The Role of Technology in Enhancing Emotional Wellbeing in Recovery: Integrating WhatsApp for Mutual Support Among Care Communities: A Case of Stroke Survivors

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Abstract: Care communities for stroke survivors and their care networks are crucial in offering emotional support and fostering community engagement. While traditional in-person meetings have been beneficial, integrating digital tools offers new opportunities for enhancing these emotional wellbeing support systems. This study introduces a novel emotional sharing system, the "Queijinho" tool (Portuguese word referring to feedback into graphic form of a cheese), integrated into a WhatsApp group to explore the potential of social media in fostering emotional communication and mutual support within a caring community. We examine the shift from traditional face-to-face interactions to a hybrid care model through a participatory approach and a social experiment, integrating the researcher into the community of stroke survivors and their care network. Our analysis highlights how digital tools can sustain daily engagement, facilitate emotional sharing, and strengthen group social cohesion. The findings demonstrate that using the application WhatsApp and the "Queijinho" tool enhances emotional communication and fosters a sense of belonging, transforming traditional care communities into hybrid models that support both emotional wellbeing and ongoing peer support. This work contributes to multidisciplinary insights into the design and implementation of digital tools to support the emotional and social needs of stroke survivors and their care networks.

Keywords: Emotional Wellbeing; Mutual Support; Emotional Sharing; Social Sensemaking; Stroke Survivors; Care Network; Communication; Social Media Platform; Social Wellbeing.

1. INTRODUCTION

Stroke is a condition resulting from disrupted blood flow to the brain, leading to cell death in affected areas. Globally, over 80 million people have survived strokes, making it the leading cause of long-term disability worldwide (Feigin et al., 2017; Johnson et al., 2019, Feigin et al., 2021). Stroke survivors often face significant cognitive and motor impairments that drastically reduce their quality of life (QoL) (Ekstam et al., 2007; Hartman-Maeir et al., 2007). In addition to physical rehabilitation, addressing emotional wellbeing is essential for the recovery of both survivors and their caregivers (Haley et al., 2019). Despite its importance, emotional support for stroke survivors and caregivers remains an overlooked aspect of rehabilitation (Silva et al., 2020; Luker et al., 2015; Em et al., 2017). Many health professionals focus on physical recovery, with emotional wellbeing often taking a backseat (Godwin et al., 2013; Smith et al., 2008; Em et al., 2017). However, personalized rehabilitation plans that consider emotional wellbeing could significantly improve the QoL of both survivors and caregivers (Silva et al., 2020; Luker et al., 2015; Gaggioli et al., 2017).

The emotional wellbeing of stroke survivors is often compromised due to the drastic changes in their daily activities, hobbies, and social relationships. Many survivors become dependent on caregivers, further affecting their emotional health. Similarly, caregivers experience lifestyle changes and emotional strain as they take on the responsibilities of supporting stroke survivors. This dual impact highlights the need for emotional

wellbeing support not only for survivors but also for caregivers and their families (Brasier eta al., 2016; Silva et al., 2020; Forsberg-Wärleby et al., 2001; Park et al., 2022). Emotional wellbeing, defined as the ability to regulate positive emotions and adapt to adversity, is crucial for effective rehabilitation and QoL improvement (Park et al., 2022; Diener et al., 2011). Therefore, it is vital to prioritize emotional support post-stroke to facilitate recovery and better manage life changes (Silva et al., 2020; Christensen et al., 2019; Diener et al., 2011).

Peer support groups and care communities can provide essential emotional, social, and practical support. These groups, including those for stroke survivors, reduce feelings of isolation by fostering a sense of belonging and shared understanding (American Stroke Association, n.d.; Lave, 1991; Dunn et al., 1999; Moos, 2008). In such communities, survivors can share experiences, receive empathy, and exchange advice on daily challenges and rehabilitation strategies (American Stroke Association, n.d.). Caregivers also benefit from these networks, sharing responsibilities and learning effective coping strategies. In addition, health professionals contribute valuable expertise, ensuring a comprehensive support system (American Stroke Association, n.d.; Reidy et al., 2024; Christensen et al., 2019).

Integrating digital tools into support communities has further enhanced emotional wellbeing by facilitating communication, self-reflection, and group interaction. Technologies designed for emotional awareness and reflection can deepen the connection within care groups, promoting collective emotional health. For example, Barker et al. (Barker et al., 2016) developed a digital tool for mental health support, involving users in co-design to enhance reflection and group discussions. The tool enhances emotional awareness by promoting group discussions and reflection and provides a new dimension to emotional sharing within support groups. Rajcic and McCormack (Rajcic et al., 2023) created a system that reframes memories through AI-generated poetry, fostering emotional wellbeing within families through digital interaction. Lambton-Howard et al. (Lambton-Howard et al., (2019) highlighted the use of WhatsApp as a platform to facilitate large-scale community engagement in the WhatFutures project. This work demonstrated how messaging platforms could foster dynamic interaction and qualitative data collection, proving effective tools for large-scale community engagement.

Furthermore, Engelbutzeder et al. (Engelbutzeder et al., 2020) examine how digital technologies can support and enhance community-led initiatives focused on sustainable food practices. The study is part of a broader field of Human-Food Interaction (HFI) research, which explores the intersections of technology, food, and community engagement. The study also emphasizes the importance of designing these digital tools to be accessible and user-friendly, ensuring broad participation and engagement within the community.

These examples highlight the potential of digital tools to enhance emotional communication and support in care communities. However, there remains a gap in exploring how these tools can be tailored specifically for stroke survivors and their care networks in hybrid care models. This study addresses this gap by examining how social media platforms like WhatsApp can enhance emotional sharing and foster stronger social connections within care communities, transitioning from traditional face-to-face interactions to hybrid models.

In this paper, we engaged with the a Portuguese care community of stroke survivors to explore the role of social media in emotional disclosure. We leveraged WhatsApp, designing an emotional sharing visualization to assess its impact on emotional communication, peer support, and engagement within the stroke survivor care network. Our research questions include: Are users comfortable sharing their emotional wellbeing with peers? How does awareness of their own and their peers' emotional wellbeing affect users? How do social media platforms influence the sharing of emotional and personal data among members of peer-support groups/communities, and what factors affect members' willingness to disclose such information?

