Using photography as a trace of activity to facilitate the retention of emergency response actions

Ophélie Morand
Télécom Paris IPP
I3, CNRS (UMR 9217)
ophelie.morand@telecom-paris.fr*

Stéphane Safin
Télécom Paris IPP
I3, CNRS (UMR 9217)
stephane.safin@telecom-paris.fr

Robert Larribau
HUG, Emergency Department, HUG
robert.larribau@hcuge.ch

Caroline Rizza
Télécom Paris IPP
I3, CNRS (UMR 9217)
caroline.rizza@telecom-paris.fr

ABSTRACT

The chances of survival of a victim of cardiac arrest or stroke decrease considerably without rapid intervention. Bystanders, the first people able to intervene, are however few to act. This ignorance of the seriousness signs of the pathologies, and of the importance of acting, combined with a feeling of incapacity to perform emergency gestures, are the main reasons for this low level of action. The absence of knowledge originates both from a lack of training and from forgetting training courses. To overcome this problem, some trainings propose high fidelity simulation devices associated with a debriefing to create a strong emotional impact leading to a stronger memory impact. To assess the impact of this type of simulation, we set up a Living Lab including a high fidelity simulation of emergency situations (with citizens, dispatchers, first responders and paramedics), a debriefing and a method to create a "trace of activity", still aiming at generating a higher memory impact. To measure the effects of the Living Lab, we analyzed the emotional impacts evoked by the participants, categorized the learning and finally studied the creation of the activity trace. The results show that the Living-Lab elicits emotions (for the cardiac arrest scenario) and projections (for the stroke scenario) and can therefore potentially improve the retention. The learnings were of several natures: individual and practical learnings on emergency management, learnings on collaboration within the chain of survival and theoretical learnings. Analysis of the retained learning after 2 to 8 months is in progress, therefore no results are available yet.

Keywords

Emergencies' simulation, photovoice, experiential learning, bystanders, chain of survival

INTRODUCTION

Any delay in the treatment of patients suffering from a cardiac arrest (Souers et al., 2021) or a stroke (Ashraf et al., 2015) has significant consequences on the victims' chances of survival. This is attributable firstly to a lack of awareness on the part of bystanders to recognize the signs of gravity of the situation (Dobbie et al., 2018; Pulvers & Watson, 2017; Teuschi & Brainin, 2010). Secondly, research also mention a insufficient knowledge and training from the citizens regarding the actions to be carried out (Berg et al., 2019; Case et al., 2018). Finally, delays can be prolonged further because of unfamiliarity in collaborating within the chain of survival (Deakin, 2018).

Citizen training and retention of first aid skills

The training of citizens in first aid is not uniform across countries. In France, for example, only 20% of the population is formed in first aid[1]. In contrary, in Switzerland, all citizens have to assist and validate a first aid

[1] https://solidarites-sante.gouv.fr/IMG/pdf/180326-dossier_de_presse_priorite_prevention.pdf

course at least once to be able to obtain their driving license. Still, despite the fact that citizens are trained, research shows that the retention of their knowledge and skills lasts from 3 to 6 months (Regard et al., 2020; Aqel & Ahmad, 2014). Most of the time, the first aid training is done in a low fidelity simulation situation; an instructor explains the actions to be performed and the participants practice on a mannequin. For the past few years, many training courses have been using high fidelity simulations, which put the learner in a situation closer to reality and enable him to interact with the actors of the survival chain. Several research have highlighted the benefits of high fidelity simulation in terms of knowledge acquisition and retention (La Cerra et al., 2019; Everett-Thomas et al., 2016) particularly if the simulation includes a subsequent debriefing (Tong et al., 2022; Cheng et al., 2018). Indeed, the high fidelity simulation puts the participant in a situation where he/she is involved cognitively but also emotionally. He/she is in an active position setting which Kolb refers to as an "experiential learning" setting (Kolb, 2014). The “embodied” experience in experiential learning enables the feeling of deepen emotions that could lead to a more intense imprinting of learning and a potentially longer retention of knowledge. In addition, the debriefing process provides an opportunity for participants to move from a variety of individual experiences to a shared, deeper understanding of the situation and of its keys elements to successfully handle it (Flandin et al., 2018).

Training through the reactivation of lived experience

Predicting the outcome of a learning experience is difficult, in particular in innovative training settings. However, using "activity traces" is known to help the participants to reactivate not only the knowledge gained from the experience but also to generate new ones (Salini & Flandin, 2019). An activity trace is an actual or virtual tangible element collected or created through an activity that is used for analysis and investigation in ergonomics. Activity traces are selected by the researcher himself (video or photograph of the activity leading to an auto-confrontation[2] between the participant and the intervener (Bonnemain, 2019, 2015; Clot et al., 2000), by the participant (selected picture previously taken and discussed in public as in addressed photography / photovoice method (Félix & Mouton, 2018) or co-constructed with the participant during the activity (picture elaborated and designed with the participant during the activity). The more involved the participant is in the construction of this trace, the more likely this trace will be "intelligible", i.e. "likely to be evocative of meaning for him/her" (Salini & Flandin, 2019). For this reason, we opted to involve the participants in the creation of a photographic trace, which will be used to carry out a later auto-confrontation.

