Embodied Imagination: An Approach to Stroke Recovery Combining Participatory Performance and Interactive Technology

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ABSTRACT

Participatory performance provides methods for exploring social identities and situations in ways that can help people to imagine new ways of being. Digital technologies provide tools that can help people envision these possibilities. We explore this combination through a performance workshop process designed to help stroke survivors imagine new physical and social possibilities by enacting fantasies of "things they always wanted to do". This process uses performance methods combined with specially designed real-time movement visualisations to progressively build fantasy narratives that are enacted with and for other workshop participants. Qualitative evaluations suggest this process successfully stimulates participant's embodied imagination and generates a diverse range of fantasies. The interactive and communal aspects of the workshop process appear to be especially important in achieving these effects. This work highlights how the combination of performance methods and interactive tools can bring a rich, prospective and political understanding of people's lived experience to design.

CCS CONCEPTS

• **Human-centered computing** → **Empirical studies in collaborative and social computing**; • **Applied computing** → *Performing arts*;

KEYWORDS

Stroke, Peer and Social Support, Embodied Experiences, Social Interaction, Participatory Performance, Motion Capture

1 INTRODUCTION

Participatory performance provides a range of techniques for helping people to explore social identities and social situations and to imagine new ways of being [6, 20, 33]. These methods are important for design because they are both prospective and contextualised; they provide a way for people to explore the implications of new ideas, e.g., abstract concepts like 'wearable computing' or the 'internet of things', in the context of their own lived experience [27, 32, 34].

Participatory performance methods also connect with more routine design concerns. Like more conventional theatre, participatory performance is typically facilitated by designed scenographic elements including the layout of space, the physical arrangement of performer(s) and audience and the use of materials and objects [27, 34]. Digital technologies

expand the scenographic possibilites, providing new ways to support people in envisioning and enacting their ideas.

We explore the combination of performance methods and interactive technology in the context of a workshop format based on a 'Green Screen' performance, *Ruff*, devised by the theatre company Split Britches (Lois Weaver and Peggy Shaw)[12, 19, 49]. The resulting workshop process aims to help stroke survivors imagine new physical and social possibilities by enacting fantasies of "things they always wanted to do" (e.g. climb a mountain, play at a concert, swim on a coral reef) in "places they always wanted to be" and with people "with whom they most want to communicate".

The workshop process emerged from an iterative collaboration between performance practitioners, cognitive scientists and stroke survivors. It employs two basic strategies. First, a gradual and playful transition from simple performative movements through to mini narratives enacted with and for other workshop participants. Second, specially designed interactive visualisations, driven by real-time motion capture, that accompany each stage of this transition; visualisations progress from 2D silhouettes through 3D point clouds to more concrete, recognisable images of each participant (see Figure 2). The process culminates with participants enacting their fantasies, in their community group setting, supported by a customised interactive scenography (e.g. mime climbing in front of a picture of a mountain).

Our approach focuses on participatory performance in the context of stroke recovery but engages with a wider argument about the value of performing arts approaches both as health interventions and as design methods [38, 50].

We first outline some of the key factors affecting stroke recovery and review some common therapeutic interventions that have been designed for this constituency. Comparison of these interventions with participatory performance approaches helps to clarify the distinctive political and experiential emphasis of the approach used here. This emphasis makes evaluation challenging. We provide qualitative evidence from participant observation, questionnaires and group-discussions led by an independent assessor.

The results suggest that the workshop process is successful in stimulating participant's embodied imagination and in encouraging people to produce a diverse range of personal fantasies. The interactive visualisations and group setting appear to be especially important to the sense of empowerment and group engagement that the workshops create.

2 STROKE RECOVERY

Stroke is a medical condition caused by a disturbance of blood supply to the brain, which results in the death of a localised area of brain cells. This can have a long-term impact on cognitive, motor and communicative abilities. There are currently 1.2 million stroke survivors in the UK [47] and

stroke is classed as the main cause of disability worldwide [35–37].

After discharge from hospital, stroke survivors face a number of challenges: adjusting to a new life routine, limited employment possibilities and restricted options for recreation. This can lead to social isolation and depression and the longer a stroke survivor is isolated from society the more problematic this becomes [2].

Peer and social support in a community environment are important in helping people to meet these challenges [2, 3, 14, 17, 28]. Both the UK Stoke Association Association [3] and the American Stroke Association Association [2] suggest that sharing experiences and concerns with peers promotes positive change. Dorning et al. [14] characterise the main benefits of stroke peer support as reduced isolation, increased confidence and improved mental wellbeing. There is evidence that peer support bolsters resilience, personal motivation, feelings of belonging and healthy behaviours [25, 29, 44].