Our findings provide empirical insights into the effectiveness of emotional wellbeing tools integrated into social media platforms, highlighting their potential to enhance communication and support within care communities.

2. METHOD

This study explores the potential of a social sensemaking approach to enhance the emotional and social wellbeing of stroke survivors and their care networks. It examines how awareness of emotional wellbeing can be fostered through interactions with an emotional wellbeing tool, a WhatsApp-based social sensemaking tool. The study was approved by the Ethics Committee of Instituto Superior Técnico, University of Lisbon (Ref. n.o 2/2024 (CE-IST)) and all participants signed a consentient form authorizing their participation in this study.

2.1. COMMUNITY ENGAGEMENT AND INTEGRATION

“For a community to be whole and healthy, it must be based on people’s love and concern for each other.” Millard Fuller

Community engagement and integration are crucial when investigating and working with communities. It is essential to understand their needs to better meet them, integrating the community carefully and with total commitment and respect. This is the key, as a researcher, to effectively integrate into a community. The integration process varies for each community. It depends on the members and the group's context. Additionally, researchers can assume different roles within a community, which will define community engagement and "embeddedness".

After pandemic restrictions eased, the first author began attending the stroke community meetings. At the first meeting, the first author was a guest speaker, presenting a workshop on the importance of sharing emotional wellbeing. We discussed various approaches to emotional sharing within the group and identified a WhatsApp group as the most suitable technological solution for sharing emotions among members. Also, the first author, since all members enjoyed the presentation and specially the theme, was nicknamed “Terapeuta das Emoções” (in English, the “Therapist of Emotions”) and became known for bringing chocolates to enhance mood and promote happiness. To build trust, the first author/researcher started attending and observing all monthly meetings during two years, creating a relationship of proximity and trust with all group members.

Moreover, the first author developed a relationship of closeness with the community, fostering openness to collaborate on activities. With the creation of the WhatsApp group, the first author's involvement with the community deepened. Daily communication between the first author and the group members transformed the role from that of an observer to an integral part of the community. The first author’s participation became action-oriented, observing sharing of personal daily experiences and emotions, which, in turn, strengthened the group’s bonds. As one caregiver mentioned, "We have all known each other for so long, but since you arrived, we have become closer. We feel like a family".

For this study, participants were recruited from a Portuguese community, which holds monthly meetings in Lisbon, Portugal in south europe. A total of 14 members were involved, including 11 stroke survivors, one health professional, a caregiver, and a family member of a stroke survivor. The participants were selected based on their consistent engagement with the group and regular meeting attendance. Individuals who had only sporadic involvement with the group were excluded. Among the 14 participants, 10 were female, and four were male, all Portuguese, with ages ranging from 29 to 66 years (M=53, SD=11). Table 1 outlines the demographic characteristics of the participants.

During the study, the first author actively participated in the community, closely observing interactions and exchanges within the group. This involvement was also supervised by a clinical psychologist to ensure immediate psychological support if necessary. The role of the first author was not just limited to that of a participant active researcher but also as a social supportive presence within the group.

All 14 participants expressed interest in joining the WhatsApp group established as part of the study. However, not everyone was actively engaged in the discussions. Four participants, all stroke survivors, were more passive, contributing only occasionally and primarily observing the group's content.

A face-to-face session was also organized during one of the meetings, with 12 members attending. Additionally, 10 participants completed the questionnaire focused on the design of the emotional sharing tool.

Table 1: Demographic Information about Participants. M - Member, F - Female, M - Male.

Member ID	Age	Gender	Role
M1	55	F	Health Professional (Physiotherapist)
M2	40	F	Stroke Survivor
M3	29	F	Stroke Survivor
M4	62	F	Caregiver (Wife)
M5	48	F	Stroke Survivor
M6	62	M	Stroke Survivor
M7	53	M	Stroke Survivor
M8	56	F	Stroke Survivor
M9	42	F	Family Member (Daughter)
M10	64	M	Stroke Survivor
M11	66	M	Stroke Survivor
M12	64	F	Stroke Survivor
M13	55	F	Stroke Survivor
M14	50	F	Stroke Survivor

2.3. "QUEIJINHO" – EMOTIONAL WELLBEING VISUALIZATION TOOL

This section describes the design evolution and creation of the emotional wellbeing visualization tool throughout the study. The tool allows the generation of a pie chart that displays the emotional states of each group member. This pie chart was nicknamed "Queijinho" (in English "Cheese"), because of it similarity to a cheese format, by the members of the group.

The tool consists of a Google Form that presents a scale for users to rate their emotional state (Figure X) (Google Forms Emotions2Group, (2023). The emotional scale presented is the combination of the valence Self-Assessment Manikin scale (SAM scale) (Bradley eta al., (1994) and Traffic Light Scale (TLS). The valence SAM scale is a non-verbal pictorial assessment technique used to measure emotional valence (positive vs. negative) consisting of figures/manikins (Bradley eta al., (1994). The color choice was based on the TLS, which has been successfully used in various domains related to emotional expression (Asplin et al., 2022; Robertson et al., 2017; Trudel et al., 2015; Koenigstorfer et al., 2014; Meng et al., 2022). By combining non-verbal representations with color-coded states, we aimed to improve understandability and facilitate emotional expression (Bynion et al., 2020; Bradley eta al., 1994). Overall, the SAM scale is often used in various psychological studies (Stevens et al., 2016; Khozaei et al., 2020; Bynion et al., 2020; Hume et al., 2013).

After data collection, a pie chart is generated with a central circle representing the average color of all participants' emotional states based on the daily questionnaire responses. The pie chart design with a central circle was selected based on an activity conducted with our research community and developed iteratively. This process will be detailed later in the procedures section. The central circle combined color hue is determined by averaging the participants' ratings and selecting the corresponding emotional state color through linear interpolation along the emotional state scale (red - orange - yellow - light green - dark green, as shown in figures 1 and 2). The names of the participants are then placed within the corresponding slices of the pie chart, reflecting their individual emotional states (Figure 1). The chart is subsequently published in a WhatsApp group, allowing all participants to analyze the group's overall emotional state and each participant. A daily reminder message is also sent to the WhatsApp group, prompting participants to complete the emotional state questionnaire.