METHODS

The objective of this study is to evaluate the effects of a Living-Lab, a setting implementing a variety of methods (simulation, debriefing, photographic creation and auto-confrontation) on the retention of knowledge associated with the management of emergencies by bystanders.

Research questions

In order to fulfill this aim, we are following three research questions:

1) Is the Living Lab a means of achieving experiential learning conditions?
2) What are the main learnings expressed by the participants during the Living-Lab?
3) Is the knowledge maintained a few months after the Living-Lab?

Field of experimentation; HUG 144 Health Emergencies center

The research field was the Geneva Emergency Community and more specifically the experiments took place within the Health Emergency Center 144, which employs 47 people: 26 dispatchers, 6 supervisors, 3 managers, 4 doctors and 8 support staff. Also part of this community are 1500 first responders[3] via the Save a Life app, with whom the dispatch center has collaborated since 2019, as well as EMTs.

Population

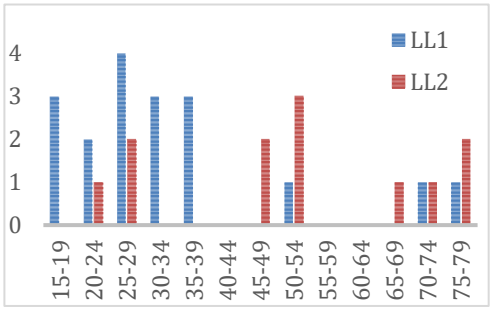
The HUG published an announcement on social networks advertising the Living-Labs to recruit a general population. It mentioned that any person wishing to participate in simulations followed by a training in first aid could register on one of the slots proposed on the HUG website. The exclusion criteria were having being trained

[2] The participant confronts the activity trace alone while being interviewed by a researcher, to be differentiated from the alloconfrontation where the participant is confronted to the trace of activity in the presence of a peer.
[3] Citizens trained in first aid who can intervene in nearby emergencies, alerted via a notification from the 144 Center.

in first aids in the previous 5 years and being a health care professional.

For the Living Lab 1, there were 18 participants for the simulation of cardiac arrests, 15 women (83%) and 3 men. The majority of the participants (Figure 1) were between 20 and 39 years old (21% of 25-29 years old, 20% for 30-34, 18% for 20-24 and 12% for 35-39). For the Living-Lab 2, we recruited 12 participants, 7 women (58%) and 5 men. 25% of participants (3) were aged between 50 and 54 years old, 17% for the 25-29, 45-49 and 75-79 categories and 8% for the 20-24, 65-60 and 70-74.

Figure 1: Age repartition of participants



The other participants were 8 dispatchers[4] from 144 center for the LL1 and 6 for the LL 2, 4 (LL1) and 2 (LL2) paramedics[5] and 14 first responder[6] only for LL1. Participant are coded as followed in the verbatim: 1B1A = 1 : ACR Living Lab / 2: AVC Living Lab, B: Bystander, 1: simulation 1, A: first bystander to take action.

Protocol

The Living-Labs are divided into 3 steps;

1) The experimental phase with a simulation (10 minutes), a collective debriefing (30 minutes) followed by an artistic restaging phase (1 hour).
2) A photographic exhibition involving all the participants (citizens, dispatchers, firsts responders, paramedics) (3 hours)
3) Individual interviews (6) one to two weeks after the exhibition (30 minutes)

Experimental phase

We performed simulations of emergencies (method 1): 8 of cardiac arrest (Figure 2) for the Living Lab 1 and 6 of stroke (LL2). The scenario was "You are in the waiting room for a job interview with someone who is starting to feel ill and collapses (LL1)/feeling dizzy (LL2). You can call for help, call 144 and follow the instructions". The dispatcher was using a video app to perform the assessment (Urgentime) and then was sending a demonstration video of the firsts aids to perform (SARA app). In both scenario, participants starts to perform first aids until the arrival of the ambulance. Save-a-Life first responders join the participant(s) around 6 minutes with a defibrillator (AED) in the Living-Lab 1. First aid was performed on a dummy for cardiac resuscitation while they were provided to a simulated patient (comedian) who played the stroke.

Figure 2: Cardiac arrest simulation (LL1)

The debriefing in form of collective elicitation interviews (method 2) follow the simulations with all participants per simulation (about 30 minutes). Elicitation interviews (Vermersch, 1994) are a technique aiming to focus on feelings during a particular event. The interviewer seeks to deepen the experience and the lived perceptions and prevents questions that result in a rationalized discourse (Vermersch, 1994; Cahour et al., 2016). The technique is suitable for both single and group interviews (Balas-Chanel, 2014).

