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Social Interaction

Video-Based Studies of Human Sociality

Data collection at height:

Embodied competence, multisensoriality and video-based research in an extreme context of work

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Abstract

Coordination, communication and practice in a range of extreme and highly specialised work settings rest upon orientations to sensory resources. For researchers to collect interactional data and to make sense of the embodied conduct of participants in these settings, we therefore argue that particular forms of researcher competence are critical. While the importance of a researcher's competence in a setting has been widely discussed in ethnomethodology and conversation analysis, the types of embodied competence required to study these settings demand further consideration. Here we spotlight ways in which various types of setting-specific participation and embodied competence have informed (i) our data collection strategies and (ii) our abilities to make sense of the recorded data in a study of rope access work, otherwise known as industrial climbing.

Keywords: competence, multisensoriality, embodied interaction, extreme work, data collection

1. Introduction

There is a growing interest in organisational practices that underpin work in 'extreme contexts' (Hällgren et al., 2018). Such research highlights how participants who make life-and-death decisions routinely rely upon abilities to experience the world with all their senses (Schmidt et al, 2015; de Rond, 2017). For scholars interested in social interaction in such settings, capturing the occasioned relevance of different sensory experiences presents a potential challenge. Audio-visual data alone often provides only limited access to the participants' perspective, given that participants rely on their multisensory experience of the situation. Furthermore, the desire to analyse interactions 'which represent people's ordinary business' (Mondada, 2006, p. 4) is further challenged when that ordinary business takes place in settings that present remarkable practical limitations on the collection of audio-visual data. Therefore, we suggest that the usual claim that competence in the setting is important for interactional research takes on particular significance in settings of extreme work.

In this paper, we outline how the setting-specific participation and embodied competence of the researcher present opportunities to better record, recognise and analyse aspects of sensory experience. We focus on professional training for rope access work, otherwise known as 'industrial climbing'. This is a method of working where ropes and other climbing equipment are used to safely undertake inspection, repair and maintenance work at height. While conducting a larger study of safety practices in rope access work, it became clear that we must take seriously the multisensory resources key to teaching and learning in this setting. For instance, visible, audible, tactile and kinaesthetic phenomena are highly relevant to participants in sharing and developing their professional, practical and safety competence.

In this article, we provide insights into how the lead researcher's competence and participation shaped our collection of audio-visual data, and our analysis of the sensory resources key to work practices in the setting. Like Kuroshima and Ivarsson (2021/this issue), we will share our experiences of how we were able to overcome some of the challenges of recording multisensorial and multimodal activities in a complex setting. In particular we consider how different strategies helped us to (i) determine the 'equipment array' required to collect recordings; (ii) "find the action" (Heath et al. 2010, p. 43), while preserving the integrity and safety of the professional activities at hand; and (iii) refine our data collection methods so as to treat "taping as an iterative, progressive process" (C. Goodwin, 1993, p.194). We then show how this generated a body of data to examine the multifarious sensory resources attended to by participants in the scene. Before we turn to these issues, though, we will briefly relate our research to currently emerging discussions of multisensoriality and interaction analysis.

2. Multisensoriality and video-based studies

Over the past forty years or so, we have observed a growing interest in the body and embodiment in sociology and cognate disciplines (Shilling, 2007). There have been substantial developments in theory and methods as well as a burgeoning body of empirical research addressing ways in which the body is treated and understood in everyday encounters. While a few early studies (e.g. Birdwhistell, 1970; Scheflen, 1974) explored how the body features in social relationships and interaction, video-based studies of interaction in ethnomethodology and conversation analysis have been particularly influential in the systematic examination of the interplay of vocal and bodily conduct (C. Goodwin, 1981; Heath, 1986; M. H. Goodwin, 1990).