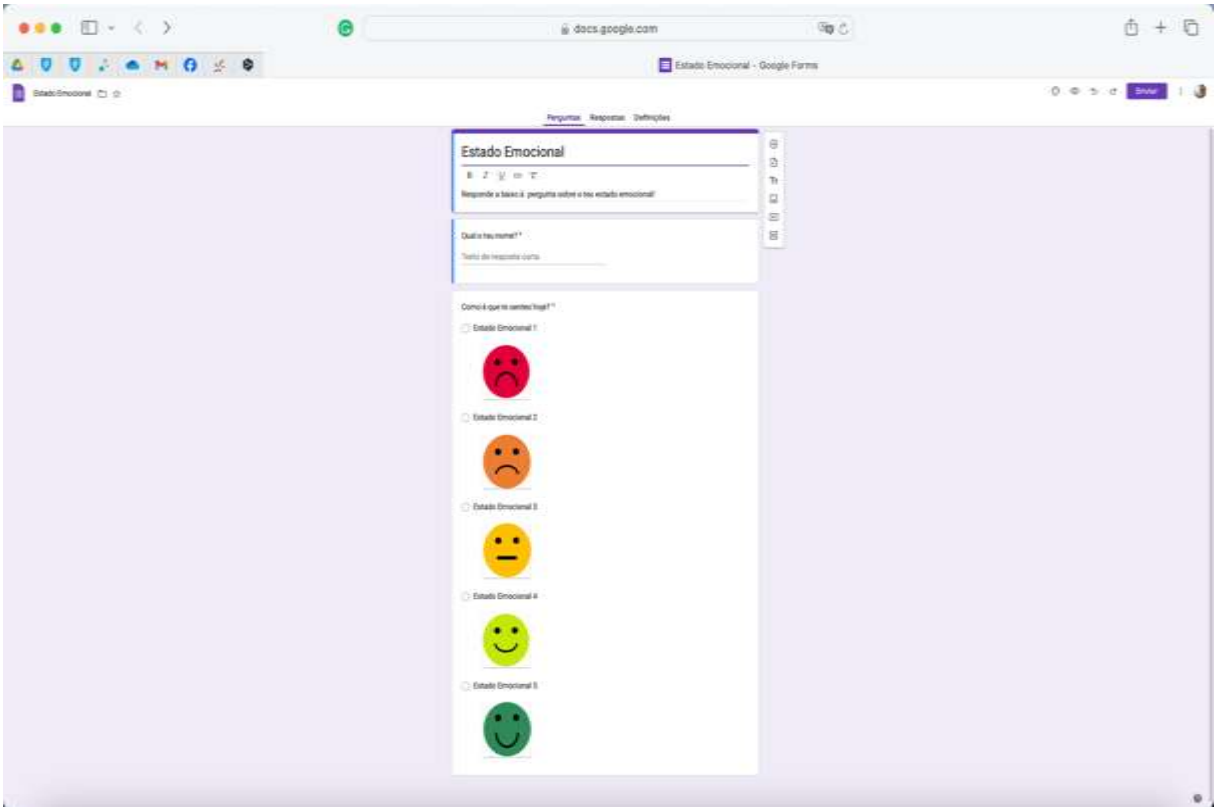

Figure 1: Google Form emotional state questionnaire.

Figure 2: Chart of the emotional state – “Queijinho” (the names are fictional).

A rapid prototyping technique was used before developing a functional prototype to facilitate the experience of designing the "Queijinho" and sharing it. The "Queijinho" of the group was created manually in PowerPoint (Figure 3), with the generated graph saved as an image and then shared in the WhatsApp group (Figure 4). Since participants can submit multiple responses daily, the "Queijinho" always reflects the most recent emotional state entered. However, there were occasions when the "Queijinho" was published, and some participants noticed that their emotional state was missing, realizing they had forgotten to answer the questionnaire. This sometimes resulted in creating and republishing a new "Queijinho". Besides creating the "Queijinho" and sending reminder messages, the first author also interacted with the group by fostering mutual support, and making the experience more dynamic and personal.