Figure 3: Artistic restaging (LL2)

The artistic re-staging (method 3) was carried out by an artist selecting key moments of the simulation highlighted during the debriefing. The participants were invited to discuss and re-stage the moments to capture them in a photograph (Figure 3).

[4] Coded 1D1,1D2, …
[5] Coded 1P1A, 1P1B, …
[6] Coded 1FR1, 1FR2, …

Photographic exhibition

The participants were invited to participate in the opening of the exhibition at the HUG central hospital 8 months after the LL1 and 2 months after the LL2. We had 25 participants: 12 citizens from LL1, 7 citizens from LL2, 3 dispatchers, 2 first responders and 1 paramedic. The citizens were asked to present their photographs (Figures 4&5) to the audience and then were invited to participate at a social gathering.

Figure 4: Example of a final picture (LL1)

Figure 5: Example of a final picture (LL2)

Individual interviews

To evaluate the impacts of the approach, we carried out interviews on Zoom with the participants of the Living-Labs, 5 citizens, 1 first responder and 1 dispatcher. For this purpose we elaborated an interview guide, based on one created to assess the photovoice methodology (Budig et al., 2018). We had 4 main themes (13 questions):

- Motivations and background (4): to understand what led them to participate and what their level of training was before the Living Lab (example: How did you decide to participate in the Living-Lab?)
- Lived experience and learning from the experience (4), in order to evaluate what they have retained from the experience (practical, theoretical knowledge...) and thanks to which part of the experiment (e.g.: Did you become aware of elements that you were previously unaware of ? / Do you think that the experience has had an influence on the way you perceive the emergency chain?)
- Traces of activity (1), if they have had the opportunity to apply this knowledge and learn from their experience (If you had the opportunity, can you give us an example of how you used the knowledge gained during the Living-Lab?)
- Evaluation (4), to assess the development of a sense of community (Do you think the Living Lab has strengthened your connection/belonging to the emergency community?), the photographic experience and the exposure and retention of knowledge (From your point of view, which advantages and constraints are related to learning first aid in a Living-Lab context?)

Data collection and analysis

The simulations, debriefings and individuals interviews post exhibition were audio/video recorded. The artistic re-staging was audio and video recorded only in Living Lab 2. For privacy reason, we did not recorded the exhibition part. All the data were fully transcribed and analyzed with Atlas. We will focus on results from the analysis of the experimental phase (QR 1&2) as the analysis of the post-exhibition interviews is currently underway. We coded the corpus around 3 categories: expressed emotions (negative, positive and number of occurence, projection (personification of the victim, sensation of reality mentioned) and learnings (realization, feedbacks on practices, theoretical contributions, knowledge inputs). Finally, for the artistic part, we have identified all the key moments represented to classify them in terms of occurrence and we have collected data on the professionals' presence in the photographs. Based on the verbatims of the debriefing of Living Lab 2, we attempt to determine some initial evaluation elements for the photographic process.

RESULTS

Projection in the situation and emergence of emotions; conditions for the experiential learning

The first element we evaluated was the ability of projection into the simulation of the various scenarios. We observed that the high fidelity set-up allowed the immersion and the projection into a realistic situation for 61% (n=11) of the participants in the cardiac arrest simulation with a dummy and for 75% (n=9) of the participants in the stroke simulation with an actor. The addition of an actor's performance provides more immersion as he reacts and the situation progresses throughout the simulation, as pointed out by some of the participants: " *It felt real, the actor did the performance really well. It was somewhere between simulation and real life*" (2B3A) or "*I think that in my head it wasn't really a simulation, I had forgotten*" (2B3C). It could be expected that using a dummy might decrease the intensity of the immersion, yet for some participants, the projection was very strong, to the point where they personified the dummy as 1B3A evoked "*the most striking moment for me was when the person in distress started to feel bad*". However, in both situations (dummy/actor), some participants remained aware of the simulation, which distanced them from the situation as 1B5A *" I didn't get stressed because I understood that I was just on a dummy.*"

The second requirement for experiential learning is that participants should experience emotions during the session. We identified the various feelings expressed by the participants during the debriefing and the results are shown in Table 1.

Table 1. Feelings expressed by the participants

Feeling expressed	Cardiac arrest (n=18)	%	Stroke (n=12)	%
Reassured	11	61	4	33
Relieved	5	28	1	8
Stressed	11	61	3	25
Affected	2	11	3	25
Impressed	0	0	3	25
Afraid to call 144	2	11	1	8
Shocked	1	6	2	17
Worried	1	6	0	0
Panicked	1	6	0	0
Tense	1	6	0	0
Desperate	1	6	0	0
Fearing to hurt	1	6	1	8
Caught off guard	0	0	1	8