For many years, video-based studies of interaction focused on phenomena most readily available to audio-visual records of action and interaction. There was an obvious emphasis on talk, gaze and bodily movement, often to the exclusion of sensory resources and experiences that are not easily recorded. Some studies explored how seemingly individual qualities of people's hearing and seeing are rendered available to professional tests in audiology (Egbert & Deppermann, 2012) and optometry (vom Lehn et al., 2013). And, other video-based studies mentioned, almost in passing, the relevance and the qualities of tactile conduct for social interaction in studies of work and everyday life.

However, sensory phenomena have been drawn more explicitly into video-based studies of interaction by a body of innovative work that explores the important role that sensory action and sense perception play in the organisation of action. They have, for example, examined tactile phenomena key to dance and family relationships (Goodwin & Cekaite, 2018; Cekaite & Mondada, 2020), as well as the professional significance of taste and smell (Fele & Liberman, 2021; Mondada, 2021).

In these studies, audio-visual data make it clear to the researchers, as lay members, how qualities of sight, hearing, touch, smell or taste are made publicly relevant and available by participants themselves. Indeed, the accountability of sensorial practices makes them accessible to co-participants and simultaneously provides opportunities for researchers to build the videographability of the activity (Mondada et al, 2021/this issue). In the rope access training centre, sensory phenomena are sometimes, and similarly, available to any analyst of social interaction. However, we would argue two ways in which this is challenged. Firstly, the collection of audio-visual data to assess the relevance of embodied conduct and sensory experience is more feasible when the researcher has the embodied competence to participate fully in the field. Secondly, at times, having that embodied competence enables the analyst to better understand the significance of certain aspects of conduct and the resources in and through which sensory experience is made relevant by members themselves.

The importance of the analyst's competence in the setting for the work of analysis is highly relevant for ethnomethodological studies. One of Harold Garfinkel's (2006/1948) principal critiques of 'traditional' sociology is that it produces scientific descriptions from the perspective of an external observer. In his view, sociological descriptions have therefore little in common with the experience of the actor in everyday life. To address this, many ethnomethodologists adopt Garfinkel's (2002) proposal that a necessary approach for understanding the production of social order rests on the 'unique adequacy requirement of methods'. This notion speaks to Garfinkel's aim to overcome the distinction between common-sense and scientific descriptions of the social world (vom Lehn, 2014). Together with Wieder, Garfinkel argued that ethnomethodologists can make sense of the social world only when they become at least 'vulgarly competent' in the local production and natural accountability of the phenomenon they are investigating (Garfinkel & Wieder, 1992, p. 182).

It has been noted that there are different levels of unique adequacy, providing for a weak and a strong form of the requirement (Garfinkel, 2002; Rooke & Rooke, 2015), ranging from 'sufficient competence to operate in a setting without censure' through to refraining from 'drawing on any theoretical resources that are not native to the research setting' (Rooke & Rooke, 2015, p. 37). Jenkings (2018) expands on the relationship between membership and unique adequacy by highlighting the importance for ethnomethodologists to embody members' practical knowledge in order to be able to describe practices naturally occurring in the field. Thus far, however, ethnomethodological ethnographies that adhere to the unique adequacy requirement have remained somewhat distinct from other approaches to ethnomethodological research (for rare exceptions, see Dupret & Ferrié, 2008; and Sormani, 2016).

Video-based studies of interaction often note the value of fieldwork for informing data gathering as well as revealing key properties of complex organisational and technological settings (Heath et al, 2010; Mondada, 2021). However, even when extensive competence is developed in a work setting (e.g. working as a 9-1-1 call-taker for 15 months, Whalen, 1995), the contributions of these aspects of fieldwork are often under-elaborated. Therefore, in our paper, we want to highlight the relevance of the unique adequacy requirement of methods for video-based studies of embodied interaction and multisensoriality in extreme and highly specialised work settings. Indeed, to study extreme social settings, like rope access training, we suggest that various forms of competence and membership are critical to support both the collection and analysis of data.