Technologies for Stroke Recovery

While health apps and online forums provide some social support [11, 52] the primary focus of assistive technologies for stroke survivors has been physical rehabilitation. This has included robotics [40], virtual reality rehabilitation [46], serious games [15, 39] and interactive rehabilitation systems [4, 5, 30, 31].

A key advantage of interactive systems is that they can automatically track movement and provide a range of feedback: exercise instructions and prompts, movement assessment and audio, visual or mixed and virtual reality environments to interact with in real time [4, 15]. Therapy enhanced by multimedia feedback is engaging and it appears to be successful in encouraging sensorimotor integration, promoting motor learning, and developing confidence in the use of the affected limb [15]. Serious games use game reward mechanisms to engage people. These systems target motor disability and use devices like the Nintendo Wiimote or the Kinect sensor to detect limb movements using infra-red technology [9, 13, 21, 39, 43].

3 PARTICIPATORY ARTS INTERVENTIONS

The main participatory arts used in therapeutic interventions are theatre, music, dance and poetry. They are interesting as interventions because of their potential for accessing the social, creative and experiential aspects of peoples' lives [10, 24, 50], and have been most thoroughly explored for people with dementia, depression, post-traumatic stress disorder (PTSD), and Parkinson's disease [7, 16, 22, 23, 26].

There is less work on the application of these tecnhiques to Stroke recovery. Reynolds [42] provides an example of visual media-based therapy for stroke survivors and reports

benefits for physical coordination, language skills and cognitive abilities and social interaction. *Remembering Who I Am* [41] treated participants' loss of identity and disconnection with their body by using mental imagery, touch and sensation visualisation. The group meetings appeared to improve patients' mood, and helped them both to express feelings and articulate who they want to become after their traumatic event.

Non-clinical participatory arts approaches are normally distinguished from art therapy delivered by health care professionals because the outcomes are not specific and easily measurable therapeutic ends (such as improved range of limb movement) even though the goals are therapeutic in a broader sense [50]. The basic premise is that creative activity and self-expression have intrinsic value for participants as well as positive effects on health and well-being. They are thought to activate and improve psychosocial resources that enhance self-esteem, identity building, and positive life experiences [24]. They are also thought to help people cope with difficult changes of routine. These impacts are inherently difficult to assess especially using standard clinical methods such as randomised control trials [50].

Participatory Performance

For current purposes, the most important arts intervention is participatory performance. This can take a variety of forms but always involves some form of direct participation by an audience in the production of the work.

A participatory, workshop approach has been used successfully in the context of people with dementia by theatre company Ladder to the Moon [38]. This involves both staff and residents in immersive performance that promotes open-ended interactions. Closer to the work presented here is Schamberger's approach to co-created performance, also involving people with dementia [50, 51]

Feminist Participatory Performance

The work described here uses a specifically political, socially engaged, feminist performance tradition that involves participants in exploring the social identities and social conditions that inform and often constrain their experience Split Britches are one of the seminal companies in this tradition [8, 20]. They create performances that focus on the intersectional (i.e. overlapping and individual) circumstances that affect each participant, especially their experience in relation to gender, race, class and other disparities. The goal is to create accessible, coalitional spaces that recognise the individuality of every participant while providing space for growth and imagination.

This practice has been developed with various different groups, including female prisoners in the UK and Brazil [48],

domestic violence survivors in New York state, emerging feminist performers in Taiwan, and University students around the world [1]. It has also been applied to the problem of developing design formats that can engage constituencies, such as older people, who are often marginalised in design thinking [32–34]. The performative strategies encourage people to talk, try out ideas on each other and can de-mystify abstract concepts such as the 'network of things' by, for example, using everyday objects and playing out scenarios in which the objects connect or communicate [27, 32–34]

The present study develops this approach in two ways. First, to assess the potential of embodied enactment as a way of encouraging stroke survivors to think and share new possibilities. Second, to examine how motion-capture and visualisation technology can be usefully integrated into this process.

4 THE WORKSHOP PROCESS

The overall aim of the workshops is to motivate community group participants to develop imaginative fantasies of *something they have always wanted to do* (like swimming with dolphins or racing cars) and share them, through enactment, with the rest of the participants, as an audience.