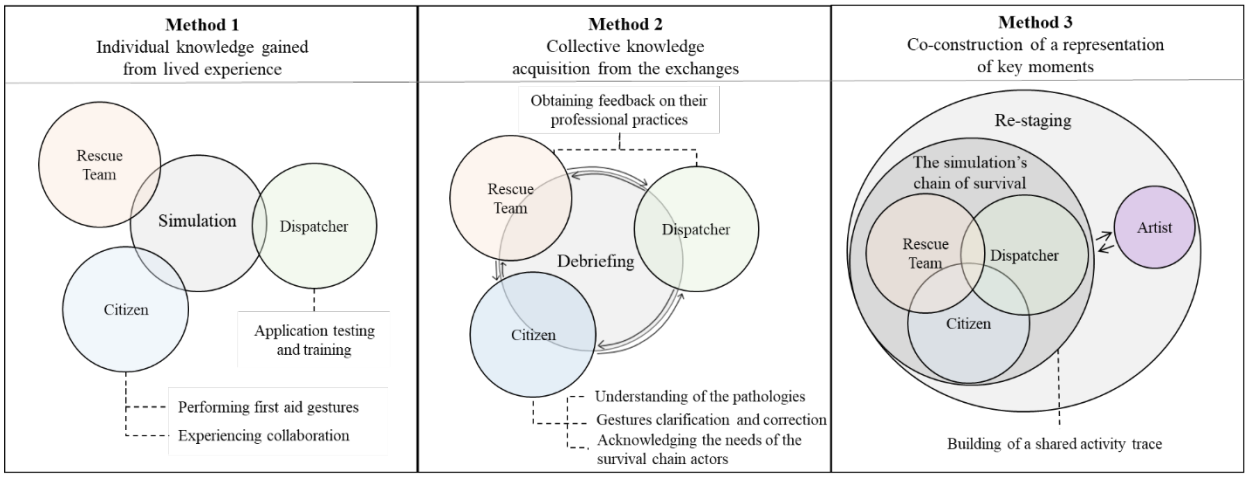
The results show that the participants felt mostly two positive emotions during the simulations, reassurance (61% for cardiac arrest and 33% for stroke) directly related to the contact and guidance by 144 (1B13C: "*As long as you have the person on the line, you are reassured. In the sense that we knew what to do*"). This emotion is followed by the feeling of relief (28% for cardiac arrest and 8% for stroke) associated with the appearance of help (first responder or paramedics) or the presence of another bystander (1B15A"*I felt relieved that they were there too, so I wasn't alone with him anymore*"). In the stroke situation, the percentage of positive emotions expressed is lower, potentially because fewer negative emotions were also experienced. Indeed, 61% of the participants in the cardiac arrest situation expressed stress compared to 25% in the stroke situation. In addition, some participants in the cardiac arrest situation said they were "panicked" or "desperate" while those in the stroke situation said they were "impressed". The cardiac arrest situation therefore provoked more strong emotions despite a lower degree of projection, whereas the stroke situation was perceived as less urgent and provoked fewer strong emotions.

Main learnings and building of an « activity trace »

The succession of methods (simulation, debriefing and artistic re-staging) leads the participants to learn individually through experimentation initially. They then expand their representations and primary learnings by exchanging with the other participants during the debriefing session to finally be led to create together a trace of activity as one specific chain of survival. The process as it has been structured (Figure 2) may facilitate the progression from an individual to a shared and collective memory within the group. As such, it is possible that the designing of the process itself creates a greater sense of belonging within the participants.

.

Figure 2: Learning and community building through sequential methods in the Living-Labs



Individual practice-oriented learning through experience

For bystanders, the simulation allows to experience an emergency and how to manage it in real time without prior knowledge. This implies stress management and collaboration with others. Most scenarios were conducted with several bystanders present. For some participants, collaboration was instinctive even though they didn't know each other (2B3B: "*we don't know each other but within a few minutes the connection is made and we feel that we are going to act together*"). For others, the presence of an additional person caused further difficulties as for 1B3B "*The person next to me was telling me " The man is going to die !". I was trying to stay focused but it was difficult*." and 1B5B: "*it was difficult to be two people because we didn't know what the other had already done*". For the most part, the bystanders experienced for the first time calling 144. It may have been first a source of stress (2B3A: *My most important experience is that for the first time in my life I called 144*", B16A: *Well first of all it was the first time I called 144 so even though it's an exercise, I was stressed* "). Yet, experiencing this call made them realize that the dispatcher was leading them, which brought reassurance both within the situation and in anticipation of potential future interaction (2B3B "*Now if I have to call 144, I know what to expect, what to do. I think that is something I will never forget.*"). Finally, the participants were able to experiment working with paramedics and first responders for Living Lab 1. While they instinctively walked away when rescue arrived (1B3B: *"The professionals are actually the paramedics, right? It is when they arrive that we stop*"), they experience being engaged in the resuscitation process via the rescue team prompting them to return and continue CPR (Simulation 11, 1P11A "*Stay here and give the massage*").

Simulation is also an opportunity for the bystanders to try to perform technical gestures as cardiopulmonary resuscitation. Some participants mentioned that they were impressed by the depth of compression required to perform a massage as 1B2C: "*you must press hard, it's surprising*" and some mentioned they realized how tiring CPR was as 1B13A: "*I found it exhausting, I didn't know it was so exhausting*". For the stroke situation, they had the opportunity to put the person in the Lateral Safety Position, an action more familiar to the general public as evoked by a paramedic "*PLS is usually the gesture that is remembered, even though it is probably not the most important one. It is systematically memorized and redone*" (2P2A).