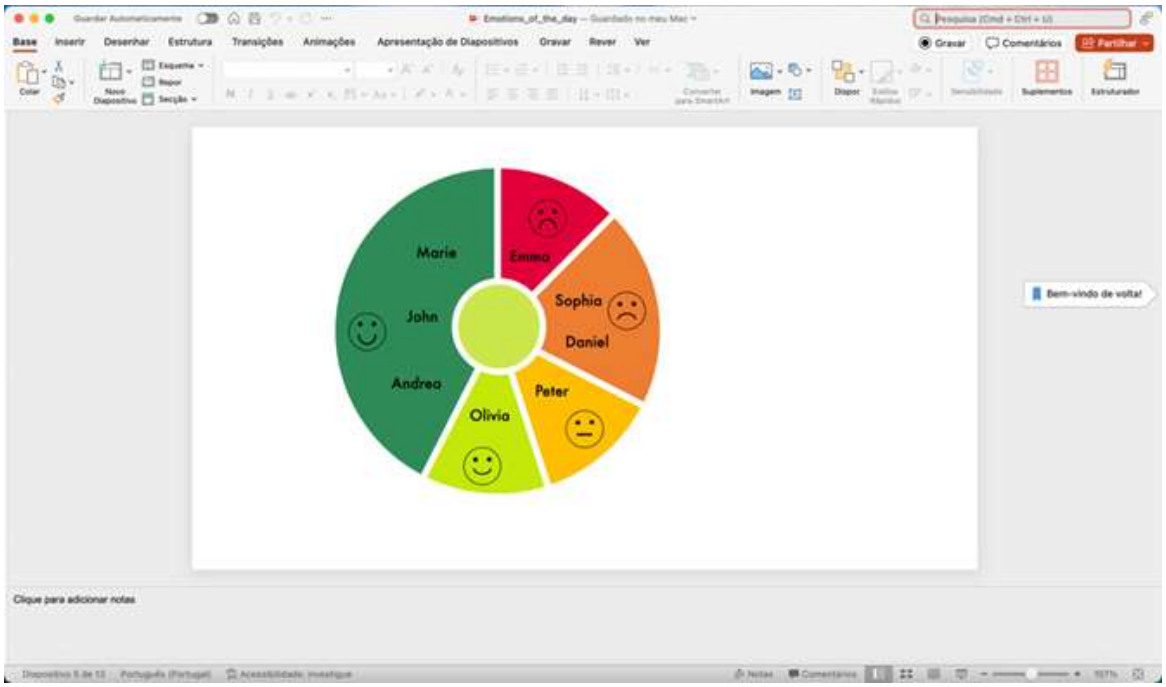

Figure 3: PowerPoint to generate the "Queijinho".

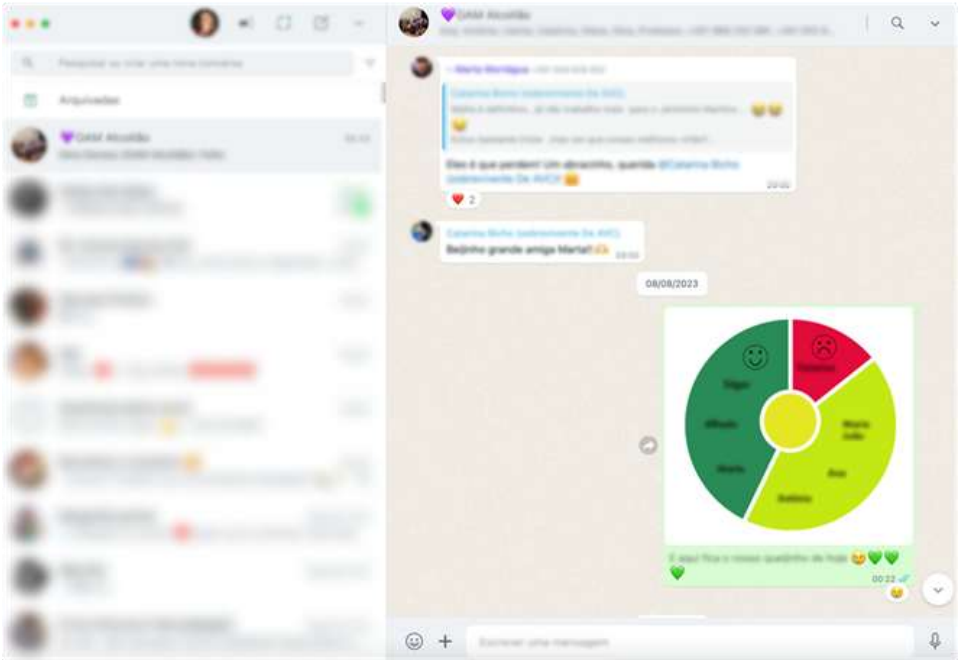

Figure 4: Whatsapp of the Portuguese community.

2.4. PROCEDURE

We conducted a participatory activity with the group in their monthly meeting . The objective was to identify the most effective method and design for visualizing and sharing emotional states within the group and to determine the appropriate technology.

For the activity, the first author began presenting a brief presentation on emotional curiosities, covering topics such as importance of hugging in social relationships, the benefits of laughter, the concept of "emotional contagion", and how chocolate can promote happiness. Also, she introduced the project, emphasizing how we intended to involve the group in this experience, making them an integral part of our research.

During the activity, we discussed potential technologies for emotional sharing and presented four graphic designs for emotional display. Moreover, it became clear that WhatsApp was the preferred communication tool among participants due to its familiarity and regular use, highlighting its relevance to our research.

Furthermore, in the participatory activity we explored the design of the visualization of emotional wellbeing that best fits them, considering four different concept models (Figure 5). After selecting the conceptual model, they liked the least, conceptual model B, we continued the activity by iterating on the others, presenting them with four different design models based on their three preferred conceptual models (Figure 6). These models, presented in figure 6, were created regarding the social interaction among the group and the exploration of the emotional wellbeing of everyone in the group. The designs presented were based on the 5-option SAM scale (Bradley eta al., (1994) and TLS. Ultimately, participants voted on their preferred design for "Queijinho".

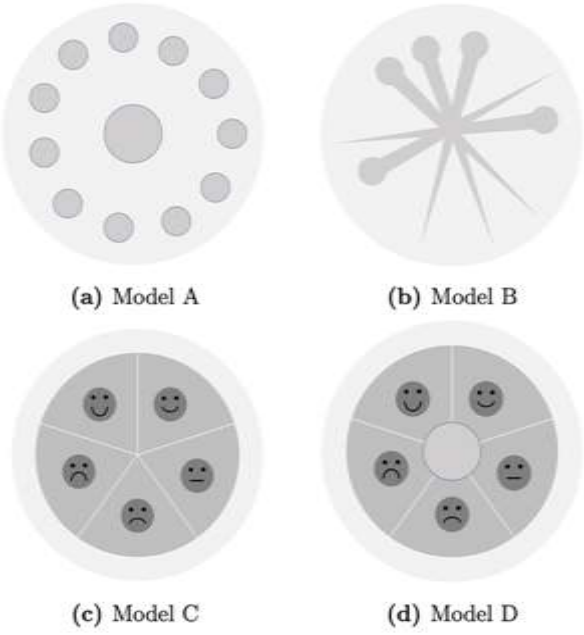

Figure 5: Conceptual models for displaying the emotional states of individuals and group.

