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A New Method to Bridge New Materialism and Emotional Mapping: Spatio-Emotional Experiences in Disaster-Affected Brazilian Favelas

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Abstract

Within the field of emotional mapping, and mapping more broadly, nonhuman things are often understood as mere instruments - they have utility but not agency to shape meaning-making. In this paper we experiment with a new method that aims to challenge the dualism between human and non-human things by bridging new materialism and participatory emotional mapping. We experimented with this “new materialist methodology” during a one-day workshop to explore residents’ spatio-emotional experiences in a disaster-affected favela in Rio de Janeiro, Brazil. Reflecting on this one-day workshop, we argue that materials with diverse colors, textures, shapes, densities, weights, and smells are key collaborators in emotional mapping. Materials have agency to invoke and evoke diverse emotions with past, present, and future temporalities, and which fall within and beyond the positive-negative emotion binary. Materials can facilitate conviviality and discussion amongst mapping participants, which enables participants to speak about their emotional-spatial experiences with more nuance and complexity.

Keywords

emotional mapping, participatory mapping, disaster risk, new materialism, Brazil, emotions

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A New Method to Bridge New Materialism and Emotional Mapping: Spatio-Emotional Experiences in Disaster-Affected Brazilian Favelas

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Within the field of emotional mapping, and mapping more broadly, nonhuman things are often understood as mere instruments - they have utility but not agency to shape meaning-making. In this paper we experiment with a new method that aims to challenge the dualism between human and non-human things by bridging new materialism and participatory emotional mapping. We experimented with this “new materialist methodology” during a one-day workshop to explore residents’ spatio-emotional experiences in a disaster-affected favela in Rio de Janeiro, Brazil. Reflecting on this one-day workshop, we argue that materials with diverse colors, textures, shapes, densities, weights, and smells are key collaborators in emotional mapping. Materials have agency to invoke and evoke diverse emotions with past, present, and future temporalities, and which fall within and beyond the positive-negative emotion binary. Materials can facilitate conviviality and discussion amongst mapping participants, which enables participants to speak about their emotional-spatial experiences with more nuance and complexity.

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Introduction

Emotions represent a central human experience and play a key role in decision making (Camara et al., 2021). Psychologists have explored how people feel in locations, whereas geographers have tended to investigate emotions over space and time (Caquard & Griffin, 2019). Yet, with few exceptions (e.g., de Oliveira & Painho, 2015; MacKerron & Mourato, 2020; Nold, 2018; Pánek, 2019), the presentation of emotions in maps and spatial data is in a nascent stage despite emotions being one of the key ways that humans interact with and respond to space (Caquard & Griffin, 2019). Mapping emotions also has policy implications as it can enhance our understanding of how populations perceive, experience, and respond to space, which can improve planning policies and quality of life. For example, mapping emotions can identify how infrastructures generate feelings like anxiety, impatience, and disturbance (noise), which can decrease quality of life (Camara et al., 2021).

Against this background, our article proposes a novel methodology that brings new materialism and participatory emotional mapping into conversation with one another. We draw on new materialism’s notion that matter has agency (Gamble et al 2019). That the material world, whether cotton wool, pieces of yellow polystyrene or pink beads (which we use in our

experimental method to map emotions) have agency to prompt us to remember experiences, have emotional, sensory, intellectual, and memory-based responses, and to craft practices that intend to make social meaning (Hickey-Moody, 2020). We build on Hickey-Moody's (2020) work by exploring to what extent materials have agency to invoke and evoke emotions and consider how this improves spatio-emotional data. Our approach innovates emotional mapping and mapping more broadly because we challenge the idea that nonhuman things are mere instruments that have utility but not force to shape meaning-making.

Our methodology is inspired by the work of Terceira Margem - a Rio de Janeiro based architecture studio, which author, Natalia Cidade collaborated extensively and co-directed for three years. Terceira Margem innovates traditional participatory methods by inviting clients to interact with different materials such as stones, seeds, cotton, bricks, and sand to facilitate clients to articulate and identify how they may experience a particular space and/or their aspirations for designing space. For example, touching a piece of material can help people to consider how different materials may be experienced. Or a piece of marble, that feels hard and cool to the touch, can be associated with spaces that are less intimate, with a more detached feeling for some people, while marble can be associated with austere and sterile places such as doctor's offices and bathrooms. On the other hand, wood can feel warm and highly textured, bringing feelings of relaxation, and of being connected to nature, and which is associated with artisanal crafts, that are strong, yet flexible. Although the experiences with materials are subjective, sharing individual perceptions in group activities often sheds light on common feelings about them¹.

