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# Barriers and Facilitators to Participation when Involving Caregivers and Healthcare Workers in Co-design Workshops in Peruvian Low-resource Settings

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**Abstract.** Participatory Design (PD) approaches aim to engage various stakeholders to democratise the design process and influence the development of technologies. However, the use of PD approaches is challenging in low-resource settings. This paper presents the lessons learned from conducting future workshops with caregivers and healthcare workersas part of a project aiming to co-design health interventions to promote healthy nutrition in low-resource settings in Peru. Reflecting on these workshops, we present a

number of barriers and facilitators highlighting the physical, social and temporal factors that affect participation in low-resource settings. Tailoring and adapting design methods do help reducing the level of complexity and fostering engagement and participation in PD activities in low-resource settings.

# 1 Introduction

Participatory Design (PD) approaches aim to engage various stakeholders through cooperative activities as a way to democratise the design process and influence the development of technologies that will affect their everyday lives (Bødker et al., 2022; Kyng, 1991; Sanders and Stappers, 2008). However, challenges for participation exist, such as power differentials within participants, facilitators and other stakeholders that may hinder participants' engagement in co-design processes (Farr, 2018). These could be exacerbated by the participant's conditions, their level of technology readiness and their everyday environments when designing healthcare interventions (Aarhus et al., 2010). In low-resource settings, the situated power dynamics might not be explicitly recognised or known by researchers, developers, and facilitators before the workshops that could impact the level of participation (Del Gaudio et al., 2014; Winschiers-Theophilus et al., 2012). Furthermore, sociocultural factors such as gender norms, geography, community hierarchical structures, and social and political issues can affect participants' engagement during the design process and the design outcomes, especially in the Global South (Jiang et al., 2022; Hussain et al., 2012; Winschiers-Theophilus et al., 2010; Till et al., 2022).

This exploratory paper describes some of our experiences working with different community stakeholders, including different types of healthcare workers and caregivers of infant and young children (IYC) under 2 years old in a recent project that aimed to co-design community-based healthcare interventions to promote healthy IYC nutrition (Rousham et al., 2023). Our co-design process involved a series of co-design workshops including idea generation workshops, future workshops, storyboarding workshops and prototyping workshops (Ortega et al., 2024) in two low-resource settings in Peru (Rousham et al., 2023). In this paper, we reflect on the practicalities and lessons learned of the future workshops including the role of the physical (the venue, and visual materials), social (verbal encouragement, attitudes, safe spaces, roles of healthcare workers), and temporal (everyday time demands, constraints, and issues with punctuality) factors that affected workshop's participation. Although we considered these factors during the initial plan of the activities, they manifested in different ways highlighting the need for designers and researchers to consider them when co-designing health interventions with caregivers and healthcare workers in low-resource settings.

# 2 Related Work

Workshops are one of the traditional collaborative methods in PD to support participation where different actors converge to engage in cooperative design activities offering the space for mutual learning by sharing ideas, expertise and knowledge about current and future practices (Bødker et al., 2022; Hansen et al., 2019). Workshops have been used to support the understanding of complex work and knowledge processes (Ørngreen and Levinsen, 2017), to explore the co-design of games with intergenerational participants (Rice et al., 2012), or to facilitate play and engagement while supporting hospitalised children (Huerga et al., 2016), just to mention a few. Rosner et al. (2016) points out that design workshops may serve as a site of inquiry, a research instrument and a research account simultaneously.

Design workshops aim to foster users' participation and better understand users' goals, experiences, and emotions (Ciolfi et al., 2016). Jungk and Müllert (1987) proposed the future workshop to support ordinary people facing a common challenge to explore desirable futures and solve small and large-scale social problems (Suoranta and Teräs, 2023). Future workshops involve a preparatory phase (e.g., practical arrangements and deciding on topics) and three workshop phases: critique (of chosen topics), fantasy (coming up with desires and alternative futures) and implementation (identifying challenges to achieve the best selected scenario and drafting a plan for action) (Jungk and Müllert, 1987; Vidal et al., 2006). The future workshop has been adapted and used widely in different contexts such as healthcare (Clemensen et al., 2007) or to engage with children and young people in vulnerable situations (Alminde and Warming, 2020), switching from "what is to what is not yet, but what could be" (Suoranta and Teräs, 2023). However, it could be challenging as participants might have difficulties voicing their ideas (Jungk and Müllert, 1987) or expressing their preferred futures Dator (1993), and could also be time-consuming, impacting people's willingness to participate due to other work or life activities (Suoranta and Teräs, 2023).