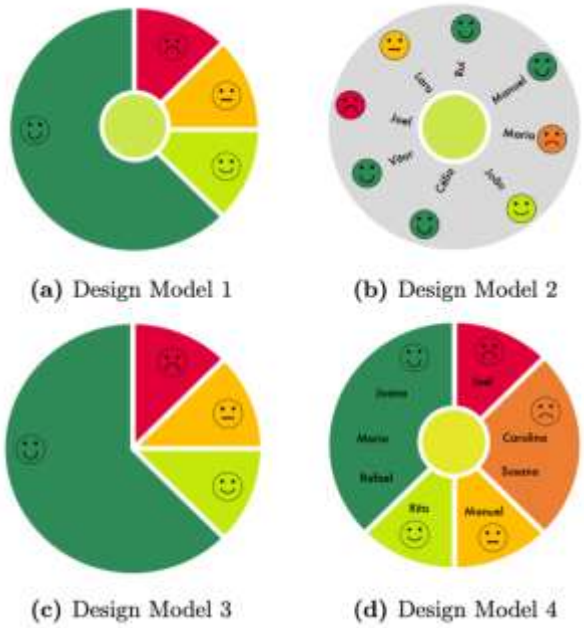

Figure 6: Design models of emotional wellbeing explored in the workshop and the first month of experience.

Following this, we started an exploratory social study with the group, where we tested the impact of daily awareness of individual and group emotional states. We intended to explore group dynamics, cooperation, peer communication, emotional and social wellbeing support among them. Furthermore, this presentation and the interaction between the first author and the group were crucial for them to feel more confident and comfortable. Also, they nicknamed the first author with “Terapeuta das Emoções” (in English, the “Therapist of Emotions”), and the emotional wellbeing visualization tool with the name “Queijinho”.

Then, we created a WhatsApp group and initiated a one-month experimental period. During this period, we tested the four emotional sharing designs presented during the participatory activity to foster interaction, communication, and emotional sharing. The aim was to evaluate the preferred design for ongoing use within the group and observe how group dynamics evolved online. We tested one different graphic design of "Queijinho" per week. Based on feedback from the initial activity, we began with Design Model 1, which was preferred. Throughout the first month of the experiment, an emotional wellbeing visualization was generated daily. Two messages were sent to the group each day: the first in the afternoon, reminding members to complete the Google Form questionnaire about their emotional state, and the second in the evening, sharing the day's emotional visualization. This routine was maintained consistently throughout the first month. At the end of the month, after testing all "Queijinho" designs, participants completed a questionnaire to provide feedback on the designs and their experience in the group.

After the first month of experience, participants selected Design Model 4 as their favorite. Subsequently, we continued to gather daily emotional state sharing this preferred design of "Queijinho" (Figure 2). Moreover, we encouraged communication through prompts such as, “How are you today?”, "How has been your weekend?" or "You have been quiet—what is going on?".

2.5. DATA ANALYSIS

We aimed to evaluate which design the participants preferred for ongoing emotional sharing within the group. We also aimed to determine whether the design chosen in the participatory activity remained their favorite after an experimental month of using the four proposed designs. Additionally, we sought to understand the group's dynamics on an online communication platform.

To achieve these objectives, we focused on three key areas of analysis:

• **Participatory Activity:** We engaged the group in discussing the importance of emotional sharing and the potential of using technology for this purpose. Four different design approaches were presented, and group members were asked to choose their preferred design and explain their reasoning. This allowed us to identify the most favored design and understand the justifications behind their choices.

• **Message Analysis**: During the first month of the experiment, we analyzed the messages exchanged within the group and the flow of responses related to each person's emotional state. We examined the average daily participation in emotional sharing (responses to the "Queijinho"). This analysis was based on the messages from the first experimental month, where we tracked the average number of messages each week and the daily response rate to the “Queijinho”.

• **Design Preference:** Finally, we assessed the group members' preferences regarding the "Queijinho" design after the first month of experimentation. At the end of this period, participants completed a questionnaire to indicate if their initial design choice remained their favorite and to provide feedback on creating the WhatsApp group. We asked if they enjoyed the group setup and whether they wished to keep all current members in order to keep them involved in the task and promote a sense of autonomy as suggested by Soares, (2024). The questionnaire also gathered opinions on the most and least liked designs and justifications.

After selecting their preferred visualization (Design Model 4 in figure 6) and justified their choice, the study progressed for one more month, where Design Model 4 was used for "Queijinho's" emotional sharing design within the group.

3. FINDINGS

This section discusses the design models presented in figure 6. For ease of reference, each model will be referred to by its name as indicated in the figure legend (e.g., Design Model X) throughout this section. In addition, to preserve the group members' anonymity, we will refer to them throughout this section by the nomenclature M followed by a number, as shown in Table 1 in the participant's section.

3.1. PARTICIPATORY ACTIVITY

At the beginning of our study, we conducted a participatory activity in which we asked the members of to choose the design of the emotional chart they considered most suitable for the group, considering the four Design Models represented in figure 6. The members unanimously selected Design Model 1 as their preferred. The main reasons for this preference were that it was a chart easy to understand, had the appearance of a pie chart, included a central circle to indicate the emotional state of the group (representing the combination of each member's emotional states), and showed that there were members in a certain emotional state without identifying them individually. This last reason was particularly significant, as it allowed participants to understand the emotional states present in the group while maintaining the anonymity of those individuals.

The choice of this Design Model enabled a clear sense of the group's overall emotional state. Because it did not reveal individual identities, it encouraged more honest responses, ensuring that everyone could participate, even those who were more reserved or preferred to keep their emotional state private.

The main difference between Design Model 1 and Design Model 4 was the loss of anonymity, which led to its immediate dismissal. The group's commitment to maintaining individual privacy was evident in this decision. A similar issue arose with Design Model 2. Although it provided more information and allowed the group to see how many people were in a particular emotional state, it also revealed the names of the individuals, compromising anonymity and leading to its rejection.

Between Designs 1 and 3, which shared significant similarities, the group unanimously rejected Design Model 3 because of missing information about the group's emotional state. This collective decision underscored the group's commitment to a design that fostered a sense of belonging and unity, encouraging mutual support among group members and aiding them in collectively striving for more positive emotional states.

Thus, we began our experimental month with four "Queijinho" designs. Each design presented in this activity was tested over a month, with one design tested per week. Since Design Model 1 was the clear favorite, we started our study with the "Queijinho" design. We tested the other designs in the following weeks according to their numbering. During this activity, the group, due to the chart's circular and divided appearance, named this emotional exposure chart "Queijinho".