3. Rope access work: Challenges for video-based research

The fact that rope access work is learned and performed at height makes it especially difficult to study with video methods. It raises distinctive challenges that draw together issues of mobility, multisensoriality, access and risk.

There is already a significant body of video-based research concerned with mobility and the movement of the body from place to place (Haddington et al., 2013), but the nature of mobility in our setting is rather distinct. Previous studies have examined vehicular mobility, where people drive (Deppermann, 2018; Goodwin & Goodwin, 2012) or fly (Melander & Sahlström, 2009). However, individuals' bodies are fairly static within vehicles and can be recorded with cameras held or placed on the dashboard or between the drivers. Others have considered 'local mobility' (Luff & Heath, 1998), and there are two main approaches here. On the one hand, cameras can be placed at specific locations that capture a moving scene – for instance, across a skateboarding pool (Ivarsson & Greiffenhagen, 2015), at the entrance to a building (Weilenmann et al., 2014) or around exhibits in a museum or gallery (vom Lehn, 2012; Best & Hindmarsh, 2019). On the other hand, we see researchers using 'roving cameras' (Heath et al., 2010) to follow the action as individuals move from place to place, whether on walking tours (de Stefani & Mondada, 2014) or using e-scooters to traverse city streets (Tuncer et al., 2020). But these studies of local mobility mostly take place on fairly flat surfaces, whereas the type of movement that takes place in the rope access training centre presents additional challenges, as participants can be located at very different heights, and individuals move quickly from one height to the next.

Prior studies of rock climbing (Hofstetter, 2021; Jenkings, 2017) and indoor climbing (Simone & Galatolo, 2020) have tended to use fixed cameras at the base of a climb. However, within the rope access centre, students practice manoeuvres in which they continuously move up and down ropes as well as laterally across steel girders and catwalks as they learn how to safely navigate their work domain. While the students are on the ropes, the instructors might be on the ground, sitting on a girder or hanging on ropes themselves. Given these issues of space and mobility, using a single fixed camera, or alternatively using a single, researcher-held roving camera, would make it very difficult to capture data amenable to the study of embodied conduct.

An additional challenge arises when aiming to capture the range of interactional resources relevant to rope access training. Instructors and students communicate with each other and make sense of their environment using sight, sound and touch. Mondada (2019; 2021) has shown that even though the video camera may not be able to record seemingly private senses like smell and taste, video can be a valuable tool to study the public displays of these sense experiences (Fele & Liberman, 2021; Mondada, 2021). Nevertheless, cameras must be in place to capture individuals' engagement with materials and establish the resources that inform aspects of conduct. In rope access training, explicit discussions of tactile and kinaesthetic phenomena are frequent and are used in training and instruction – for instance to reveal how weight should be distributed between different rope systems. In order to record these phenomena, it is important that the researcher is able to both recognise these moments and work around the different environmental obstacles that might make them difficult to record.

As well as challenges related to mobility and multisensoriality, there are additional safety-related challenges. For instance, the placement of a standard, tripod-mounted camera on a catwalk would introduce a potential safety hazard into an already dangerous environment. Accordingly, the need to 'avoid the action' (Heath et al., 2010, p. 44) is rather acute in that regard, such that the cameras must be accommodated in the work, rather than inhibiting or obstructing it. The fact that the training centre environment is a dangerous setting places an additional constraint on what might then be recordable and how a researcher might safely navigate the scene.

Thus, we have a setting in which participants are moving across space, located at different heights, relying on material and interpersonal resources that are both distant and close at hand, and where there are serious safety risks for the participants and researcher alike. As an extreme context of work, it is also a potentially dangerous context for research. In the following sections, we aim to document the strategies, experiences and decisions adopted to resolve these challenges and to study embodied interaction in the context of rope access training.