Moreover, previous research highlights how workshops still remain a privileged activity that could fail to produce equitable design solutions, especially for underserved communities (Harrington et al., 2019). Socio-cultural aspects such as community hierarchical structures, religious beliefs, social problems, etc., can affect participants' engagement in design workshops especially in low-resource settings (Hussain et al., 2012; Till et al., 2022). Other challenges include how the location and conditions of the venue influence people's participation (Farr, 2018; Raman and French, 2022) and the time imposed by the workshops' structure that are not always aligned with participants' needs or routines (Rosner et al., 2016). Thus, engaging in participatory design research in low-resource settings requires an ongoing negotiation among diverse stakeholders with different needs, values, expectations and motivations taking into account the sociocultural context and realities of people's everyday lives (Byrne and Sahay, 2007).

To develop the capacity of the users (Byrne and Sahay, 2007), different visual materials such as cards, storyboards and sketches have been utilised to enhance

participatory processes and support people in articulating their ideas, especially with marginalised or vulnerable communities (Raman and French, 2022; Till et al., 2022). However, when materials are not contextualised they can also create friction and prevent more engaged participation (Harrington et al., 2019).

# 3 Research Context and Methods

This study is part of a larger multidisciplinary research project (seven co-investigators from Peru, one from France, and eight from the UK) that started in 2019 aiming to create new strategies to tackle the double burden of malnutrition in children aged 6-23 months in two peri-urban low-income communities in Peru: Manchay in the city of Lima in the Coastal region, and the city of Huánuco, in the Andean highlands. Initially, we conducted qualitative (observations and interviews) and quantitative (surveys) studies to get an understanding of the context and the major challenges around breastfeeding, complementary feeding and maternal dietary diversity (Pradeilles et al., 2022). The fieldwork took place at four health centres (two in Manchay and two in Huánuco) and in the caregivers' households surrounding these healthcare centres. The four major challenges that informed the next co-design phase are: 1) High consumption of unhealthy foods, sugar-sweetened beverages and savoury snacks (fried, salty, and sweet products) in mothers and IYC, 2) Low prevalence of (or difficulties with) iron supplementation in IYC, 3) Issues with nutritional counselling and maternal well-being, and 4) No way of tracking the double burden of malnutrition at the healthcare centres.

In summer 2022, we engaged with healthcare workers (healthcare professionals (HCPs) and health promoters (HPs)) and caregivers of IYC through a series of co-design workshops (idea generation workshops, future workshops, storyboarding workshops and prototyping workshops) to explore the design space for potential solutions to address the aforementioned four major challenges in two low-resource settings in Peru (Rousham et al., 2023). The project received ethical approval from the Nutritional Research Institute in Lima, Peru, and from Loughborough University and confirmed by Cardiff University in the UK.

## 3.1 Future Workshops: Practicalities and Structure

### 3.1.1 Pre-workshop activities and Participant Recruitment

Based on the results from idea-generation workshops in Huánuco and Manchay, we got nine clusters of ideas that were transformed into visual representations by the first author (e.g. promoting healthy eating with informative and demonstrative sessions as illustrated in Figure 1a).

To support the critique phase, the research team prepared a big paper template with a circle at the centre to place a selected idea and three main divisions to collect participants' input regarding the selected idea's advantages, disadvantages and the ideal state (see Figure 1a). For the fantasy phase in Huánuco, an A3 template with

Table I. Number of participants during the Future Workshops.

| Place | Phases | HC-Staff | | Caregivers | Facilitators |
|---|---|---|---|---|---|
| Huánuco | Critique | 3 HCPs | | 12 | 3 |
| | Fantasy | 3 HCPs | 3 HPs | 9 | 2 |
| Manchay | Fantasy and Critique | 3 HCPs | | 6 | 2 |

a sketch of the waiting area of the healthcare centre was created to support the discussion and help them imagine and sketch alternative futures (see Figure 1b).