The main technology used to support this is live motion capture which digitally records movement and can translate it, in real-time, onto a model in projected or screen-based 3D space (see Figure 1).

This use of motion capture might seem counter-intuitive as an environment for stroke survivors since people's body movements are often impaired and a dynamic visual representation might simply serve as a reminder of this impairment. However, the idea came from a 2012 workshop in the Deakin Motion.lab in Melbourne. Shaw, one of the founders of Split Britches and who suffered a stroke in 2011, was playing with an avatar driven by her own movements. The de-personalised, real-time motion feedback this provided seemed to have a compelling and liberating effect. Shaw interacted almost continuously with the avatar over an 8 hour session. A similar observation is reported by Stewart and Hillier [45] in describing the use of video technology in Australian Dance Theatre's performance *Proximity*. During rehearsals a stroke survivor played with the technology and commented on the sense of augmentation or empowerment it created.

The first iterations of Split Britches' *Ruff* performance [19, 49] used 'Green Screen' chroma key techniques to provide mixed-reality interaction and these were piloted with stroke groups in Manchester and London [12]. Several general objectives emerged from this pilot work [18]. First, to make the motion capture elements both cheaper and more portable to facilitate wider use. Second, to exploit the potential for progressive use of dynamic, performative movements. Third,
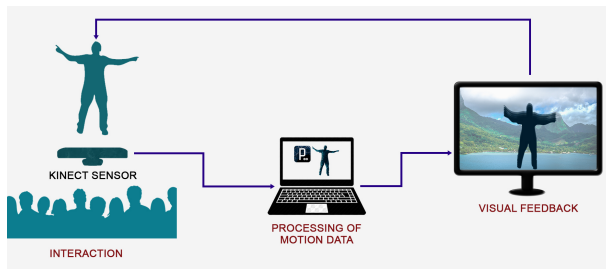
Figure 1: Interaction Diagram

to explore the potential of projections in virtual space for representing people's bodies in a variety of ways.

Interactive Scenography

In response to the practical considerations the green screen set-up was substituted for a Kinect sensor, a screen or monitor, and a computer that processes the incoming image from the Kinect and transforms it into three different interactive scenes. Participants stand or sit in the capture space of the Kinect sensor (pointing towards them) and their movements are displayed on a monitor located above the sensor (Figure 1) [18].

During the workshop, the interactive scenography displays three different interactive scenes in the monitor and, to interact with it, the participant moves in front of the Kinect until the sensor detects them. Once this has happened, the participant is free to move, play and improvise ideas, metaphors or storylines in conjunction with the scenes they are experimenting with. This takes place in a communal setting and the workshop leader and other participants have the opportunity to direct the participant or suggest different ideas about their performance. Although the kinect's ability to detect more than one person in the capture space was originally perceived as a problem that needed a technical fix (truncated capture space) we realised that this was a potential advantage since it enables group involvement in a performance.

Workshop Structure

Building on previous research results [18], five basic stages were designed for the workshop:

Opening. A performance warm-up method is employed to introduce participants and encourage movement and interaction. Each participant improvises a small gesture and the rest of the group copies it. The interactive scenography is not introduced yet but this is running in the background, producing small glimpses of participant's movements on the screen.

Impulse Work. Interactive scenography displays the **empowering silhouettes scene** (Figure 2, upper left). The aim
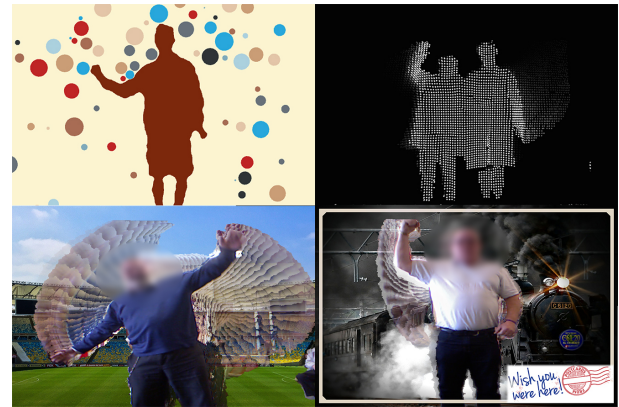

Figure 2: Interactive Scenes (Faces Blurred to Preserve Anonymity

is to guide participants towards a movement-based interaction with the system. Participants observe their body silhouettes in the screen and interact with digital, falling circular shapes that can be moved around the two-dimensional space, popped or stopped from falling. 'The body silhouettes provide a simple representation that does not directly signal the identity of a participant, rather they discover this by moving to control the shapes' [18, p. 3].