3.2. FIRST MONTH OF EMOTIONAL SHARING EXPERIMENT

During the experimental month, the group members exchanged a few messages on WhatsApp group, expressing their opinions on the different "Queijinhos" designs. In the first week, we started with Design Model 1, which was well-received and the favorite in the activity. However, a curious phenomenon occurred. Some group members (M3 and M6) wanted to know who was in the emotional states represented in the "Queijinho". M6 asked, "Curiosity, who is in each part of the 'Queijinho'?". This later showed that designs that identify people are more interesting to the group from the point of view of allowing group members to give each other more personalized and targeted support. This way, after a week, we moved on to Design Model 2, which identified the individuals and the emotional states they reported. This design brought about a small interaction change when the "Queijinho" was published. The support and concern for the person's emotional wellbeing were given directly to those in question. At the end of the week of Design Model 2, we moved on to Design Model 3, undoubtedly the least liked design because it went from a design that identified the people and their emotional states, as well as the emotional state of the group, to a design that was just a simple pie chart that

showed slices of the emotional states (depending only on the number of people who selected a given emotional state). For this reason, several members (M3, M5, M7 and M10) said they preferred Design Model 2 because it identified people by their emotional state. M3 said, “I vote for option 2!” and M5 reinforced, "I agree with M3, and I also prefer option 2". M10 also agreed with M3 and M5. M7 went even further, saying, "You can skip the third one for me too. It conveys the least information of the three we have tried so far. Its resemblance to a simple pie chart does not help either. Especially when the data is 50/50.". So, at the justified request of the members, we only did two days of Design Model 3 and moved on to Design Model 4, the current design. This design has been very well received, with the messages of support, once again, being more targeted at the people identified in "Queijinho". Some group members, such as M6, even justified their emotional state immediately after "Queijinho" was published. As soon as the first "Queijinho" with Design 4 was published, M3 said, “I really like this one! Absolutely!”. M5 jokingly said, "Out with (Design Model) 3! Buuuuuuu". Moreover, we stayed with Design Model 4 of the "Queijinho" until the end of the experimental month.

3.3. AFTER THE FIRST MONTH OF EMOTIONAL SHARING EXPERIMENT

After this first month of the WhatsApp group and the emotional sharing with the different designs, we asked the group members to answer a questionnaire. We asked them to choose their preferred visualization option from four alternatives they had experienced in the first month within the WhatsApp group. The reasons for their preferences provide insight into what features they value most in these visualizations.

When asked about their favorite "Queijinho" Design Model, most participants pointed to Design Model 4. Out of 10 participants, 5 chose Design Model 4 (50\%), 3 chose Design Model 1 (30\%), and 2 chose Design Model 2 (20\%).

Participants indicated that Design Model 4 shows clarity and comprehensiveness, suggesting that these participants value visualizations that are easy to understand and provide a complete picture where they can identify who is associated with each emotional state (M1, M6 and M10). Other participants (M5, M7 and M10) found this option appealing because it offered a personalized and holistic view of the group's emotional state, which aligns with the desire for a tailored and inclusive representation of the group's dynamics.

Design Model 1 was selected by one participant who found it resonant, particularly when experiencing negative emotions (M4). This individual's preference suggests that Design Model 1 might offer a more empathetic visualization that helps users feel understood and connected even during challenging times without losing anonymity (M4, M8 and M9).

Design Model 2 was also popular among the participants. Those who favored this option did so because they found it more "tidy" (M2), implying that the visualization was neatly organized. This might suggest that clarity and a structured presentation are important to these users. Another participant described this option as "more specific" (M3), indicating a preference for detailed and focused information, likely because it provided specific insights that were more meaningful.

Design Model 3 was not the favorite for any participant.

Overall, the analysis of the justifications reveals that the visualizations' clarity, completeness, organization, specificity, and personal resonance are key factors that influence user preferences. Users appreciate visualizations that present data effectively, cater to their emotional needs, and provide a sense of connection and understanding within the group.

When asked which "Queijinho" Design Model they liked the least, participants pointed to Design Model 3. Out of 10 participants, 6 chose Design Model 3 (60\%), 3 chose Design Model 2 (30\%), and just 1 chose Design Model 1 (10\%).

Participants who selected Design Model 3 as their least preferred visualization cited several reasons, primarily focusing on its lack of completeness and specificity. They described it as "less complete" (M1) and "less specific" (M2 and M3), indicating that this option did not provide the detailed or comprehensive information they valued. Additionally, some respondents criticized it for not being personalized, noting that it "is not personalized, nor does it represent the group"

(M5), which suggests that they prefer visualizations that offer a tailored view reflecting the group's dynamics. The absence of names and a general lack of informativeness were also highlighted (M7), making it "the least informative of all" (M6).

Some participants chose Design Model 2 as their least favorite due to its perceived emotional distance. M4 mentioned that it "Feels like we are not as close together!" implying that the visualization failed to create a sense of connection. Others found this option to be of moderate appeal, referring to it as "reasonable" (M8), but another indicated it had "less impact" (M9), suggesting that it did not resonate strongly with them emotionally.

Regarding Design Model 1, a single participant selected it as their least preferred option, justifying it with "Because I had to choose one!" (M10). This indicates that this option was not particularly disliked but that the respondent felt compelled to select it without strong negative feelings toward it.

Overall, the analysis of the justifications reveals that participants' preferences for the least liked visualizations were influenced by factors like completeness, specificity, personalization, emotional connection, and visual appeal. Design Model 3 was the one they liked the least because it showed less information, maintained anonymity, and did not consider the group's emotional state.