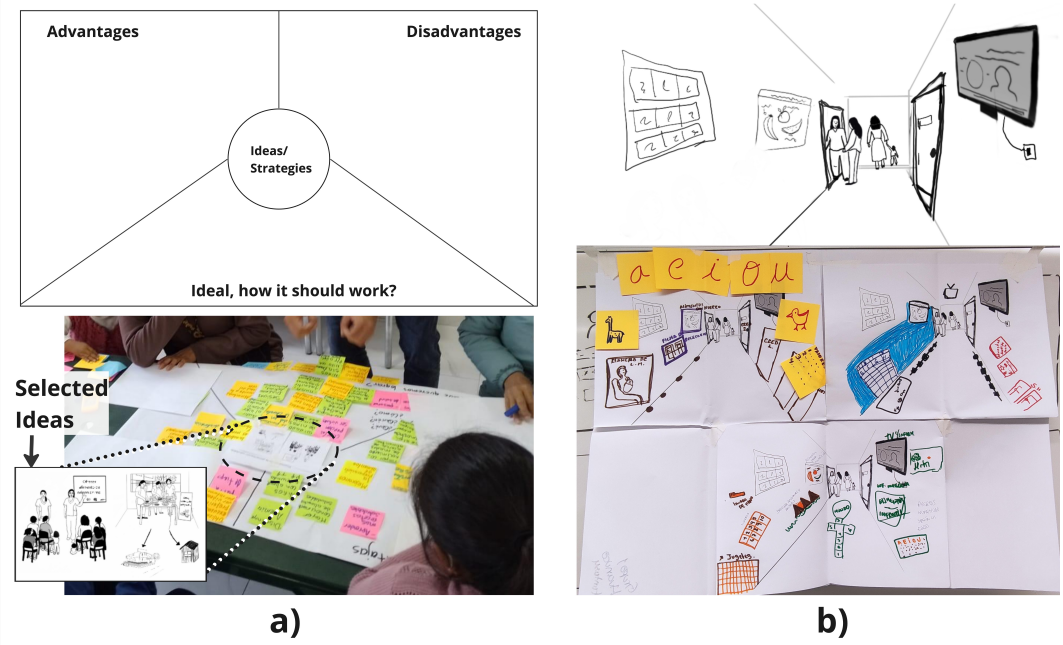


Figure 1. Visual materials for future workshops: a) Above, the big paper template for the critique phase, and below, participants in Manchay using the template for the selected idea; b) Above, an A3 template with a sketch of the waiting area of the healthcare centre, and below three examples of co-produced sketches envisioning a future waiting area in Huánuco.

In partnership with the health centres in Huánuco and Manchay, we recruited nine HCPs that participated during their regular working hours, and three HPs that bring health care services closer to caregivers' homes (e.g., regular visits to monitor the progress and growth of infants during their first year of life). Twenty-one caregivers were recruited in Huánuco and six in Manchay (See Table I). We engage with healthcare workers and caregivers as proxy-users (Sjölinder et al., 2017; Dai and Moffatt, 2021) due to their important role in the development of children's eating habits and considering that IYC under two years are unable to participate in the co-design activities as they depend on their parents.

When planning the workshops, we paid particular attention to the potential factors (e.g., time and location, power dynamics, diverse needs, digital literacy, childcare, etc.) that could influence caregiver's involvement based on previous experiences in other low-resource settings and insights from previous co-design

workshops. For example, we arranged sessions in the afternoon considering the children's consultation appointments. We also set up a playing area where three researchers and two HPs helped to supervise babies and toddlers during the workshops to facilitate caregiver's participation. In Huánuco, the workshop took place in an auditorium space at the healthcare centre in two sessions (critique phase in August 2022, fantasy phase in September 2022) to avoid long sessions that could be tiresome for caregivers as participants arrived late to the first session. In Manchay, the future workshop occurred in one session (August 2022) in a rented venue, considering the space restrictions observed in previous workshops, and 10 minutes walking distance from an associated healthcare centre.

### 3.1.2 Introduction and giving an overview of previous workshops

In Huánuco, we had three facilitators for the critique and two for the fantasy phases. In Manchay, we had two facilitators for the entire workshop. The facilitators were mediators or participating observers (Trapani (2019)), scaffolding the co-design activities, letting the participants work but also asking questions or intervening when necessary. A facilitator welcomed participants and introduced the research team with an icebreaker activity in every co-design workshop. Next, another facilitator briefly explained the nine visual clusters of ideas placed on the walls around the venue and invited participants to stand up and walk around (like a visit to the museum) to check the clusters of ideas, and voice their understanding or ask further questions. Considering the number of participants in each setting, participants voted for the top three visual clusters in Huánuco and the top two in Manchay according to their perceived importance in relation to their own realities.