Embodied Fantasy. Interactive scenography displays the **embodied movement scene** (Figure 2, upper right). The scene consists of point cloud silhouettes with a delay effect, producing a slight movement trace that accentuates body motion. The aim is to enhance awareness of individual motor potential. 'Participants are asked to imagine where they would like to be now and what they would like to do: their own fantasy. Their ideas are embodied by performing a signature gesture or body movement that represents their wish' [18, p. 3].

Fantasy World. Interactive scenography displays the **fantasy world scene** (Figure 2, lower left). The scene combines a recognisable RBG silhouette of the participant with a slight delay effect and a stock picture of the participant's fantasy place (concert hall, exotic beach, etc.). ÂťThey are encouraged to perform the signature gesture or movement developed in the previous stage and to improvise further on it' [18, p. 3].

Self-Portrait. The closing stage proposes participants to pose for a picture while still immersed in their fantasy world scene (Figure 2, lower right). These pictures are printed into postcards tagged with a *Wish you were here* slogan, and given to participants as a 'take-away'.

5 TWO CASE STUDIES

The workshops were trialled with two *Life after stroke* (LAS) support groups. The Stroke Association (UK) provided permission to observe the workshops and interview the groups for research purposes.

The aim of these case studies was to explore the extent to which the workshop encourages movement, stimulates a sense of empowerment and self-awareness, and encourages the development of fantasies. In particular, the use of embodiment to develop fantasy ideas, and the role of social interaction in shaping their performance.

As noted above, these outcomes are difficult to evaluate. Standard assessment instruments used by physiotherapists cannot be consistently applied across the diverse patient motor and communication deficits typical of the LAS community groups. Moreover, these instruments are intended for repeated longitudinal comparisons over periods of weeks or months. Simple before/after comparisons for people at a single workshop is too small a sample to be valid for this kind of comparison. It is also confounded by factors such as fatigue and novelty. Experimental contrasts with control groups are also problematic because facilitators actively collaborate with participants and cannot replicate their behaviour in a meaningful way in different situations e.g., with and without the visualisations or with different workshop structures. Perhaps most obviously, these evaluation methods would also not provide insight into participant's experiences of the workshops or the content or range of fantasy narratives produced.

As a result of these considerations a three stranded qualitative approach to evaluation was used in order to draw out a rich, mutli-perspective description of participant's responses. First, each workshop was video and audio recorded for subsequent analysis (using ELAN). Second, separate follow-up sessions were conducted by a third-party with experience in the evaluation of performance interventions. The facilitator was not present at these sessions which were video and audio recorded. Third, group coordinators were consulted on email, using a written questionnaire to elicit their opinions of the process and comparative assessment of the perfomance workshop relative to other regular group activities.

Participants

A total of 21 adults participated in the study across two Green Screening workshops offered to Life After Stroke (LAS) groups (from the Stroke Association); a breakdown of demographic data is given in Table 1.

The study was approved by the Queen Mary Ethics of Research Committee at Queen Mary University of London (date of approval: 23.08.2016; Reference QMERC2016/42). All participants provided signed, informed consent; they were not paid for their involvement and did not receive another type of incentive. Data collection, from the first workshop to final questionnaire application, ran from 14th of March to 26th of June 2017.

Table 1: Participant demographics

Workshop	W1 LAS	W2 LAS
N Total	10	11
N Male	4	6
N Female	6	5
T Walking Aid	4 Walking Stick 2 Wheelchair 1 Carer Assistance	3 Walking Stick 1 Wheelchair
N Speech Impairment Impairment	4	2
Follow up N Total	7	7

Procedure

Performance Workshop delivery. The study was conducted in the community centres where the Life after stroke groups usually meet. Each workshop lasted up to 80 minutes; group coordinators and carers were present as normal to support participants that had difficulty communicating or moving. The workshop followed the five-stage structure detailed above. There was one workshop facilitator (Weaver) and two specialists supporting with the technology and workshop activities.

The workshops were filmed with two cameras, one placed at the back of the room and the other at the front. By matching the videos, we could observe the primary participants' interactions and performance, as well as monitoring the responses of the other participants as their audience.

Follow-up Session. One week after the workshop, each group attended a follow-up session conducted by an external evaluator. A semi-structured group discussion was used to explore participant's experience during the workshop and how it compares to their usual self-care and therapy activities, as well as any post-workshop effects. Each session lasted up to 30 minutes.