For the dispatchers, simulation is an opportunity for testing applications in a training setting without risking undesirable effects in case of failure or delay in the use of the application as explained by one dispatcher in a later interview "*It is the first real use on a real and concrete case. I was determined to monitor the breathing with the help of the video and the bystander and to be able to objectify whether the abdomen was rising or not. I took the liberty of doing it in this setting and wasted 5 minutes before doing a cardiac massage, something I could never have allowed myself to do in real life".* It's a way to get familiar with the application and adjust their future practices based on what they have experimented. Although the dispatchers noted benefits in terms of assessment and gesture guidance (1D1 "*It really helps us to understand what is happening on the spot, to be able to evaluate the patient better, to be able to guide the gesture and to be able to see if the gesture we are trying to make is correctly done."),* they determined from the simulation that the applications were best used when there were at least two bystanders and it was crucial not to be fixated on the application if it did not work.

Enrichment through collective discussion of theoretical aspects and feedback on professional practices

The debriefings are an opportunity for the bystanders to deepen the knowledge acquired through the experimentation via inputs given by the professionals (dispatchers, paramedics and eventually first responders). Two main themes appeared in our analyses; a theoretical contribution on the simulation's pathology and its treatment as well as a provision of practical knowledge on the various roles within a chain of survival. For pathologies, the professionals provide explanations on :

- The etiology, i.e. the origin of the pathology, related to its treatment. For example, adult cardiac arrest are often due to a cardiac problem and not a pulmonary one so it is not necessary to give ventilations to the patient.
- The symptomatology: the symptoms suggestive of the pathology (for stroke, amputation of the visual field, difficulty to smile or to lift the arms, for cardiac arrest, the presence of gasp or "false breaths" that indicate that the person is not breathing), the signs of seriousness of a situation (the breathing, the state of consciousness)
- The stakes of performing first aids:
    - Placing the patient in PLS will protect his or her airway and prevent choking
    - Cardiopulmonary resuscitation keeps the victim's heart beating and therefore circulates blood and oxygen, otherwise after a few minutes, irreversible damage will occur ("*On a cardiorespiratory arrest, the losses of chances are very fast. After 3 minutes the brain is no longer irrigated*." 2D4)

Professionals are attempting to foster an awareness of the necessity of the gesture, while at the same time reassuring about the potential consequences on the patient of the bystander's actions as we can saw in these examples: "*even if you don't have the perfect position at least you do something. It's always a gain for the patient, if you don't do anything he dies*." (1P13A) and 1B15C: "*Don't we risk crushing the ribs if we do CPR too long?* 1D15: *The worst thing is to do nothing. It's true that sometimes you broke one or two ribs... But when you compress the chest and you release it, you make the heart beat. You can't stop because if you stop, the heart stops.*"

The second contribution of the debriefing for the bystander is to embrace their role as an active member of the survival chain. This is achieved through becoming aware of their position and responsibility as the first link in the chain; by deciding to call 144, to carry out the gestures asked despite being unsure about them ("*So we have a responsibility to intervene even if it's not perfect" 1B9)* and to stay as a relay for the emergency responders (1B11B:"*When the professionals arrived I immediately stopped and actually, I was wrong because we have to continue anyway"*). Another key to helping them is to gain a better understanding of roles, activities and expectations of the other actors. The debriefing is an opportunity for the dispatchers to insist on the importance of locating the victim and to give the bystanders elements to help future management (2D2 "*If you are in Geneva, it is rare that we don't have a geographical point to locate. There is always a store or a restaurant. We also have entered all the bus stops in the database. Otherwise, we'll send you a link that you'll open and that will geolocate you*"). They also explain that the most important thing for them is to determine if it is a life-threatening emergency (such as cardiac arrest) and otherwise to get resources to the location as quickly as possible (2D4 "*For a stroke, the point is that the ambulance arrives quickly, that the patient does his scan quickly and that he goes quickly to thrombolysis. Ultimately, it's almost a waste of time to be able to assess that it's a stroke without sending an ambulance."*). They also provide information that will help the bystander to do this more quickly ("2B4B: *So when we communicate with you, it has to be in key words*. 2D4: *There you go, one question, one answer*"). Finally, they can express the fact that they are doing all these activities simultaneously, which have generated misunderstanding and frustration for some bystander who had the impression of losing time in taking care of the patient. Similarly, the debriefing gives the paramedics a space to express their needs in terms of relay for the massage to perform gestures that are more technical. This global approach to an emergency situation, first through experimentation followed by a theoretical discussion based on a real and lived situation leading to an greater understanding of the causes, stakes and interveners roles, may allow more profound learning since it involves several paths of knowledge acquisition and memorization.