### 3.1.3 Critique Phase

Participants were divided into small groups to brainstorm at separate tables where they got pens, markers, post-its, and flip charts to sketch or write all the criticism down. We balance the number of participants in each small group so that the number of caregivers would never be less than the number of healthcare workers. In Manchay, the first group had 5 participants (2 HCPs and 3 caregivers) and the second group had 4 participants (1 HCP and 3 caregivers). In Huánuco, there were three small groups: the first group with 5 participants (1 HCP and 4 caregivers), the second group with 5 participants (1 HCP and 4 caregivers), and the third group with 4 participants (1 HCP and 3 caregivers).

Each small group randomly received one of the top clusters of ideas and asked to confirm if they were happy to continue with the assigned cluster. Participants were asked to rank the individual visual ideas within the selected cluster and decide which one they would want to criticize or combine. The selected idea was then placed at the centre of the big paper template (as illustrated in Figure 1a). First, facilitators invited participants to discuss the advantages, disadvantages, and problems around the selected ideas. Second, participants were asked to reflect on how they could address the emerging challenges, and whether technology could be helpful or not.

### 3.1.4 Fantasy Phase

In Manchay, facilitators asked participants to address the critiques and be creative by sketching how they envisioned alternative futures based on their own experiences. Considering their level of digital literacy uncovered in previous workshops, we suggested imagining without restrictions and assuming that everything could be possible. In Huánuco, the fantasy phase took place a month after the critique phase. The first small group had 6 participants (2 HCP, 1 HP, 3 caregivers) and the second group had 7 participants (1 HCP, 1 HP, 5 caregivers). Participants worked together in pairs. One HCP or HP was paired with a caregiver in the first group. The second group had three pairs (a pair of two caregivers and two pairs of one HCP/HP with a caregiver). As suggested by previous research (Markham (2021); Suoranta and Teräs (2023)), and considering the low level of digital literacy we observed in previous workshops, we invited each small group to go on a short tour to the waiting area of the healthcare centre to facilitate envisioning. We asked them to observe the physical and material elements of the waiting area, recall their experiences while waiting for their child's appointment, and think about what is missing and what they could imagine to add to transform the space and draw it on the A3 templates.

At the end, participants shared their drawings within their groups and commented on how to improve each other's ideas. Then, they had 5 minutes of break to eat, relax, and talk between them about their collective ideas.

### 3.1.5 Closing the workshop

Each group shared their sketches with everyone to get feedback and comments. Next, the workshop finished by reflecting on what participants like, what they did not like, what could be improved, and participants provided feedback.

## 3.2 Data Analysis

The first author captured the sketches and notes from participants' outcomes, transcribed the audio recordings of the workshops (5h 55m in Huánuco and 2h 30min in Manchay) and used Reflexive Thematic Analysis (Braun and Clarke (2021)) for analysis. After being familiarised with the data, initial codes were generated. The codes with their quotes were placed in virtual post-its notes on Miro (an online collaborative board tool). Miro allowed the first author to verify and reflect on the codes and use Miro's 'comments' functionality to make questions and annotations to better understand the data. For generating the themes, the first author discussed the partial results with two members of the research team: one with expertise in global public health (ER) and the last author with expertise in human-computer interaction for development (NV). Last, the first and last authors reviewed and refined the potential themes. All the data collected was analysed in Spanish and translated to English for reporting.

# 4 Findings: Barriers and Facilitators for Participation

## 4.1 Physical factors: The role of the venue and visual materials

The research context and the venue of the workshops played an important role to make participants feel comfortable. While we rented a big venue with good illumination not far from the healthcare centre in Manchay that was well received e.g., the venue was *"very nice"* (Manchay HCP01), we could not find a big venue to rent close to the healthcare centre in Huánuco, and activities took place in the auditorium of the health centre. On the one hand, this facilitated the attendance of healthcare workers and caregivers. On the other hand, it might not have been considered as important as healthcare workers were mostly late as they tried to fit the sessions as part of the working hours.