We experimented with the method during a one day workshop in a Rio de Janeiro favela with a history of floods and landslides because mapping emotions can help to understand how people experienced former disasters, their emotional responses to potential future disasters and how emotional attachment to space influences people to stay in environmentally risky areas (Rohland et al., 2014). In this sense, emotional mapping can provide a more holistic understanding of human experiences of disasters, which can potentially support collaborative and locally appropriate disaster risk management planning and policies (Brand & Gaffikin, 2007). It is important to highlight that favela is the name given in Brazil to informal settlements, often used interchangeably with slums. Favelas are segregated from the rest of the city, with a clear distinction between the informality of their settlements in contrast to other spaces of the cities. They are spaces where the greatest environmental risks for marginalized and socio-economically marginalized people are concentrated (Cunha et al., 2015). The development of favelas is not subject to traditional urban planning practices. This in turn leads to a bottom-up non-linear type of development, with high population density, in which inhabitants are constantly trying to improve their living conditions (e.g., adding a new room or a terrace to their houses) with the resources they have at their disposal, but often without official permits. These settlements often lack some basic services or have a poor quality of these services. In the case of Brazil in general, and of Rio de Janeiro in particular, the location of favelas within the metropolitan areas is diverse. Some are located on the outskirts of the city, while others are intertwined in the urban cores. Their placement in central areas is usually linked to urban grounds with complex building conditions, such as steep hills. This, alongside their informality of their development, raises their vulnerability to floods and landslides.

We analyzed the discussions and social interactions during the workshop, and the emotional maps to draw conclusions on both the conceptual and material levels. We found that the materials bolstered residents' ability to identify and articulate their spatialized emotional experiences, and to communicate their vision for their neighborhood. Resonating with Powell

¹ For more information about Terceira Margem see <http://www.3margem.com.br/praticas-oficinas>

(2010), more than mere illustration, the materials invoked emotions which facilitated the spatial mapping of emotions, contributing to an embodied, sensory experience of space as lived.

Emotional Mapping

Emotional mapping is premised upon the interrelation between emotions, spaces and places, and that people have emotional responses to locations (Mody et al., 2009). Emotional maps “allow users to devise and customize their own emotional landscape, to choose what kinds of thoughts and experiences, feelings and passions, to map” (Perkins, 2009, p. 130). To map emotions, one must be able to identify and characterize an emotion and spatially locate the emotion. However, emotions and how they are expressed are not universal. Certain facial expressions, body gestures or even emojis may indicate different emotions across different cultures (Pavlenko, 2014). Measuring the spatial location of emotions is not without its problems either and can confront researchers with a choice between more data on location or more data on the emotion. Some research has used georeferencing to give the specific coordinates of where a person experiences an emotion (Resch et al., 2015). Whereas other research prioritizes gathering contextually rich information about people’s emotions over the specific location of the emotional experience (Caquard & Griffin, 2019).

Emotional mapping has principally employed tools such as geo-tracking devices, heart monitors and/or crowdsourcing data from social media (MacKerron & Mourato, 2020). Nold’s (2009) bio-mapping project asked participants to wander around a neighborhood, mentally noting feelings and reactions to their surroundings and a polygraph recorded heart rates and sweat reactions in locations. After each walk, participants explained their physiological reactions in different locations to contextualize the bodily responses. The combination of quantitative and qualitative data allowed people to explain affect data or quantitative measurements of emotions. As Barrett and Russell (2014) argue, emotion concepts such as sad, happy, or scared are needed to make sense of physiological experiences. Researchers have “scraped” social media platforms for this data, including text-based articulations of emotions which are then georeferenced and mapped (Hauthal et al., 2019). Data on the spatial location of emotions has also been gathered on the internet via voluntary crowdsourcing (Klettner et al., 2013). However, social media is often used in a highly constructed and performative way, and not to disclose people’s inner emotional states (Longhurst, 2016).