All group members unanimously answered "Yes" to the question about whether they liked creating the WhatsApp group. The justifications indicate that the group was highly valued as a space for sharing and mutual support, where participants could exchange experiences and offer help to one another. Many appreciated the convenience and connection the group facilitated, with several noting the benefits of daily interaction and feeling more connected with other members. The ease of use and accessibility of the WhatsApp platform also contributed to the positive experience, making it simple for participants to stay in touch. Additionally, the group provided emotional and social benefits, offering a place for members to share their feelings and maintain social ties, which was especially appreciated by those who might otherwise feel isolated. Overall, the WhatsApp group was seen as a valuable and effective tool for fostering community and support within the group. This reinforces the idea that moving from a face-to-face care community to a hybrid care community has brought many benefits to the whole group. While most participants were satisfied with the WhatsApp group, some had concerns about time management, group interaction, and the need for additional caregiver-focused activities. There were also suggestions for enhancing the group by incorporating reminders of each member's history and possibly more engaging content.

Furthermore, most participants (9 out of 10) indicated that they liked having the group on the WhatsApp platform, while one participant expressed indifference. The justifications provided by those who preferred the WhatsApp platform highlight its role in unifying the group. Participants appreciated that WhatsApp group "unifies people", serving as a central platform where members can unite and foster a sense of community. Additionally, the ease of sharing information and experiences was a significant factor, with participants noting that the platform allowed them to "share everything" effortlessly. The accessibility and convenience of WhatsApp were also valued, as it made staying connected with the group simple and effective. No justification was provided for the participant who expressed indifference. The analysis reveals that most participants appreciate the WhatsApp group's ability to bring people together, facilitate easy communication, and provide a convenient way to stay engaged with the group's activities.

Regarding the question, "Do you think this WhatsApp group can help you emotionally and motivate you as an online help group?" most participants (9 out of 10) answered "Yes". The justifications provided by those who responded affirmatively emphasized the group's sense of friendship and solidarity. Participants expressed that they feel the warmth of these connections, which creates a supportive and encouraging environment, positively impacting their emotional wellbeing. However, one participant responded "No" to the question, explaining that her experience differed due to personal reasons. She mentioned having a mental illness and feeling that the group does not provide the specific support she needs. This response suggests that while the group is beneficial for many, it may not meet some specific conditions of individuals dealing with more complex mental health challenges, indicating that additional or alternative forms of support may be necessary for some members.

All participants expressed a unanimous preference for WhatsApp group to include not only stroke survivors but also caregivers, therapists, and friends who are part of the community. The justifications for this preference emphasized the value of having diverse perspectives and support within the group. Participants appreciated the comprehensive support system that arises from including these different roles, noting that it enriches the group dynamic and fosters a more supportive environment. Even those with limited participation felt that including caregivers, family, health professionals, and friends was beneficial, contributing to a stronger sense of community and mutual aid. This preference reflects the participants' desire for a holistic approach to the group composition, where the involvement of various individuals enhances the overall experience and effectiveness of support from the group.

Finally, all participants liked to receive reminder messages in the WhatsApp group to answer the emotional state questionnaire and view the results at the end of the day. They highlighted the importance and benefits of these reminders. Many participants saw the reminders as necessary, helping them stay on track and consistently respond to the questionnaire. They also noted that these prompts were crucial in guiding their progress, keeping them engaged with the process and aware of their emotional journey. Additionally, participants appreciated the end-of-day visualization of the results, which provided a clear overview of the collective emotional state. This feature was valued for its role in self-reflection and enhancing group awareness.

To complete the analysis of the first month's experience with "Queijinho" we examined the daily response frequency. The data showed that the average daily number of responses, of the first month of experience, was approximately 8.07 participants (SD = 1.21; Minimum = 6; Maximum = 10). Given the group consisted of 14 members, these results suggest that most participants consistently engaged with "Queijinho", with an average of 8 members responding each day. The standard deviation (SD = 1.21) indicates a relatively stable response rate, typically fluctuating about one participant per day. This reflects a strong level of participation, with more than half of the group contributing regularly, indicating good initial adoption of the tool. Additionally, we compared the response frequency between the first and second months. In the second month, the average daily responses remained at approximately 8.07 participants (SD = 1.59; Minimum = 5; Maximum = 10). These findings suggest that engagement levels remained steady between the first and second months, with no significant drop in participation, maintaining a consistent level of emotional sharing.

4. DISCUSSION

Creating a WhatsApp group and the emotional sharing reinforced the sense of community and belonging, which grew as the group opened up. What began as casual discussions about daily activities turned into intimate conversations like those shared between close friends or family members. This openness nurtured deeper relationships within the group, creating bonds.

Group members became increasingly invested in each other's wellbeing, offering authentic encouragement, support, and feedback. A community that once met only once a month for structured activities developed into a hybrid care community. This community now connects daily via a WhatsApp group, where members share their feelings and emotional states not out of obligation but from a genuine desire to maintain these connections. As M9 observed, "This group has existed for many years, but only since you [first author] joined did we truly feel like a family.". The shift to daily interactions, supported by the emotional sharing on WhatsApp and the "Queijinho" tool, has brought the members closer together. The technology effectively bridged physical distances, allowing real-time support and sharing of day-to-day moments.

The comfort that members feel in sharing their emotional wellbeing is evident in the active and consistent participation in the "Queijinho" activity. The use of "Queijinho's" Design Model 4 provided participants with greater awareness of their own, their peers, and the group's emotional states, facilitating personalized interaction. This dynamic reflects a balance between the comfort of sharing and the need for personal connection, fostering a sense of safety and trust within the community. Most participants shared their emotional wellbeing regularly and comfortably, although a few showed some reservations about fully disclosing their emotions.

The awareness of both individual and collective emotional wellbeing had a significant impact. It fostered self-reflection, as seen in participants' growing ability to evaluate and express their daily emotional states. Additionally, the emotional expression facilitated through "Queijinho" led to heightened empathy and concern for others. Group members routinely checked on peers who expressed negative emotions, demonstrating an increasing attunement to each other's emotional needs. This process of mutual support reinforced the sense of unity within the group, encouraging deeper reflection on personal and shared emotional experiences.