The debriefing is also of interest to professionals, as it is an opportunity for them to get feedback on their practices because they "*usually don't see the reactions"* (2D2). For the dispatchers, it allows them to "*analyze these practices*" (2D3). They grasp an understanding of the effects of their words on the bystander as said by 1D7 "*each word we use is very important and can be interpreted differently*" to the effect of the tone of their voice "*I am very pleased to discover that my voice calms people, that I don't change my tone and that it helps in the intervention. It's information that you never have in fact, so that's pretty positive."* (1D5). These feedbacks will lead to modifications in the emergency management procedures as mentioned by 1D9 "*We will re-evaluate and readjust our protocols. We become aware that there are also some flaws in our procedures.*"

Co-creating an activity trace as one survival chain

In this section we aimed to identify and compare the key elements chosen throughout the process and assess the primary outcomes of the approach for the participants. The table 2 displays the various photographic subjects (n=23) and actors featured in the pictures for the cardiac arrest situation[7] (n=13) and the stroke situation[8] (n=11).

Table 2: Key moments and featured actors

Keys moments		Occurrence	%	Dispatcher presence	Paramedics presence	First responder presence
Initial situation	2: Patient malaise	5	45	2	0	0
Assessment	1: Breathing	3	23	3	0	0
	2: Vision	2	18	2	0	0
First aid actions	1: Bystander CPR	9	69	6	1	2
	2: Bystander PLS	2	18	1	0	0
Relay with emergency team	1: First responder CPR	1	8	1	0	1
	2: Paramedic care	2	18	0	2	0

First, the events most represented were the bystander performance of cardiac massage (69%) for Living Lab 1 and the initial situation of patient malaise for Living-Lab 2 (45%). We also observe that the initial situation was not represented for cardiac arrest and that re-staging focuses on the phases around cardiac resuscitation, the pre-phase, the assessment of breathing (23%) and the post-phase, the CPR witH a first responder (8%). Because these phases were conducted mainly in collaboration with the dispatcher, 77% of the pictures featured the dispatcher, 23% the first responders and only 8% the paramedics. In contrast, in the Living Lab 2, as the most represented event concerns the initial situation, then equally the assessment of the vision, the implementation of the PLS and the relay with the paramedics, only 45% of the photographs include the dispatcher and 36% of photographs are the bystanders by themselves. Yet, paramedics were more included (18%) than in the Living-Lab 1. It can be assumed that the created activity's trace will reactivate in Living-Lab 1 participants the memory of an interaction with the dispatcher and of the cardiac massage, but will be less significant regarding the feeling of being part of the chain of survival, while it would be more present in the mind of Living-Lab 2 participants.

In terms of evaluation, participants mentioned during the debriefing that re-staging process allowed for a deeper marking of the whole process (2B3B: "*actually everything leaves a mark, simulation, debriefing and photography. I never expected so many different experiences*", 2D3 "*it provides an amazing reminder*") and it created some expectation about the exhibition to come.

Knowledge retention after a few months

The final selection for the exhibition was generated by the artist in discussion with the researchers and is composed as follows:

- 8 photographs of the cardiac arrest re-staging (LL1): 6 bystander CPR interacting with the dispatcher (4), with the dispatcher and first responder (1), with paramedics (1), 1 breathing assessment with a filming bystander and 1 CPR performed by the first responder
- 4 photographs of the stroke re-staging (LL2): 1 of the initial situation with the patient's collapse and the call to 144, 1 of the patient's vision assessment and 2 of the PLS positioning of the victim.

The interviews post exhibition were conducted with the selected photos by confronting the participants using the photo-voice method. The results are currently being processed.

[7] Noted 1
[8] Noted 2

DISCUSSION

Does the living lab provide a setting for experiential learning ?

The following section discusses our findings in light of the existing literature. The first research question focused on the suitability of the Living Lab as a tool for providing experiential learning. Experiential learning (Kolb, 2014) refers to learning in an active position in a realistic situation involving the participants physically, cognitively and emotionally. In order to achieve the most realistic situation possible, we chose to use a high fidelity simulation (La Cerra et al., 2019; Everett-Thomas et al., 2016), with a scenario, real professionals (dispatcher, paramedics and first responders) and for the Living-Lab 2 a comedian playing the victim. To assess this aspect, we examined the participants' feeling of projection and immersion in the two settings. More than half of the participants described the simulation as real and projected themselves, occasionally even forgetting the experimental nature of the setup. The presence of a comedian provided an added sense of immersion for the Living-Lab on Stroke. However, one of the other prerequisites for experiential learning is to bring out intense emotions. In contrast to the feeling of immersion, the cardiac arrest simulation generated more strong emotions (positive and negative) than the stroke simulation. At stake was the perception of a lower degree of severity of the stroke situation, showing that indeed a bystander's lack of awareness and recognition of the severity of the symptoms might have a detrimental effect on the care of the victim (Pulvers & Watson, 2017). Though it is still too early to know which modality results in deeper learning or whether the combination of the two has an effect on it, it is worth noting that while the moment when participants evoked the most negative emotion (stress) and projection was the initial situation for the cardiac arrest and stroke, they were relatively unrepresented in the selected activity traces. The selected moments, on the other hand, correspond to positive emotions, mainly the relief of interacting with the dispatcher to perform the technical gestures. The selection of a photograph by the research team can then constitute a bias in the sense that the more the participant is integrated in the process (construction, selection and presentation of the photograph), the more it evokes meaning for him (Salini & Flandin, 2019). Although the participant actively contributed to the elaboration of the photograph, he was deprived of the final choice, the very basis of the interview confrontation (Bonnemain, 2019, 2015; Clot et al., 2000). The main result of these findings is that our Living-Lab setup seems to provide the prerequisites for experiential learning by mixing learning channels and approach.