Emotional mapping has also harnessed tools that are more rudimentary, including “sketch maps,” where participants populate a georeferenced base map with information about their emotions in a process reflecting participatory mapping (Chamber 1994, 2012, D’Antona et al., 2008). Camara et al. (2021) asked participants to use emojis on a paper base map to indicate their emotional experiences of urban mobility in Brazil. Other examples include Pánek (2019), who conducted participatory workshops to map citizens’ emotions in cities in the Czech Republic to support urban planning processes. In one workshop people shared six colored crayons to populate a communal georeferenced map. However, it was difficult to digitize the data and a small number of participants would end up dominating the mapping process – problems that are widely observed in participatory planning processes in other contexts (Cooke & Kothari, 2001). Non-digital approaches to emotional mapping described above, understood here as hands-on approaches, that make no use of digital tools during the mapping process and recur to artisanal map-making procedures, have a problematic characteristic. Their use of emojis and prescribing colors to certain emotions prior to workshops may prevent other emotions from emerging, which may undermine the emotional nuance of such maps and can reduce human emotions to only those pre-identified by the researcher(s).

We still know very little about how the materials used to map emotions shape the emotional mapping process and the spatio-emotional data that is collected. We consider this

gap from a new materialist perspective, where matter is not understood as inherently passive or devoid of meaning (Gamble et al., 2019). New materialism recognizes some form of agency in non-human actors. That matter can make cultural, lived, ephemeral issues visible, as it communicates through color, textures, densities, and smells. In the words of Jane Bennett (2010), matter is “vibrant.” Daniel Miller also argues that “Things do things to us, and not just the things we want them to do” (2010, p. 94). There is “a congealing of agency”- resulting from the “intra-action” of (human and non-human) things that shape the social world (Barad, 2003, p. 809). As such, new materialists displace the anthropomorphic notion of human exceptionalism and human sovereignty.

Texture and colour carry and re-perform histories and critically inform how memory operates and shape the registers people mobilize in constructing narratives (Bennett, 2010). Design studies demonstrate how shape, colour and texture have sensorial and intangible properties that evoke emotions and convey meanings to humans (Karana & Kestern, 2008). Okamoto et al. (2013) identified five dimensions of the “epicritical” touch that affect our tactile perceptions: hardness (hard, soft), temperature (hot, cold), friction properties (wet, dry, sticky, slippery), fine roughness (rough, smooth) and macro roughness (*uneven, relief*). Color can impact human behavior, well-being and learning, (Jalil et al., 2012) and atmospheric stimuli in stores, including color choices, have an effect on emotional reactions (Roschk et al., 2017). However, even though there is a growing literature on the topic of color and psychological functioning, the insights of this line of inquiry have focused on retailer-consumer environments, associated with marketing and environmental psychology (e.g., Plass et al., 2014). There remains minimal engagement with the potential agency of materials to influence participatory emotional mapping – or participatory mapping more generally.

Against this background, we bring new materialism and emotional mapping into conversation with each other by experimenting with a participatory method to spatially map human emotions using materials that have distinct colors, textures, smells, weight, and shapes. Our methodology seeks to explicitly mobilize the agency of matter and asks people to access the archive of their own experiences, emotions, and memories through mapping with materials. By asking people to materialize their emotions on a map using matter, our methodological experiment builds on what Hickey-Moody (2020) calls a “new materialist methodology.” A research method that embraces the agency of matter. Such an approach helps to understand emotional mapping as materially embedded in a network of human and non-human actors. This decenters the human subject, expanding emotional mapping beyond the frame of the human body and human identity, to the non-human world of matter.

The authors of the paper bring an interdisciplinary perspective to this work. Gemma Sou is a development geographer, originally from the UK. Her research focuses on the everyday geographies and politics of climate change, with a particular interest in the impacts of climate change on low-income families across Latin American and the Caribbean. Juliana Carvalho is Brazilian scholar of International Relations, with a particular research interest in sustainable urban planning initiatives and the role of participatory processes as tools for both civic engagement and local resilience building. Natalia Cidade is an architect and urbanist from Rio de Janeiro. Her research explores socio-spatial integration and the narratives of vulnerable populations living in urban areas of Brazil. Her work has also examined the local integration (and marginalization) of refugees in Rio. Gemma, Juliana, and Natalia met during a two-week summer school for early career researchers at the Brown International Advanced Research Institutions based at Brown University, USA. It was during their discussion at Brown that the ideas for this research project emerged. Later, Maria Eugenia Nico, also an architect and urbanist, from Argentina, joined the research team. She works for TECHO, a South-American Non-governmental organisation that uses participatory approaches to assist the development of vulnerable informal settlements across South America.