The participant's answers guided the interpretation of our participant observation findings. These sessions were filmed using one camera at the back to minimise observer effects when participants were speaking with the evaluator.

Questionnaires for Group Coordinators. To conclude the study, we applied a questionnaire to the Life after stroke group Coordinators. They are familiar with each participant's circumstances and have seen the group collaborating in different

environments and activities. Therefore, we designed a questionnaire to reflect upon the results of our workshop and how it could compare to other group activities they regularly do.

Post-workshop contact with the group coordinators was established via email. We sent them the questionnaires, asking them to provide more information about the perceived effects of our interactive guided process. The answered questionnaires were returned a few days later via email too.

Data Analysis

Data analysis focused on four issues: use of embodied imagination, fantasy content, role of the real-time visualisations, and audience involvement. Analysis followed three phases. Firstly, the workshop's footage was reviewed for responses to the performance methods applied during the workshop, both individually and as a group. Secondly, the audio recording of the follow-up sessions was transcribed using ELAN. The participant's feedback was organised into categories of satisfaction to analyse positive and negative feedback, novelty, and achievement. Along with this information, the evaluator's notes were used to cross-check the comments. Finally, the questionnaire answers were organised into the same categories of satisfaction, as well as comments from the group coordinators.

Results

Basic demographics of participants are provided in Table 1. The groups are of similar size and both are diverse in the effects of stroke for each individual. There is a realtively large spread of ages and both groups are mixed gender. The group including a slightly older age range also presents the greater amount of people using walking aids (W1 LAS, Table 1). In addition to individual therapy treatments, participants stated that they mainly attend small group activities focused on socialising (like stroke clubs) and artistic activities (i.e. choir) to support their recovery. These activities involve stroke survivors and, sometimes, spouses or carers.

A number of key themes emerged from the qualitative analysis:

Body Movement. At the start of the workshop, participants approached the interactive scenography with a diversity of attitudes towards it. Most participants explored movement with their upper body, pushing and moving the digital falling shapes around the scene. Some participants performed quick interactions that were not too exploratory while others focused on further exploration, like discovering they could kick the falling shapes or *pop the bubbles* when clapping. One of the participants displayed a more experimental interaction, he commented that pressing the falling circles felt like *Pac-Man*, he mentioned that we was trying to get only the purple

circles, and he also realised that he was not able to keep the circles on his hands and asked *'Can you actually grab them?'* while trying to do it. He then moved his right arm in circles rapidly and once he was done interacting with the shapes he paid closer attention to his silhouette and commented *'Look how thin my arms look!'*.

Even though such attention was not a generalised approach at the start of the workshop, the participant's range of movement increased considerably from the first stage to the last one. By the time they interacted with the last scene (Fig. 2, stage 4), most participants had moved more around the space and employed their whole body to embody fantasies.

For instance, a participant in a wheelchair showed minimal movement and appeared not to understand what was going on during the first stage. However, during the last stage she abstractly embodied her fantasy: she was a figure ice skater spinning but but since she could not turn due to her wheelchair, she raised her right arm with a finger pointing to the ceiling and spin it. This simple embodied movement that she repeated for a long time was compelling enough for her to enact her fantasy's storyline.

The workshop encouraged people to move beyond their limits because they were focused on animating the real-time visualisations and this interacted with the storyline they developed. One of the participants stated:

"The only thing that I realized back seating, watching the stuff from the screen - which I found beneficial - is that when you've got a side of your body that doesn't work properly, which is often the case with strokes, that by trying to move it to the reaction: touch the bubbles and the balls, you could actually see quite clearly that you can do things with the stiff side... The realisation that if you keep trying it can get a little bit better."

The fact that the communication was body movement-driven also appeared to help participants with speech impairment to express their ideas. For instance, one of the participants with aphasia produced a robust set of gestures to enact her fantasy; this set the storyline for the audience who then helped to narrate the actions, and it was one of the more striking performances during the *fantasy world* stage.

A group coordinator commented on the strength of these responses:

"I saw people very animated and moving out of their usual restricted area of movement, throwing away aids and standing unaided and overreaching."

However, participants did not like the fact that it was only a session and were expecting more opportunities to interact with the system, which suggests that they did not fully explore their ideas and embodied resources during the sessions.