3.1 Selecting the 'equipment array'

Our first concern was to identify recording equipment well suited to capturing multiple, mobile bodies working at height. From his previous research on rock climbing, the lead author had identified the benefits of using small recording devices (e.g. GoPro cameras) worn on the helmets of the research participants. Small helmet-mounted cameras allow the participants' own bodily movements to direct what is recorded and later studied by the researcher (see also Licoppe and Figeac, 2018, on the use of wearable cameras). If the cameras are small, they do not restrict movement and they allow the participants to go about their work as they normally would. As rope access workers already wear a full body harness and helmet, the addition of a small helmet-mounted camera is neither troublesome nor restrictive.

Helmet-mounted cameras offer a view that indicates where that person is looking, what they are touching and, indeed, a close-up of their work with hands, ropes and other equipment (see Figure 1).

Figure 1. Views on the same scene from two helmet-mounted cameras revealing manual rope work

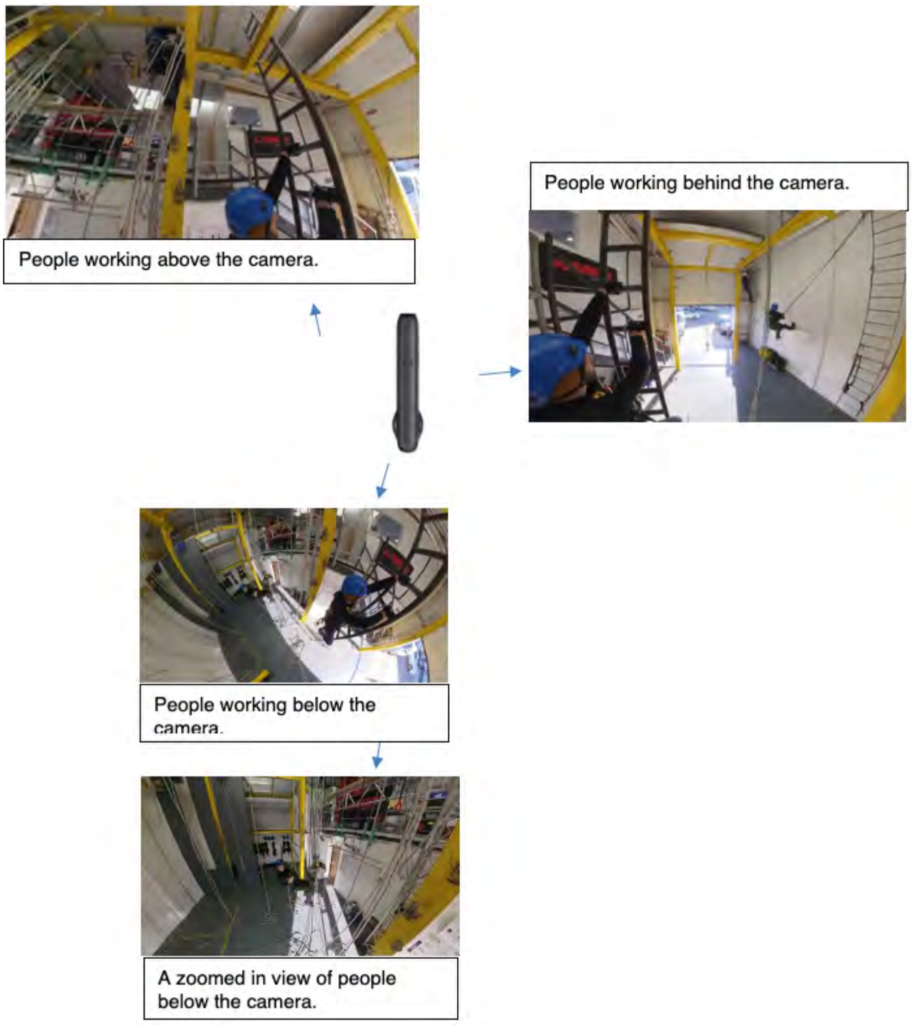
However, these cameras alone do not provide sufficient access for the analysis of multisensorial practices in the rope access training centre. Therefore, given the wide range of recording options on the market, it was important to be able to experiment with various combinations of recording devices. It was not appropriate to experiment with equipment in the training centre itself because experimentation, and the inherent possibility of mistakes, might heighten risks, or, on a more mundane level, undermine the ability to secure and sustain the trust of the participants.