Social media platforms, especially WhatsApp, played a crucial role in enabling emotional and personal data sharing within the care community. The platform's ease of communication, real-time sharing capabilities, and the closeness it fosters contributed to members' willingness to disclose their emotional states. However, factors such as the need for privacy, emotional availability, and concern about how one's emotional state might affect others sometimes influenced the extent to which participants were willing to share. Overall, most participants appreciated WhatsApp's familiar interface, which enabled continuous connection and support. It allowed members to share their experiences and emotions in real-time, fostering stronger relationships and encouraging ongoing communication and emotional sharing-dynamics that were difficult to achieve when interactions were limited to monthly, face-to-face meetings.

4.1. DESIGN ON SOCIAL AWARENESS AFTER A STROKE IN A CARE COMMUNITY

This study examines how integrating an emotional wellbeing visualization tool within a social media platform like WhatsApp can transform a traditional face-to-face support group into a hybrid care community. The findings highlight the dynamics of emotional sharing, community engagement, and the role of technology in fostering connections, particularly among stroke survivors and their care networks.

Our research underscores the significance of digital technologies in promoting emotional wellbeing and mutual support within care communities. Previous studies, such as Barker et al.'s (Barker et al., (2016) development of an interactive mental health tool and Rajcic and McCormack's (Rajcic et al., (2023) exploration of AI in domestic settings, align with our work in using technology to enhance emotional awareness and communication. Similar to these studies, our use of the "Queijinho" tool has facilitated the creation of a shared emotional language within the community, which is vital for fostering deeper connections and ongoing support.

However, this study offers new insights specific to stroke survivors and their care networks. Unlike previous research, which often focuses on mental health or broader community engagement, our study addresses the unique challenges of transitioning from face-to-face support to a hybrid care model. The "Queijinho" tool enabled real-time emotional sharing and significantly changed the community's interaction patterns, fostering more frequent and meaningful exchanges. This transition allowed members to stay connected daily rather than only during monthly meetings, enhancing the overall sense of community.

What sets our study apart is the integration of WhatsApp, not merely as a communication platform but as a tool for real-time emotional sharing and reflection. The "Queijinho" tool transformed WhatsApp from a simple messaging app into a dynamic platform for continuous emotional interaction. Sharing daily emotional states within WhatsApp encouraged regular participation and fostered emotional awareness and transparency, which are critical for the wellbeing of stroke survivors and their caregivers.

The researcher's role in the community was another key factor in the study's success. An initial presentation helped build trust and encouraged participation, setting a positive tone. The first author's active engagement and consistent interaction with the community, contributed to a sense of inclusion and continuity. This involvement allowed the researcher to become a peer within the group, which likely contributed to the high engagement levels and enhanced the study's authenticity.

A vital component of the study was the co-design process, where participants were actively involved in selecting the design of the emotional sharing tool. This participatory approach empowered participants and led to a more effective

and user-friendly outcome, underscoring the importance of involving users in the development process to ensure solutions meet their needs.

The study also highlighted the importance of mutual awareness in promoting emotional wellbeing. Participants preferred a design that allowed them to see who was experiencing specific emotional states, fostering empathy and solidarity within the group. This transparency encouraged openness and reduced the stigma around expressing vulnerability, essential for building trust in care communities. WhatsApp's ease of use made it an effective platform for maintaining daily connections and emotional sharing. It facilitated the development of a shared emotional language, strengthening the group dynamic and promoting continuous engagement.

In summary, this study focuses on the daily lives of stroke survivors and their care networks, creating a space where emotional wellbeing is consistently nurtured. By leveraging WhatsApp and the "Queijinho" tool, the study demonstrates how digital platforms can enhance emotional communication and foster a sense of community within hybrid care models.

5. CONCLUSION

This study highlights the transformative potential of digital tools in enhancing emotional wellbeing within care communities, particularly for stroke survivors and their support networks. By integrating an emotional sharing visualization tool - "Queijinho" - into a widely accessible platform like WhatsApp, we successfully transitioned a traditional face-to-face group into a hybrid care community. The daily sharing of emotional states through "Queijinho" facilitated real-time interaction, deeper emotional engagement, and stronger bonds among members. These connections were fostered through the sharing of emotions and a co-design process that empowered participants to tailor the tool to their specific needs, further enhancing user experience and emotional awareness.

The findings underscore the importance of mutual awareness in promoting emotional support, empathy, and transparency within care communities. By providing a platform for regular, meaningful interaction, we observed that the group evolved from sporadic monthly meetings to continuous, dynamic support through digital means. This highlights digital technologies' significant role in creating sustained emotional engagement and fostering a sense of belonging, particularly in hybrid care models where physical presence may be limited.

While the study achieved its goals of enhancing emotional wellbeing and fostering a stronger community, the findings suggest that individual preferences for privacy and emotional openness must be carefully balanced in designing such tools. Moreover, the success of the "Queijinho" tool and the WhatsApp platform illustrates the potential for scalability in similar care networks, providing a framework for future studies to explore how other communities could benefit from digital emotional sharing tools.

In conclusion, our research contributes valuable insights into the evolving role of technology in care communities, particularly in supporting stroke survivors' emotional and social wellbeing. As care models shift towards hybrid formats, tools like "Queijinho" present a promising avenue for enhancing emotional communication, fostering mutual support, and sustaining engagement in meaningful, life-changing ways.

6. STRENGTHS AND LIMITATIONS

This study offers valuable insights into the potential of digital technologies to enhance emotional sharing and support within care communities, but it has limitations. The research was conducted with a specific and small sample group of stroke survivors and their care networks, limiting its generalizability to other communities or health conditions. Additionally, while many participants were engaged, some were hesitant to share their emotions, suggesting a need for improved privacy features and customizable sharing options. Future work should expand the study to include diverse communities and explore strategies to increase participants’ comfort.

Future work should explore several key directions. Longitudinal studies are needed to assess the long-term effects of hybrid care models on group cohesion and emotional wellbeing. Expanding the adaptability of the "Queijinho" prototype to different care networks and health conditions would increase its generalizability.

CONFLICT OF INTEREST STATEMENT

The authors report no conflicts of interest.

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ETHICAL APPROVAL STATEMENT

The study was approved by the Ethics Committee of Instituto Superior Técnico, University of Lisbon (Ref. n.o 2/2024 (CE-IST)).

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