In addition, setting up the playing area for children (e.g., a mat with toys) in the same room was attractive and playful for children and also supported caregivers' participation enabling them to check on their children at any time while focusing on the activity at hand. If a child started to cry, the researchers immediately took them to their mom to feed them or calm them down. For instance, a caregiver stated: *"Right now, I'm focused on this because someone is caring for my baby"* (Manchay Caregiver05). However, we still faced an unavoidable challenge when a child cried as it could have been distracting for the participants, e.g.,: *"[a child] is crying, [...] where is his mom?"* (Huánuco-S2 Caregiver01). In these few occasions, caregivers had to take care of their IYC and either continue participating while breastfeeding them at the table, or some preferred to go to a separated space to feed them, preventing them to fully focus.

The visual materials also played an important role to facilitate participation while catching the participant's attention and being simple to understand. First, the visual clusters of ideas facilitated a share understanding of the illustrated ideas, and supported caregiver's engagement as participants discussed them or asked questions to confirm their understanding of the ideas. For example, a caregiver commented: *"It [the idea] is to feed the child, micronutrients, [the mom in the drawing] is giving him with puree, right?"* (Huánuco-S1 Caregiver). Similarly, a HCP commented about the visual cluster:

> *"One idea is for the mother to have more recipes or help to make the preparations. The other... has to do with the packaging or where it is going to be served. And the other has to do with the presentation of the supplement"* (Manchay HCP01).

Furthermore, the visual sketch of the waiting area (see Figure 1b) helped participants to visualise the spatial dimensions of the waiting area including the existing constraints of the physical infrastructure. For example, the following dialogue between a HP and a caregiver clearly illustrate this:

> *"HP02: maybe the waiting room could be spacious. Caregiver08: yes, but the waiting room, as it is, cannot be expanded"* (Huánuco-S2)

The visual sketch also helped participants to examine the current state of the waiting area before envisioning future alternatives. For example, a caregiver

stated: *"That part, the television, in front, directly... move it to the centre, because if they put it on the side or on the other side [of the room] you can no longer see it"* (Huánuco-S2 Caregiver09). While imagining alternative futures, participants spatially visualised the waiting area and modified the sketches. A HP expressed:

> *"Let's see what I want to put... here I wanted to put weight and height, the scale that weighs the children and all that"* (Huánuco-S2 HP01).

The co-created sketches also offered an opportunity to express participant's ideas and values while keeping them engaged in the activity. For instance, a caregiver commented:

> *"on this side the image, if you have noticed, [...] well, I have done it more or less in this way because I believe the family very important within society"* (Manchay Caregiver05).

During presentations, the co-produced sketches helped participants to remember details and facilitated the engagement with the audience while visualizing multiple perspectives, as a HCPs commented:

> *"Well, to complement those I see in the previous group... Because in reality, they covered needs that perhaps we had not seen from our perspective"* (Huánuco-S2 HCP02).

## 4.2 Social factors: Verbal encouragement, attitudes, safe spaces and the different roles of HCPs

Considering the needs and digital literacy of our different groups of participants, as observed in previous workshops, we simplified the activities for Huánuco. Despite the favourable outcomes (e.g., co-produced sketches) and successfully completing the co-sketching activities, it is noteworthy that at the beginning of the workshops some participants perceived themselves as lacking creative skills or self-confidence for sketching or doing presentations. For example, a caregiver commented: *"No, I'm very nervous, I'm going to stumble over my words"* (Huánuco-S1 Caregiver03). Here, HCPs offered help with the sketching activities or practicing the presentations with them. A HCP expressed: *"putting it together, we have to practice to present it, right?"* (Huánuco-S2 HCP03).

During workshops, we observed how the use of visually-oriented methods helped to generate a more positive attitude from participants. For example, a HP expressed: *"[laughs] I'm not much of an artist, but I'll do my best* (Huánuco-S2 HP01). Participants put effort into their drawings, wanting to draw and paint them better. For example, the same HP commented to her team member: *"You have to paint the place to make it look nicer"* (Huánuco-S2 HP01). Similarly, a caregiver highlighted how she added details to her drawing: *"here, a little son, right?... It is the path so that he is not on the air"* (Manchay Caregiver01).

Moreover, the verbal encouragement provided by healthcare workers, facilitators and other caregivers was helpful for caregivers who needed help with the activity at hand. For example, our analysis highlighted a case where all

participants at the table encourage a caregiver to speak/explain her work to the group. Another caregiver commented: *"As in family [...] there is nothing to be afraid"* (Huánuco Caregiver01). Once the caregiver presented to the team, everybody celebrated her stating, *"Well done!" [clapping]* (Members of the group), and a HP expressed: *"bravo!! You did it very well!"* (Huánuco-S2 HP01), and a facilitator positively reinforced that *"[she] did it very well!"*. In addition, participants and facilitators also praised each other's sketches. For instance, a HCP expressed: *"look now, a very cool drawing"* (Manchay HCP01).