Therefore, indoor climbing gyms provided a comparable and readily accessible environment to test out options. There, pairs of climbers communicate with each other at various distances and from different angles and often provide feedback on each other's activities. In the course of our tests, we discovered two key issues to be addressed that required us to use more than just the helmet-mounted cameras: (i) the quality of sound recorded is often poor and (ii) multiple first-person views provide detailed, but fragmented, viewpoints that can be hard to reconcile. To consider each in turn:

1. ***Audio.*** Capturing useable audio data is an underappreciated concern in video-based research. Indeed, in many settings, it is often easier to collect near broadcast quality video data than to secure audible recordings of talk. To solve the problem in our setting, we found that police-style bodycams were very helpful. These offer a series of benefits for research in our setting: (a) they come with a lightweight body harness which makes the camera secure, unobtrusive and easy for climbers to wear; (b) they are designed to be robust, so if they happen to bump against a structure at height, they are less likely to be damaged; (c) they are designed to record over long periods, so that changing batteries (and disturbing trainees and instructors) is unnecessary; (d) they are designed to record speech of participants nearby; (e) unlike helmet-mounted devices, the bodycam's placement towards the top of the chest tends to offer a clearer audio from the mouth; and (vi) they also record a different camera view on a complex scene (useful in its own right and as a back-up recording).

2. ***Reconciling views.*** To capture a coherent view of the wider scene, we used a 360° camera. This presents a number of benefits over a standard tripod-mounted camera: (a) it captures climbers' movements through height without the need for re-positioning or adjustment; (b) it keeps different parties in shot, even as the distance between them extends; (c) it is very lightweight, which makes it possible to mount on a tripod or hang from the rafters; and (d) while researchers are often concerned with the influence of off-screen conduct, the 360° camera provides the built-in possibility to check different angles and participants in the scene (see Figure 2). There are, of course, limitations to what the 360° camera can capture, for instance in relation to sensory experiences, but as McIlvenny (2020, p. 803) suggests '[w]ith passive 360° cameras, we catch a glimpse of how we might begin to recover the lived practice of circum-stance and the artful production of a spatial field'.

Figure 2. The same moment viewed at multiple angles from the same 360° camera vantage point



Experimentation in the indoor climbing gym enabled us to identify a workable equipment array for use in the training centre study (see Figure 3). That said, planning the exact data collection strategy demanded greater familiarity with the nature and organisation of activities in the centre itself.

Figure 3. The equipment array

A) Three helmet cameras (Next to a blue helmet)

B) Three Police style body cameras

C) Three harness mounts to fix body cameras to participants

D) Two 360° cameras (one acts as a back-up)

E) One Tripod for a 360° camera

Three participants (one instructor and two trainees) each wore a single bodycam and helmet-camera at all times while one 360° camera was placed at a fixed position on the scene. The second 360° camera served as a backup in case the first ran out of battery.

3.2 Finding the action

While selecting the equipment array is an important step, the next step for us was to decide on where to *focus* our recordings. Within the training centre, people were involved in teaching and learning a range of manoeuvres, activities and tasks. Any and all of these could be recorded. However, we wanted to select activities that might best inform our concerns with safety practices. Therefore, we needed to better understand the setting in order to identify the specific locations and activities to focus our data collection.