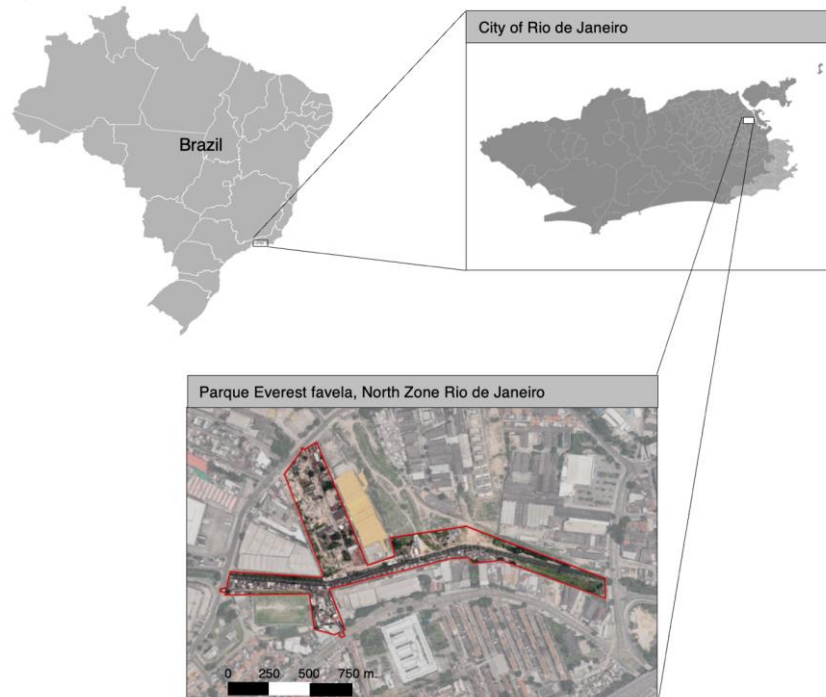
Case Study: Parque Everest, Rio de Janeiro

We chose as our case site the favela, Parque Everest located in the North Zone of Rio de Janeiro city, Brazil (see Image 1). Typical of Brazilian favelas and informal settlements across the world, Parque Everest was established through the settlement of low-income people who migrated from rural areas seeking opportunities to improve their lives and livelihoods in urban centers. When people began arriving at Parque Everest, the favelas were not legally and politically recognized by the state. Therefore, the state did not provide access to public services such as water, sanitation, and improvements to roads and transportation (IBASE, 2020). However, over time, the state has implemented public infrastructures in Parque Everest. Although the quality of these services remains poor, they have provided Parque Everest with de facto political and legal recognition by the state.

In the 1980s Parque Everest and surrounding favelas became formally recognized as part of the administrative responsibility of the Rio de Janeiro government, which has formalized the state's responsibility to provide services for residents. Most working residents are low paid and employed in the informal sector and only 36% of the residents completed elementary School (IBASE, 2020). Parque Everest is characterized by high density, precarious housing construction and the construction of houses on slopes over ditches. Sub-standard sanitation, potable water distribution, waste collection, and drainage systems increase the risk of floods and landslides.

Image 1

Parque Everest Situated within the Brazilian Context



Note. Source: Google 2022

We experimented with this method during a one-day workshop in May 2018 in the headquarters of our partner organization, Raízes em Movimento – a community-based organization that works on the social and economic development of Parque Everest and surrounding favelas (Cunha et al., 2015). We homed in on people's emotional experiences of a flood that occurred in February 2018 in Parque Everest. The workshop was attended by 11 residents. Of the participants, 10 were aged between 20 and 60, and one child was the daughter

of one of the participants. There were six females and five males, who self-identified their genders.

Methods

Emotional Mapping in Parque Everest

We do not extensively discuss the data that was unearthed about people's emotional relationship with space. Rather, we focus on the praxis of our experiment with methods to map emotions, including our critical reflections on mapping emotions individually rather than collectively and bringing emotional mapping and new materialism into conversation with one another via the inclusion of materials.