We also observed how participants considered the workshop as a safe space to share their experiences, ask questions, and raise concerns about the services at the healthcare centre. A caregiver expressed:

> *"Also the nurses who provide us with the services... they may treat us with kindness. Sometimes they treat us quickly, quickly, and sometimes there is no [good] treatment [...] There should always be a [good] treatment"* (Huánuco-S2 Caregiver02)

Similarly, a HP commented:

> *many [healthcare] professionals weigh, size [the child] and that's it, but you don't know if it's appropriate [for the child] and they don't explain it to you"* (Huánuco-S2 HP02).

A HCP also recognised the weaknesses of the services and commented:

> *"A mother also told us about the values many times as I already mentioned, the mothers come in and [the HCPs] only do weight, height, or complain, and sometimes they treat [the caregiver] badly."* (Huánuco-S2 HCP02).

In some cases, HCPs adopted a mediator role and scaffold the tasks for caregivers, reinforcing caregiver's engagement and motivation. A HCP expressed:

> *"What will this allow you [a caregiver]? What advantage does it have? One, for example, having this marked in the schedule, [another caregiver] has said, for example, in due time we are going to give iron [supplementation] to the child... This is an advantage. Another [caregivers] has said that this is accessible..."* (Huánuco-S1 HCP02).

In most co-produced sketches, caregivers drew while HCPs contributed with ideas. When caregivers could not draw, some HCPs offered to draw (e.g, *"I draw it, but tell me the idea"* –Manchay HCP01), and facilitators also gave the option to write down the ideas instead of drawing. . We also observed one case where both (a caregiver and a HCP) stated that they *"don't know how to draw"*, and the HCP suggested the caregiver should draw. When healthcare workers (HCPs or HP) and caregivers collaborated without any pressure in a comfortable and equal environment they co-produced enriched ideas. For instance, the following dialogue shows how caregivers and a HCP discussed a problem and alternatives to solve it:

> *"Caregiver03: For me, when it is my baby's turn for the consultation, [the doctor] always tells me about food and I forget.*

*Caregiver02: Sometimes, when they explain it to you, you forget, right? They tell you this is [what] you have to give to the child... We didn't know, [and then] we arrive home and my mind is empty [forget].*

*Caregiver03: We forget.*

*HCP02: But with the images...*

*Caregiver02: With images, sometimes you are in a hurry you can take a photo and once you get home you can take care of your little daughter...*

*HCP02: a portrait of foods with iron"* (Huánuco-S2)

Finally, we also observed how caregivers looked for feedback from facilitators: *"Is [the concept] okay? what do you think?"* (Manchay Caregiver03). Overall, caregiver's involvement and confidence was influenced by the health workers and facilitators that provided verbal engagement, had a positive attitude, and provided a safe and comfortable environment. However, we also observed some discussions dominated by HCPs when a facilitator asked and the HCP answered on behalf of the group. Here, facilitators asked again directly to the caregivers.

## 4.3 Temporal factors: everyday constraints, and punctuality

Participants mentioned that usually, the time for medical appointments and demonstrative sessions was not planned according to the caregiver's needs. As workshops are extraordinary events in caregivers' day-to-day activities, some caregivers' faced difficulties to plan their attendance to the workshops. Participants mentioned that most of their activities are planned around children's needs (e.g., children's time to eat). When they have older children, they also have to consider the older children's schedules (*"sometimes it's already time to go to school [for older children]"* –Manchay Caregiver02). Indeed, engaging caregivers throughout the project has been difficult due to the complexity of caregiver's every day lives and the socioeconomic demands in low-resource settings. In contrast to the healthcare workers who have continuously participated in the workshops, caregivers found it difficult to fully commit their time and workshops were attended by previous caregivers and new caregiver participants.

