidi Hatfield Edwards, Yifeng Hu, and Carmen Stavrositu. 2007. Blogging for better health: Putting the “public” back in public health. *Blogging, citizenship, and the future of media* (2007), 83–102.
- [58] Katie G Tanaka and Amy Volda. 2016. Legitimacy Work : Invisible Work in Philanthropic Crowdfunding. In *Proc. CHI 2016*. <https://doi.org/10.1145/2858036.2858110>

- [59] Yi-chia Wang, Robert Kraut, and John M Levine. 2012. To Stay or Leave? The Relationship of Emotional and Informational Support to Commitment in Online Health Support Groups. *Proc. CSCW 2012* (2012), 833–842. <https://doi.org/10.1145/2145204.2145329>
- [60] Natalie A Wyer. 2010. Selective self-categorization: Meaningful categorization and the in-group persuasion effect. *The Journal of social psychology* 150, 5 (2010), 452–470.
- [61] Anbang Xu, Xiao Yang, Huaming Rao, Wai-tat Fu, Shih-wen Huang, and Brian P Bailey. 2014. Show Me the Money! An Analysis of Project Updates during Crowdfunding Campaigns. In *Proc. CHI 2014*. 591–600. <https://doi.org/10.1145/2556288.2557045>
- [62] Diyi Yang, Robert Kraut, and John M Levine. 2017. Commitment of newcomers and old-timers to online health support communities. In *Proceedings of the 2017 CHI conference on human factors in computing systems*. ACM, 6363–6375.
- [63] Diyi Yang and Robert E Kraut. 2017. Persuading teammates to give: Systematic versus heuristic cues for soliciting loans. *Proceedings of the ACM on Human-Computer Interaction* 1 (2017), 114.
- [64] Haiyi Zhu, Robert Kraut, and Aniket Kittur. 2012. Organizing without formal organization: group identification, goal setting and social modeling in directing online production. In *Proceedings of the ACM 2012 conference on Computer Supported Cooperative Work*. ACM, 935–944.

## APPENDIX

### Recruitment Messages

This 20 minutes long survey asks your opinion about the interface design of a medical crowdfunding campaign. Please take a survey here. You will receive a \$5 cash/gift card for completing the survey and have a chance to win a \$50 lottery prize (2% chance)! Please use your desktop/laptop (avoid using your mobile phone) to see the best interface design.

### Measures for Perceived Interfaces Influences on Sympathy

Using the following statements, we measured how much participants thought that each core interface feature on both Control and Community Journey conditions influenced their sympathy toward the campaign's cause.

#### *Control Condition.*

- "Reading Olivia's medical progress on the Updates section led me to sympathize with the cause."
- "Seeing donations from many supporters led me to sympathize with the cause."
- "Reading the messages from supporters led me to sympathize with the cause."

#### *Community Journey Condition.*

- "Reading Olivia's medical progress and her team members' responses to her progress led me to sympathize with the cause."
- "Seeing a wide range of support activities (promotions, offline support, donations, and messages) from many team members led me to sympathize with the cause."
- "Reading the messages from team members led me to sympathize with the cause."

### Measures for Perceived Interfaces Influences on Willingness to Contribute

Using the following statements, we measured how much participants thought that each core interface feature on both Control and Community Journey conditions influenced their contribution behaviors.

#### *Control Condition.*

- "Reading Olivia's medical progress on the Updates section made me want to contribute."
- "Seeing donations from many supporters made me want to contribute."
- "Reading the messages from supporters made me want to contribute."

### Community Journey Condition.

- "Reading Olivia's medical progress and her team members' responses to her progress made me want to contribute."
- "Seeing a wide range of support activities (promotions, offline support, donations, and messages) from many team members made me want to contribute."
- "Reading the messages from team members made me want to contribute."

### Verification Questions

Please feel free to explore and read the information on the campaign above when answering the questions below.

**\* Which of the following information is NOT consistent with the Olivia's story?**

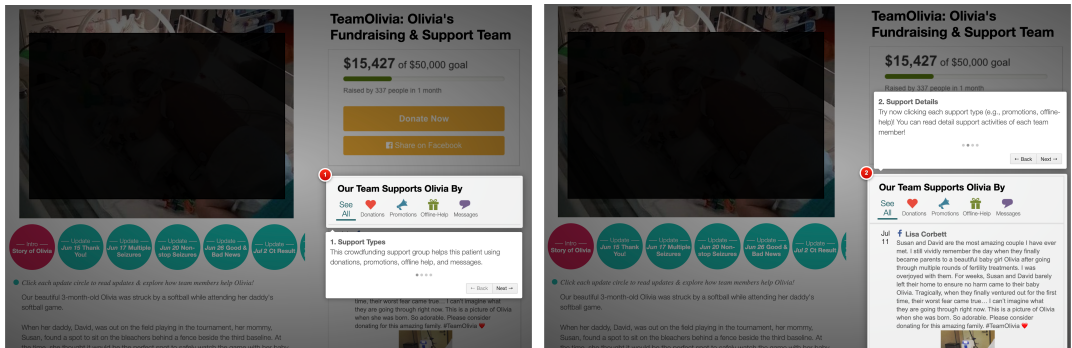
- Olivia was struck by a ball while attending her daddy's softball game.
- Olivia's mom was breastfeeding Olivia when Olivia was hit by a ball.
- Olivia's dad was playing a softball when Olivia was hit by a ball.
- Olivia's mom was also hit by a ball.
- Olivia had a skull fracture and 2 brain bleeds because of the accident.

**\* Please click the "July 2 Ct Result" update on the campaign above. Which of the following image do you see in the "July 2 Ct Result" update?**

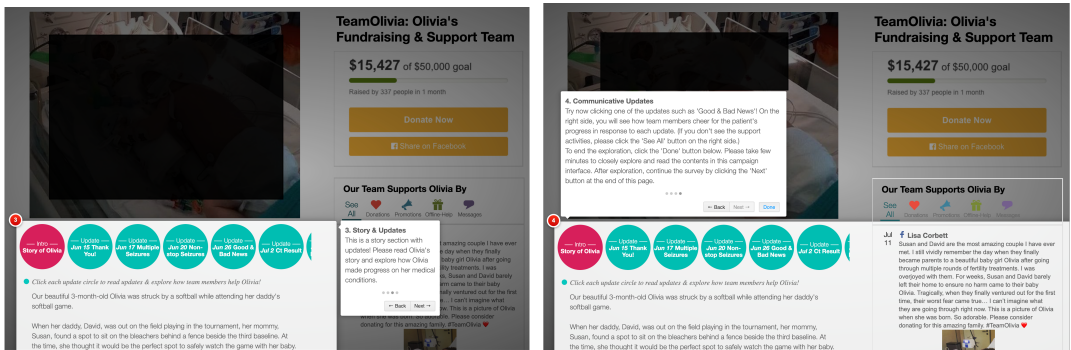


**\* Paraphrase your favorite message from one of Olivia's team members.**

### Tooltips







Received April 2021; revised November 2021; accepted March 2022