From individual experiential learning to the creation of a shared representation

In terms of learning content, the findings show that the 3 methods provide different knowledge. The simulation will bring individual and subjective knowledge from the experimentation. For the bystanders, it is mainly experiencing an emergency situation and having to react in collaboration with real actors while taking an active position in the chain of survival (by calling 144, by performing gestures). The simulation brings to the dispatchers knowledge on applications, their contexts of use, their effects in a setting that allows a test without risk for the victim. The debriefing, which is considered one of the key elements in the retention of learning after a simulation (Tong et al., 2022; Cheng et al., 2018) will allow to deepen this knowledge by theoretical contributions. The knowledge provided by the professionals concerns the pathology itself, its etiology, its symptomatology and a clarification of the need to perform certain actions. The global explanation of the pathology in connection with the purposes of the gestures to be carried out gives, firstly, the opportunity to raise awareness about the necessity of rapid action which is one of the deficiencies mentioned in the literature (Souers et al., 2021, Dobbie et al., 2018; Pulvers & Watson, 2017, Ashraf et al., 2015). Secondly, it also provides an opportunity to demystify people's fear of performing an inappropriate action or an action that could have negative consequences for the victim (Berg et al., 2019; Case et al., 2018. The professionals insisted during every debriefing on the fact that the worst thing to do was to do nothing and that they would be guided to perform the gestures. Moreover, the debriefing and the creation of a shared activity trace moves participants from an individual experience to a group experience through exchanges that focus on stakeholder needs. Dispatchers expressed that they require the location of the victim and a single contact point, paramedics insisted on the need of a relay on site to perform cardiac massage and expect bystanders to be active when they usually withdraw when the rescue team arrives. This discussion thus familiarize participants with collaboration within the chain of survival, another identified weakness from the literature (Deakin, 2018). In parallel, the feedback given by participants gives professionals insights to adapt their protocols and discourse to facilitate futures interactions.

CONCLUSION

As a conclusion, the Living Lab setup offers a variety of learning opportunities through different approaches, while enabling a transition from an individual experience to the establishment of an entity of the chain of survival. The richness of this approach is the diversification of methods that allows for a significant engagement of the participants. The artistic creation of a trace of the activity doesn't constitute an mandatory step to reproduce this

type of Living-Lab. However, this last method allows to anchor in a tangible way in the memories the learnings resulting from this experience. The post-exhibition interviews analysis will provide evidence regarding the most efficient methods in terms of learning and knowledge retained 2 to 8 months after the Living Lab. This will allow us to adapt our method for potential future uses.

REFERENCES

Aqel, A. A., & Ahmad, M. M. (2014). High-fidelity simulation effects on CPR knowledge, skills, acquisition, and retention in nursing students. *Worldviews on Evidence-Based Nursing*, *11*(6), 394-400.

Ashraf, V., Girija, A., Maneesh, M., Praveenkumar, R., & Saifudheen, K. (2015). Factors delaying hospital arrival of patients with acute stroke. *Annals of Indian Academy of Neurology*, *18*(2), 162. https://doi.org/10.4103/0972-2327.150627

Balas-Chanel, A. (2014). *La pratique réflexive dans un groupe, du type analyse de pratique ou retour de stage*. 22.

Berg, D. D., Bobrow, B. J., & Berg, R. A. (2019). Key components of a community response to out-of-hospital cardiac arrest. *Nature Reviews Cardiology*, *16*(7), 407-416.

Bonnemain, A. (2015). *Les paradoxes de l'intensité affective dans l'autoconfrontation : L'exemple de l'activité dialogique des chefs d'équipe de la propreté de Paris*.

Bonnemain, A. (2019). Affect et comparaison dans le dialogue en autoconfrontation. *Activités*, *16-1*, Art. 16-1.