In addition, we realised that punctuality is an important factor to consider. In Huánuco, the first workshop had a 40 minutes delay because some caregivers arrived late and few HPs were attending a last minute training session that overlapped with the time of the workshop, which affected the planned activities. In this case, we finished the workshop after the critique phase because *"it [was] already getting dark"* (Huánuco Caregiver04), as it was inconvenient for caregivers and HCPs to avoid a long session. In Manchay, the HP who recruited the caregivers scheduled them an hour before the scheduled time for the workshop to prevent delays taking into account the sociocultural context. In this case, some caregivers arrived at the time indicated by the HP and then complained that the workshop started too late.

# 5 Discussion

Reflecting on how participation took place in our workshops, we presented a number of barriers and facilitators that highlight how the physical, social and temporal aspects of co-design workshops can influence the involvement of caregivers and healthcare workers in low-resource settings.

Future workshops are not an easy method to use as it can be time-consuming, people could find it difficult to imagine desired futures and to participate due to the constraints of everyday life (Dator, 1993; Suoranta and Teräs, 2023). To facilitate future workshops and envisioning activities with low-resource communities, we used a variety of visual materials (Sturdee and Lindley, 2019) to convey information and ideas during the workshop, and to support participant's engagement with the activities. Our findings confirmed that all visual materials clearly facilitated a shared understanding of ideas between participants and showed how the collaborative sketching activities helped to reduce the effect of traditional unequal power relations between healthcare workers and caregivers (e.g., HCPs leading discussions). The workshops and the visually-oriented materials helped building a positive relationship between caregivers and healthcare workers, where HCPs with a positive attitude often acted as mediators of caregiver's participation, and where caregivers felt comfortable and safe to share and voice their concerns, empathising with each other's perspectives (Lewis and Coles-Kemp, 2014). Nevertheless, negotiating power dynamics (Jiang et al., 2022; Guo and Hoe-Lian, 2014) between multiple stakeholders with different values and demands is one of the major challenges when co-designing interventions for maternal and child health in low-resource settings (Till et al., 2022, 2023; Coleman et al., 2023).

When deciding on the venue, we considered setting up a space for children in the same room to supervise them while caregivers could see them, aligned with prior work (Balaam et al., 2015; Wardle et al., 2018). However, despite the benefits, it is also worth noting that some challenges still remained, as in some cases, it was difficult to grab caregivers' full attention when their babies were in their arms. Aligned with Balaam et al. (2015) and Wardle et al. (2018), our caregivers' attention was divided between the workshop activities and their children. Future work should investigate additional ways for keeping children engaged in the play area to minimize interruptions in caregiver's participation.

In addition, we need to be mindful and consider caregivers schedules when organising co-design workshops as most of their activities revolve around children's routines (babies and older children). Indeed, previous research has shown that low-income families often have less control of their time (Roy et al., 2004). Aligned with Rosner et al. (2016), we initially consider that workshops have to be planned taking into account participants' availability and routines while attaching them to the consultation appointment. However, our participants found it difficult to attend the workshops due to the less control of their time in their busy routines, and existing cultural traits such as lack of punctuality (Basu and Weibull, 2003) that we did not envisage. Even when the venue of the workshop was located

in the area where caregivers live in Huánuco, they still had to travel. We provided transportation costs to help participants reach the venue. Regarding HCPs, some of them were late even though the workshop took place as part of their working hours, due to their busy schedules or unexpected training.

Regarding caregiver's confidence in drawing, our approach was consistent with Sturdee and Lindley (2019)'s recommendation of making a team effort to draw more detailed images. Aligned with Till et al. (2022) and Wardle et al. (2018), our findings confirmed the important role of visual materials and words of encouragement from other caregivers and healthcare workers to support peer-to-peer interactions, build caregiver's confidence, and support positive reinforcement (Wardle et al., 2018).

## 5.1 Limitations

One limitation is the fact that as facilitators, we may have impacted the HCPs and caregivers' participation, intentional or unintentional (Dearden and Kleine, 2018), since we were external actors in their day-to-day context (Mainsah and Morrison, 2014). In the workshops, facilitators played an active or passive role when it was necessary.To mitigate our influence, we encouraged open participation for both caregivers and HCPs and recruited participants through our local team. We also attempted to balance their interaction in group work to avoid caregivers feeling intimidated by another group of participants. Another limitation relates to the positionality of the research team belonging to an upper-middle socio-economic class that shaped how we framed the project and analysed data. Here, our multidisciplinary team have extensive experience conducting participatory research on maternal and child health in low-resource, urban and rural settings in Latin America and the Global South. We followed the best practices to continuously involve community participants before, during, and after the project.

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