Furthermore, the technology had some glitches that cause unexpected digital effects. Most participants integrated such

glitches into their performance. However, participants using walking aids felt frustrated because they did not understand if it was a mistake of their own or felt they could not move as much for the system to detect them. Such technology issues need to be fixed for future iterations.
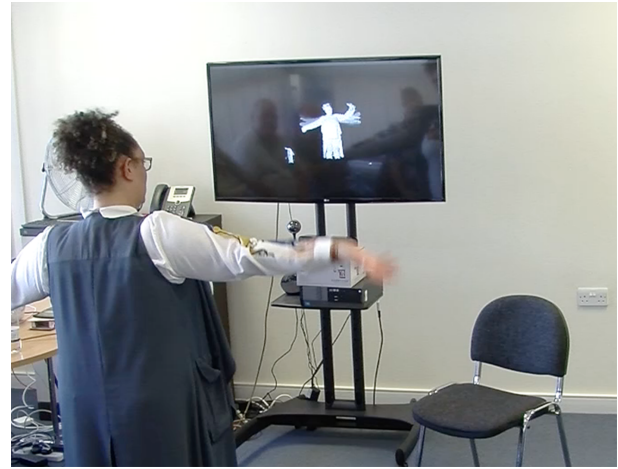
Embodied Imagination. Once the participants had warmed-up to the performance methods and the interactive technology, the next stages of the workshop focused on generating fantasy actions and places. Table 2 summarises the fantasies and places that participants generated during the workshop.

Table 2: Participant's fantasies

	Fantasy Action	Fantasy Place
P1	Ballerina	Big theatre
P2	Singer	Wembley Stadium
P3	Chief constable	Goodison Park
P4	Punk dancer	70's club
P5	Swimmer with dolphins	Caribbean sea
P6	Footballer	Liverpool Football field
P7	Guitar player/singer	Big arena
P8	Parachute jumper	Airplane
P9	Shark diver	Sea
P10	Train driver	Old locomotive
P11	Drummer player	Wembley Stadium
P12	Races spectator	Velodrome
P13	Cyclist	Cycling arena
P14	Prima ballerina	Covent Garden
P15	Drummer	Concert hall
P16	Footballer	Manchester football field
P17	Singer and song writer	Concert hall
P18	Figure ice skater	Frozen river
P19	Singer	Concert hall
P20	Horse rider	Sandy beach
P21	Skiing	Snow

Before interacting with the *Embodied Fantasy* stage (Figure 3), participants shared their fantasy action and fantasy place with the rest of the group. Once confronted with the interactive scenography, the visual effects promoted more in-depth exploration of these ideas. At this point, participants had a clearer idea of the set of movements they could use and engaged their whole body in action or as much as their movement possibilities allowed them. For instance, one of the participants performed an arm gesture imitating an orchestra director while she sang, then she took a bow with her head.

The scenes in the *Embodied Fantasy* stage display the participants as a white point-cloud figure on a black background with a visual lag that leaves movement traces on the screen;

Figure 3: Participant exploring gestures to embody her fantasy.

designed to emphasise movement dynamics. The repetition of gestures during this stage stimulated body movement and, with it, their embodied imagination. During the follow-up session, some of them recounted having moved more than the usual when being concentrated in the storyline they were creating. For instance, one participant composed a whole story about swimming and communicating with dolphins. She added a gesture to each part of the story and explained that she connected her fantasy with previous life memories.

Participants also employed sound resources to express the storyline they were crafting, like the neigh of a horse or a 'swish' while skiing. One of them fantasied being a figure skater and entered the performing area humming a song, the rest of the participants joined in the humming. As previously mentioned, because she was on a wheelchair and with limited movement possibilities, she lifted her right arm with the index finger pointed to the ceiling and spin it around explaining that it represented herself doing a full body spinning, she then increase the speed of the movement while saying:

'I'm spinning around... I'm spinning around... and now I'm dizzy'.

While some participants repeated the same gestures and movements in the *Fantasy World* stage, others tried new options. However, those who employed repeated their movements did make changes repeating more times, or adding some explanation of what was going on in their fantasy storyline. Participants that tried new movements were often motivated by the audience, who were providing some direction of what was going on. For example, when one participant was performing skiing another appeared on his virtual environment and, although this was unintentional, it prompted an improvisation on the storyline suggesting he

Figure 4: Collaborative Interaction.

should ski faster because the intruding head was following him on a train.

For the group coordinators, the participant's most enjoyable aspect of the workshop was the prompt to elaborate fantasy experiences:

"They really enjoyed the aspect of being screenshot into experiences they would never have the opportunity to try out, e.g. pop star."