Budig, K., Diez, J., Conde, P., Sastre, M., Hernán, M., & Franco, M. (2018). Photovoice and empowerment : Evaluating the transformative potential of a participatory action research project. *BMC Public Health*, *18*(1), 432. https://doi.org/10.1186/s12889-018-5335-7

Cahour, B., Salembier, P., & Zouinar, M. (2016). Analyzing lived experience of activity. *Le Travail Humain*, *79*(3), Art. 3. https://doi.org/10.3917/th.793.0259

Case, R., Cartledge, S., Siedenburg, J., Smith, K., Straney, L., Barger, B., Finn, J., & Bray, J. E. (2018). Identifying barriers to the provision of bystander cardiopulmonary resuscitation (CPR) in high-risk regions : A qualitative review of emergency calls. *Resuscitation*, *129*, 43-47. https://doi.org/10.1016/j.resuscitation.2018.06.001

Cheng, A., Nadkarni, V. M., Mancini, M. B., Hunt, E. A., Sinz, E. H., Merchant, R. M., Donoghue, A., Duff, J. P., Eppich, W., & Auerbach, M. (2018). Resuscitation education science : Educational strategies to improve outcomes from cardiac arrest : A scientific statement from the American Heart Association. *Circulation*, *138*(6), e82-e122.

Clot, Y., Faïta, D., Fernandez, G., & Scheller, L. (2000). Entretiens en autoconfrontation croisée : Une méthode en clinique de l'activité. *Perspectives interdisciplinaires sur le travail et la santé*, *2-1*, Art. 2-1. https://doi.org/10.4000/pistes.3833

Deakin, C. D. (2018). The chain of survival : Not all links are equal. *Resuscitation*, *126*, 80-82. https://doi.org/10.1016/j.resuscitation.2018.02.012

Dobbie, F., MacKintosh, A. M., Clegg, G., Stirzaker, R., & Bauld, L. (2018). Attitudes towards bystander cardiopulmonary resuscitation : Results from a cross-sectional general population survey. *PLOS ONE*, *13*(3), e0193391. https://doi.org/10.1371/journal.pone.0193391

Everett-Thomas, R., Turnbull-Horton, V., Valdes, B., Valdes, G. R., Rosen, L. F., & Birnbach, D. J. (2016). The influence of high fidelity simulation on first responders retention of CPR knowledge. *Applied Nursing Research*, *30*, 94-97. https://doi.org/10.1016/j.apnr.2015.11.005

Félix, C., & Mouton, J.-C. (2018). La photographie adressée, comme méthode indirecte d'accès à l'expérience du professionnel. *TransFormations-Recherche en Education et Formation des Adultes*, *18*.

Flandin, S., Ria, L., Périnet, R., & Poizat, G. (2018). Analyse du travail pour la formation : Essai sur quatre problèmes méthodologiques et le recours à des synopsis d'activité. *TransFormations - Recherches en Education et Formation des Adultes*, *18*, Art. 18. https://transformations.univ-lille.fr/index.php/TF/article/view/224

Kolb, D. A. (2014). *Experiential learning : Experience as the source of learning and development*. FT press.

La Cerra, C., Dante, A., Caponnetto, V., Franconi, I., Gaxhja, E., Petrucci, C., Alfes, C. M., & Lancia, L. (2019). Effects of high-fidelity simulation based on life-threatening clinical condition scenarios on learning outcomes of undergraduate and postgraduate nursing students : A systematic review and meta-analysis. *BMJ Open*, *9*(2),

e025306. https://doi.org/10.1136/bmjopen-2018-025306

Pulvers, J. N., & Watson, J. D. G. (2017). If Time Is Brain Where Is the Improvement in Prehospital Time after Stroke? *Frontiers in Neurology*, *8*. https://www.frontiersin.org/articles/10.3389/fneur.2017.00617

Regard, S., Rosa, D., Suppan, M., Giangaspero, C., Larribau, R., Niquille, M., Sarasin, F., & Suppan, L. (2020). Evolution of Bystander Intention to Perform Resuscitation Since Last Training : Web-Based Survey. *JMIR Formative Research*, *4*(11), e24798. https://doi.org/10.2196/24798

Salini, D., & Flandin, S. (2019). La trace comme ancrage pour l'analyse de l'activité et la conception de formations. *Formation et pratiques d'enseignement en questions*, *Hors série 3*, 67-84. https://hal.archives-ouvertes.fr/hal-02272329

Souers, A., Zuver, C., Rodriguez, A., Van Dillen, C., Hunter, C., & Papa, L. (2021). Bystander CPR occurrences in out of hospital cardiac arrest between sexes. *Resuscitation*, *166*, 1-6. https://doi.org/10.1016/j.resuscitation.2021.06.021

TeuschI, Y., & Brainin, M. (2010). Stroke Education : Discrepancies among Factors Influencing Prehospital Delay and Stroke Knowledge. *International Journal of Stroke*, *5*(3), 187-208. https://doi.org/10.1111/j.1747-4949.2010.00428.x

Tong, L. K., Li, Y. Y., Au, M. L., Wang, S. C., & Ng, W. I. (2022). High-fidelity simulation duration and learning outcomes among undergraduate nursing students : A systematic review and meta-analysis. *Nurse Education Today*, *116*, 105435. https://doi.org/10.1016/j.nedt.2022.105435

Vermersch, P. (1994). *L'entretien d'explicitation [The explicitation interview]*.