Small (30x42cm) georeferenced cork base maps of Parque Everest were distributed to individual workshop participants. These maps were vectorized versions of the satellite image of the favela and were composed of lines that outlined buildings and places of interest (e.g., a park). We kept the maps simple to ensure the research team did not impose their own perceptions of how space was used and to facilitate participants to populate the map with meaning from their subjective and lived experiences. The size of the base maps was large enough to ensure that points of reference e.g., streets, were clear and easily recognizable, but the maps were also small enough (and light in weight) for participants to comfortably handle them and populate them individually.

Image 2

Materials and Emotions Identified by Participants



Notes. Source: Authors' photographs. ALT text: There are a total of eleven transparent plastic pots in the photo, piled into three columns. They are placed on the top of a plastic table. In the background we can see a concrete wall, with worn-out graffiti. Each pot has a white sticker, with a word written by hand, in capital letters. The words assign a particular feeling to the materials inside. Reading the words, from top-to-bottom, left-to-right, we have unity, chaos, freedom, instability, hope, mourning, strength, fun, revolt, loneliness, comfort.

Next, participants were presented with eleven pots of different materials that the research team had chosen. The materials ranged from small shiny pink beads, soft bright yellow pieces of polystyrene, coarse pieces of black stones, green grated scented candles, pieces of broken red brick, small pieces of red foam, cotton, and strands of silver tinsel (see Image 2). We chose materials that were of diverse colors, textures, shapes, densities, weights and even smells. They were “fun to look at” and “lively” as one author commented.

As a group, and facilitated by two members of the research team, participants were invited to feel the textures of the materials, notice their color and smell, their temperature, weight, and density, and collectively discuss what emotions the materials evoked. Residents actively engaged with both the materials and with each other in the process of associating the materials with emotions. They made jokes about the feel and look of some materials. They moved the materials in playful ways – squeezing them, throwing them up and down, shaking them, rolling them in their fingers, and even biting them. It was a humorous process and helped to develop a sense of conviviality amongst the participating residents, according to both the participants feedback and workshop facilitators present for the activities.

After fifteen minutes, and with these sensed and tangible experiences, the group collectively discussed the eleven materials and identified each with a single emotion. It was striking how many different emotions were evoked by the materials, and which represented a broader and more complex array than basic emotions such as sadness, happiness, and fear. Eventually, the group identified unity, chaos, freedom, instability, hope, mourning, strength, fun, revolt, loneliness, comfort. These emotions do not sit neatly within the positive-negative binary, which previous research on emotional mapping has tended to work with. Several of the emotions, such as revolt, strength, and hope, are more ambivalent. They can signify positive sensations; yet they can also recognize how a person’s current situation is challenging. For example, one may be hopeful that their current situation will improve, or how strength and revolt is required because life is difficult.

Next, the residents studied and familiarized themselves with their individual base map and were asked to imagine walking through the neighborhood, passing by spaces and locations on the map. They were invited to focus on identifying the emotions they experience or associate with the different spaces represented on their map. During these moments there was limited chatter as people quietly contemplated personal experiences and associated emotions in their neighborhood. Many closed their eyes to enhance or bring themselves closer to their memories and sense of emotions (Foster and Webster 2001). Residents then used the eleven materials to spatially map their emotional experiences in the neighborhood. Each map was unique to the participant as they could use the materials in whatever way represented their individual spatio-emotional experience in Parque Everest, which contrasts to most emotional mapping methodologies where participants collectively map onto a large collective map. The choices of where people placed (and glued) the material highlighted a relationship between story, perception, and space. In this sense we were asking people to access and excavate their personal histories; however routine or mundane they may think they are.

Although participants mapped their emotions on an individual map, this was by no means a silent process. The distinct colors and textures of the materials made the maps very enjoyable to look at, with some participants describing them as “beautiful” (see Image 3). This encouraged residents to inquire, comment and admire one another’s maps. As such, the visually appealing maps that they produced, provoked the curiosity of participants, and acted as bridges to facilitate personal discussions. These interactions developed into conversations about the experiences that evoked the emotions that were mapped, and through these discussions, we observed how participants were prompted to recall greater details of their experiences in the favela. These were often intimate and highly personal retellings of their stories and perceptions of their neighborhood.

Image 3*Example of a "Beautiful" Emotion Map*

Notes. Source: Authors' photographs; ALT text: There is a brown cork base map, placed in the center of the photo, on top off a grey concrete floor. A diverse set of materials are on the top of the map. Small black stones make up the line of the river, with terracotta brick fragments contouring it on both sides. The river crosses the map from left to right, in a sinuous shape. In the top half of the map there are metallic silver bands symbolizing freedom. The bottom of the map is covered in green material, symbolizing hope. Small white, blue, and black materials, referring to unity, revolt, and strength respectively in all parts of the map.