And, fantasy places:

"Using their imagination to put themselves in a place they would probably not be able to be in 'real life'."

Audience Engagement. As an audience, the participants were engaged with each performance and the more complex it was, the more they clapped and cheered. Because they know each other from previous meetings, they would cheer participants when they knew that they were taking risks with their movements; one participant started with small movements to embody a *prima ballerina*, but eventually tried a full turn to obtain more claps from the group. The participants were an engaged audience when observing the fantasy performances. They were surprised every time somebody discovered a new gesture or an interactive effect.

Engagement and co-creation of meaning were especially evident where one member of the audience suggested a movement idea and the performer enacted it (Figure 4). The first evidence of collective storyline development potential was found when one participant included another peer in his interaction when trying to collect all of the falling shapes with one arm and then pretending to throw them at someone else who was sitting close to him. She played along and commented to him *"You missed!"*.

Laughing and cheers also were used to demonstrate approval. When participants liked somebody's idea, they provided clear overt responses. Furthermore, when the audience demonstrated engagement with a performer, this tended to extend the performance. Enacting fantasies in front of a group was

the most enjoyable aspect for the participants. One participant mentioned that this had been the most enjoyable aspect for her because she takes singing and dance lessons during the week. She declared that moving in front of the interactive scenography was similar to her dancing lessons. Furthermore, performing in front of the audience permitted her to show her artistic skills. Overall, participants expressed their enjoyment in seeing each other perform and succeed in their interactions with the technology:

"I think that one of the nicest things is the ability to stop your inhibitions from stopping you doing something. [...] each of us were willing to stand up in front of other people. And risk feeling embarrassment, ridicule [...] And I think in a group session that'd be better than on your own at home, to be honest with you."

Sense of Community. The workshop is a group activity and peer presence, perhaps surprisingly, appears to be reassuring and stimulating (rather than inhibiting) to performance in this context. After the follow up session, the independent evaluator also reported that the project was successful in tapping into existing group dynamics, and the encouragement and empathy shared between members in these kinds of support groups. Participants expressed their enjoyment in seeing each other perform and succeed in their interactions with the technology. As they see each other every fortnight, they are well placed to notice positive responses and improvements in motility.

"You do it then, but you don't do things on your own. It gives you that sort of discipline, you know, it gives you a reason."

Participants liked to perform their fantasy. They were happy to share it with their peers and to create a collaborative storyline. One participant recalls:

"I enjoyed it because it was something that no one had asked you before: would you like to have done this if you could?."

Others used the activity as a jumping off point to discuss an aspect of their personal history, dreams or ambitions. The groups agreed that the communality of the experience was paramount; it made them realise how connected they felt as a group already, given this opportunity to support each other as they performed, and to trust everyone to support them when it was their turn.

Overall, sociality seemed core to people's activities. Across the two groups, participants mentioned similar support groups, lunches with friends, visiting family, going to the pub and football games, joining choirs and art clubs, as key parts of their weekly recovery activity, all sociable events. When a carer suggested how the technology could be used to encourage exercise and physiotherapy at home, several participants were quick to argue that it would not be the same doing the activities independently. Furthermore, in W1 LAS, the group agreed that the workshop would have been very different if

they had been a group of strangers, they would have been much more reticent about getting up and engaging with the activities.

Interactive Technology. Stroke group coordinators noted that this was the first digital activity participants had done during the group meetings and attributed at least some of the enjoyment of the experience due to its novelty. Participants that were not familiar with the technology asked how the system works when confronted with it.

From the semi-structured group discussion it is clear that this approach is not for everybody. Some participants stated that they preferred Conversation over performing in front of their peers. One participant stated:

"Not too much for me."

when asked if he had enjoyed watching his peers performing. He added that he would have liked to talk more instead. For most participants it was challenging to interact with a virtual representation on the screen, but after practising they became familiar with it. Co-ordinators agreed on this by stating that the most challenging part of the workshop is to stand up in the front and perform.

"Asking them to come out of their comfort zone to 'perform' in front of others. I think they were pleased they did though."

However, due to the workshop leader and the workshop format, they all overcame their fear and were gradually guided to open up more.

The group enjoyed remembering each of their personalised *desire portraits*. There was a consensus that at the beginning of the session everyone was unsure if they would want to participate, but were surprised at how comfortable they felt once they got going. Another participant spoke specifically about being nervous at the start, but after spending time engaging with the activities, she felt less self-conscious by the end of the session. This feeling lasted after the group had finished for the day.