To inform these decisions, the lead author participated in a rope access course as a student. It was possible to secure access to the course because of his extensive experience as both a rock climber and new route developer[1]. The movement of climbing ropes and abseiling down overhanging rock to establish

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[1] Developing new routes for rock climbing on cliffs that no one has ever climbed before and climbing 'first ascents' often involve the use of much more complicated rope skills than normal recreational climbing. Most of the modern routes that the average rock climber enjoys at weekends have been extensively cleaned of loose rocks and sometimes equipped with bolt anchors to make them safe for popular use. Preparing or developing new routes for climbing in this way often involves the use of complicated rope techniques to access steep sections of unclimbed rock, and then the climber must hang there for long enough to drill holes for bolts and lever off loose blocks of rock with a crow bar. Both the rope techniques that are used and the amount of time that is spent hanging on ropes while using tools make new route development very similar to some aspects of rope access work.

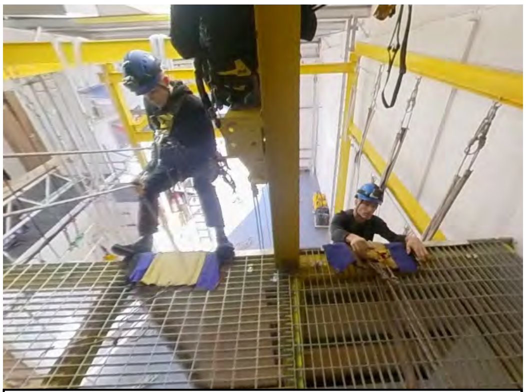
first ascents require a similar embodied competence as that used in rope access work. Even so, the precise equipment and context of each are sufficiently different for the technical rock climber and rope access technician to consider threats in their environment somewhat differently. Thus, the training and certification process gained in the rope access course helped the lead author to further his knowledge of safety practices in rope access work and identify locations and activities that might be most fruitful to record.

For instance, the opportunity to practice each manoeuvre during the training course, and make the common mistakes of a novice, provided initial insights into the character of teaching and learning in the setting. Experiencing those events first hand highlighted some of the communicative, multisensorial resources key to rope access training and suggested which camera angles would best capture them. Furthermore, and outside of the formal coaching sessions, brief conversations with instructors and students over lunch and coffee breaks made it possible to discuss the challenges presented by different rope access skills.

Following the completion of the training course, the lead author then worked in the industry as a window cleaner during the cold months of the year. This work experience sharpened his understanding of the significance of the manoeuvres and their relevance for the professional community. As an aside, working as a window cleaner also seemed to ease access, as it convinced gatekeepers and participants alike that the researcher was committed and genuinely interested in understanding their profession.

Participation in the setting and the wider development of professional, embodied competence helped us to decide to focus the study on the training of two manoeuvres in the centre (Figure 4). One manoeuvre – called 'going over the edge' – was chosen because it is key to most work settings. Here, an operator usually descends over an edge to move from a flat platform to the ropes hanging below. The second manoeuvre, a 'simple rescue', was chosen because it is a common cause of failure during assessments. To perform a rescue, the technician must retrieve a casualty and return to the ground with them attached to the harness. Performing this complicated manoeuvre while also maintaining the necessary standard of safety for two people means that there is additional potential for error.

Figure 4. The two manoeuvres



Two trainees 'going over the edge'