Although many of the emotional experiences that people mapped were serious in nature, discussions remained somewhat light-hearted and cheerful. This was of course shaped by factors such as the participants' personalities and local socio-cultural norms. However, we propose that the uniquely colorful, diverse and "fun" materials also made the process playful, avoiding the workshop seeming "too serious." This enhanced the convivial atmosphere and interparticipant dialogue in the workshop. In this way, the materials' agency shaped the social interactions of research participants in ways that facilitated open and often candid personal discussions. This represents what Barad (2003) refers to as the "congealing of agency" (p. 822) – resulting from the "intra-action" of (human and non-human) things that shapes the social world. Ultimately, this enhanced the methodology to gather in-depth subjective data on people's emotional experiences in Parque Everest.

Our emotional mapping workshop was variously narrative, interactive, and intra-active, political, emotional, and imaginary. It was both affirmative and generative in its ability to unearth how people hope for the future of the neighborhood and city more broadly. For example, during one-on-one discussions participants reflected upon and recounted the history of past disasters in the neighborhood, especially those associated with flooding, violence, and crime. And with this they explained the histories behind their maps. However, some people mapped their future aspirations for risk within the neighborhood. For instance, the river in Parque Everest has flooded many times causing extensive damage. Therefore, we expected participants to associate the river with emotions such as "instability" or "chaos." Yet,

participants such as Felipe filled the river with materials symbolizing “hope” and “strength.” He explained, “I thought that one day the river could become a place of hope for the neighborhood. For better days. And the strength was based on the idea that the river would be transformed, be fortified [to prevent flooding].”

Image 4

Participants Populating Individual Maps with Materials



Notes. Source: Authors’ photographs; ALT text: This photo was taken from a top-down perspective, encompassing a total of eight participants and their respective individual maps, sitting down on the concrete floor of the local organization terrace, each person has their map in front of them. They are organized in a circle-like shape, with the material’s pots in the center, facilitating their sharing among participants. We can also see some scissors and a glue, that were used to adjust the materials and attached them to the base maps.

Felipe had mapped his aspirations for improving the neighborhood, mobilizing the map as a medium for perceiving and articulating ideas about future disasters. We propose that the temporal constructions of emotions facilitated this future-oriented discussion. That is, some of the emotions, such as fun, chaos and comfort were invoked by recalling past experiences (Mattley, 2002). Whereas an emotion like hope is both informed by past experiences, but also has a future-oriented temporality, whereby people consider future scenarios (Hallman, 2017). Through the entry point of future-oriented emotions, participants articulated their alternative and future visions of the favela. The inclusion of future-oriented emotions facilitates favela residents to express their capacity as imaginative and aspirational future-oriented agents, which challenges representations of favela populations as passive victims of risk and marginalization – a notion that implicitly circulates in research on disasters in the “global south” (Hallman, 2017).

Nevertheless, our methodology does not provide the precise geospatial locations of emotional experiences. Materials spilled across the georeferenced² streets, buildings, and other landmarks on the cork maps, making it difficult to record and aggregate data. Increasing the size of the cork maps might address this issue; however, previous research demonstrates how emotional mapping can mean a choice between more data on location or more data on the emotion. As such, our experimental method reflects Caquard and Griffin (2019), who placed emphasis on assembling contextually rich data about people's emotions over the specific georeferenced location of the emotional experience. We also recognize that some of the materials that we worked with may be difficult to access. Freely available or cheap materials such as leaves, pebbles, buttons, or dirt may be used; however, it is important that the materials have diverse shapes, colors, textures, and smells to invoke diverse emotions. Free and naturally available materials such as leaves, stones and flowers have been used in the participatory mapping (e.g., le Dé et al., 2020), yet the new materialist agency of these materials to shape this process has been minimally explored.