Discussion

Although the data cannot support strong causal conclusions the qualitative analysis provides three convergent lines of evidence that the workshop process had a marked and generally positive effect on participants. It succeeded in creating a stimulating and permissive environment for participants to delve into desire and imaginative creativity and express these in a diverse range of novel verbal and non-verbal performances. Overall, participants, organisers and assessors' responses were strongly positive. There seems to be several key factors in this.

The experience of articulating personal ambitions and desires in a performative context appears to be successful in opening imaginative possibilities for self-expression [6, 20, 33]. These fantasies are produced *for* performance,

often collaboratively, and do not represent straightforward expressions of individual desires. However, there is a clear sense of disinhibition and playfulness amongst the workshop participants.

This desire-led aspect contributed to the distinctiveness of the workshops as a group activity. Participants commented that it was unusual to be given the opportunity to talk about the things they had always wanted to be. This reflects one of the main precepts of this form of participatory performance which is to engage with people's own experience, an important contrast with more conventional therapeutic interventions.

The visualisations appear to have contributed to the increased and atypical levels of movement observed in the workshops. This may be due to the novelty of the technology as much as the specifics of the design. However, there are some indications that the abstract, anonymised representations were more successful at encouraging playful movements than the more concrete ones.

Perhaps the most salient theme emerging from the analysis is the importance of the audience. From the start people engaged as a group, filling out each others narratives, jointly producing them and providing supportive feedback through applause and laughter. This is underlined by participant's comments that they would not really be interested in doing it on their own. The implication is that it is not the interactive scenography itself that enhances the experience but the way in which it facilitates sharing.

Setting the workshop format into the peer support is a key element in participants' motivation, confidence and feeling of belonging [14, 25, 29, 44]. This is evident in participants' declarations that they used their postcards as a jumping off point to discuss an aspect of their personal history, dreams or ambitions with peers and even family and friends.

This leads to a number of practical recommendations about the workshop process. Set-up and introduction are especially critical. People are understandably nervous about "technology" and "performance" and the more these elements are talked up the less comfortable people are with participating. Presenting the workshop as "trying out a group video game" would be much more effective and arguably just as accurate. Rooms organised into rows like a lecture theatre instantly create the wrong expectations about participation. The optimal arrangement of seating for the workshops is a horse-shoe positioned so that people are already in the capture space before the workshop starts. Instead of explicitly introducing the technology it is much more effective if they discover it for themselves as they come in an sit down.

Although we emphasise the importance of the process and the technology the facilitator plays an especially critical role. They are key to making people feel comfortable, driving and helping with improvisation, managing the transitions

between stages and managing the group dynamics e.g. giving everyone an opportunity to contribute. This has implications for how easily this format can be used elsewhere.

This is especially important given that, at least initially, some participants are ambivalent about taking part and some are anxious about self-expression and sharing personal concerns, or that have had previous experience in the arts which gives them preconceived ideas about what it expected and whether they are skilled enough to take part.

Conclusion

The results suggest that our performance-based approach succeeded in promoting higher levels of movement, which furthered an active embodiment of fantasies and motivated the rest of participants to engage and develop storylines collectively. The interactive scenography's visual effects allowed participants to share their fantasy ideas with the peers, stimulated body movement and reduced monotony.

The workshop's structure was successful in guiding fantasy development and enactment, and it also promoted a wider range of movement linked to the embodiment of complex fantasies. In this matter, the workshop leader plays a fundamental role in the process. She must guide the narrative as well as to improvise in case something changed, or the participants are not responding adequately. In this study, the workshop leader was able to craft a workshop structure that bolstered the embodiment potential in the interactive scene. However, further research on the impact of particular structures during the Green Screening workshop is necessary.

Future Directions. A persisting question is whether we can objectively determine whether participant's range of movement increased from the first stage of the workshop to the last. One option is to use computational vision techniques to measure *optic flow* as an index of body movement during each section of the workshop.

Another key question is whether the process can be repeated across multiple sessions. This would help to disentangle effects of novelty but it seems likely that straight repetition of the fantasy narratives would not be engaging. An alternative is to expand the performative contexts to include, for example, a chat show format in which people recount their (imagined) experience for the audience.

Lastly, to make the process scalable to LAS groups across the UK and more widely the interactive elements need to be packaged as a self-contained application that can be run by non-experts.

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