Conclusions

The mapping of emotions has received limited attention, despite emotions being one of the key ways that humans interact with space. In this article, we proposed and experimented with a method for collecting emotional data. Inspired by Jane Bennett's (2010) argument that matter is "vibrant," our experimental method embraced the agency of matter to spatially map emotions. Drawing on new materialism we demonstrated how matter, contexts, and people can co-create knowledges in processes of participatory mapping. Put differently, a new materialist perspective allowed us to think about the agency of matter in the participatory mapping process. This approach unpacks the dualism between the human and the non-human, the material and the immaterial, and in doing so shows us that the material world is not neutral and passive. This enabled our methodology to work from a dynamic notion of life in which human bodies, fibers, fabrics, and materials are inextricably entangled in meaning making (Smelik, 2018). Such a perspective permits an understanding of emotional mapping as materially co-produced through the interactions of human and nonhuman actors. Bringing new materialism into the practice of emotional mapping allowed us to understand how innocuous materials such as, white cotton wool to pink plastic beads, silver tinsel or yellow polystyrene have some form of agency to shape the mapping process.

Our experimental method suggests that the ways materials are used can change thinking and relationships between people in ways that facilitate more intimate and nuanced discussions about emotion and space. The sensorial and tangible properties of materials are embedded with meanings to humans (Van Kesteren, 2008). This enabled participants to evoke a wide array of memories and emotions, building on Cassidy (2012) As such, the materials used in the workshop facilitated people to identify an array of emotions that fall within and beyond the positive-negative emotion binary. This enabled participants to speak about their emotional-spatial experiences with more nuance and complexity. The emotions which were evoked by the materials also displayed past, present, and future temporalities. As such, participants were provoked to discuss their aspirational and imagined futures for their neighborhood, suggesting the transformative potential of our methodology.

² Georeferencing is an increasingly common procedure in mapping, increasingly facilitated by the development of Geographical Information Systems (GIS), in which the cartographical representation of a space and its internal coordination system is linked to the physical world using a geographic coordination system. The process allows for higher degrees of correspondence, making maps more precise and trustworthy, at least from a technical perspective. Hauthal et al. (2019) give a good example of how ephemeral features, in this case "tweets" can be associated with a particular point in space.

We also suggest that the materials worked to encourage interactions, dialogue and contributed to a sense of conviviality and relaxation across participants. However, we propose that the choice of materials is key to this process. Put differently, distinctly colored materials with diverse shapes and textures, enabled participants to create aesthetically beautiful maps that encouraged participants to inquire, share and talk about one another's maps and their experiences represented therein. Considering this, we propose the term "convivial materials" to signify materials that encourage interaction and dialogue between workshop participants, and which create a sense of playfulness in participatory workshops. We propose this is one of the key strengths of bringing materials with unique colors, textures, temperatures, and shapes into the participatory emotional mapping process. Relatedly, and inspired by Le Dé (2020), we propose that diverse and "convivial materials" such as those used in our workshop can be advantageous for facilitating child-centered workshops and policy.

Mapping emotions is important because it can augment our understanding of how people experience space. In Parque Everest it exposed the wide variety of emotions that people experience when navigating their neighborhood, the nuanced emotional ways that people perceive and respond to the risk of floods and landslides. The latter point is particularly insightful for disaster studies and policy where there is a tendency to label people "irrational" if they do not act to reduce or avoid risk (see Sou 2019). This has been labelled a "bounded rationality" whereby "behaviour is generally rational or logical but is limited by perception and prior knowledge" (Tobin & Montz, 1997, p. 5). Critics argue this is a reductive caricature of human behavior, which does not acknowledge the social, economic, political, and cultural factors that shape people's risk perceptions and behavior (Lupton & Tulloch, 2002). We agree, yet we also contend that emotions must be added to this list because they are key to understanding human experience and behavior in "risky" areas.

Ultimately, our aim here has been to bring emotional mapping together with new materialist methodologies to demonstrate how materials are employed in the process of emotional map making. Materials are collaborators, and the physical nature of their form is central to how meaning-making happens. The materials that are chosen for emotional mapping facilitate people to identify a diversity of emotions, remember experiences and engage in dialogue with other participants. To have emotional, sensory, intellectual, and memory-based responses that are enlightening for understanding how people emotionally experience space. We end by suggesting that data about how people emotionally experience space in disaster-affected contexts ought to be leveraged to facilitate more human-centred and sustainable disaster risk reduction programmes and urban planning policies. The mapping of emotions in areas that are at risk of natural hazards has received very limited inquiry and so our experimental method in emotional mapping represents modest first steps in this direction, and we call on other researchers to develop these ideas further.

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