One trainee rescues a casualty

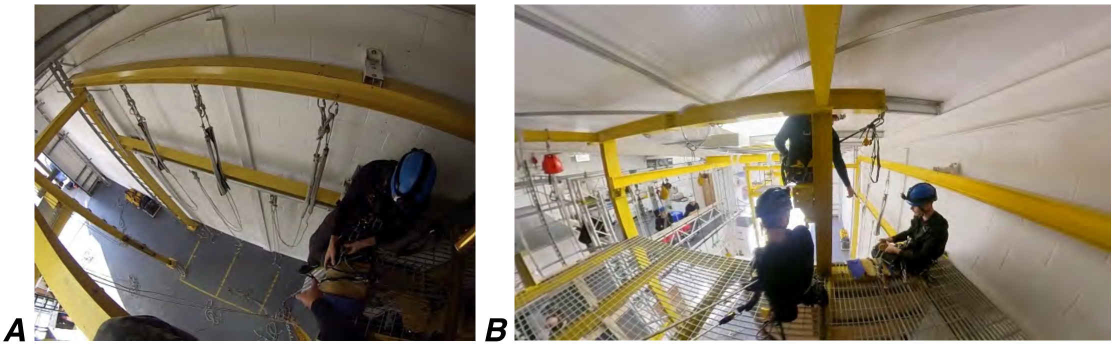
3.3 Filming as an iterative process

As a result of our preparatory work, we had been able to decide on the equipment to use and the manoeuvres on which to focus our data collection. Furthermore, we had decided that one instructor and two trainees would wear both a bodycam and a helmet-mounted camera, while a single 360° camera would be hung from the roof of the training centre. Seven cameras were used in total and were left running throughout each training session. While we had determined that initial set-up, the mobility of participants presented challenges for recording that demanded ongoing monitoring of the equipment and, in turn, occasional adjustments both between and during recording sessions.

While the bodycams and some of the GoPro cameras had viewfinders, it was not feasible to review the footage until the end of each training session. However, reviewing footage between sessions led to adjustments. After review of the 360° footage of trainees going over the edge, we decided that the camera was too far from the action (Figure 5). It was positioned to record events taking place both above and below the edge. However, when reviewing data from different sources, it became clear that the various helmet cameras captured a better view of the actions of trainees (Figure 6, Image A) than the 360° camera positioned some distance away. Having a view of the trainee's back was not adding to the quality of the data set (Figure 5). Thus, in the next session, the 360° camera was moved to a position above the catwalk, which delivered a valuable, additional perspective on the scene (Figure 6, Image B). This camera position provided a good view of the trainees as they began the manoeuvre and as they later returned to the platform.

Figure 5. Perspective from the initial placement of the 360° camera

Figure 6. Later perspectives from two different cameras at the same moment



A. Instructor's helmet camera footage which reveals where he is pointing to and what the trainee is doing with his equipment in that moment.

B. The 360° camera footage shows how everyone on the platform is moving in that moment and what their response is to the instructor's utterance and gesture

The fact that the lead author was certified to move freely above the training centre floor made it possible to move the 360° camera while instruction was ongoing and without disturbing the participants (see Figure 7). This was also possible when lighting conditions in the training centre changed and the camera needed to be moved. If we had to rely on the instructors to position and adjust the cameras, it would have been an additional burden that participants might have resisted and, even if participants had agreed to adjust the cameras, they would only have been able to do so occasionally, most likely generating a number of unusable recordings.

Figure 7. Still frame from the 360° camera as lead researcher moves it

During the recording sessions, the lead author wore the same equipment as everyone else and often took a position close to the group of trainees. This meant that he was near enough to be able to make adjustments to the helmet-mounted cameras in between manoeuvres, for instance if he noticed that a camera had been bumped and dislodged (Figure 8).

Figure 8. Adjusting helmet-mounted camera angles in the field

In making such micro-adjustments, it was necessary to rely on embodied experience in the setting (e.g. understanding the distances and angles between participants during manoeuvres) coupled with a detailed knowledge of the equipment itself (e.g. typical camera fields of view). Importantly, the camera angle that might work for one person could not be used for a participant of a different height. When a tall person ties a rope to a beam that is at the height of their waist, they tilt their head down at steeper angles than a shorter person who performs that task with the same beam at the height of their chest. Therefore, when adjusting a helmet camera to record manual work, it is important to consider the ways that the body will move during specific manoeuvres. If the researcher themselves is competent in the task and has an embodied sense of the relative position of objects and structures in the course of the task, they can use that embodied knowledge to inform the work of adjusting the camera angle (see also Pehkonen et al., 2021).

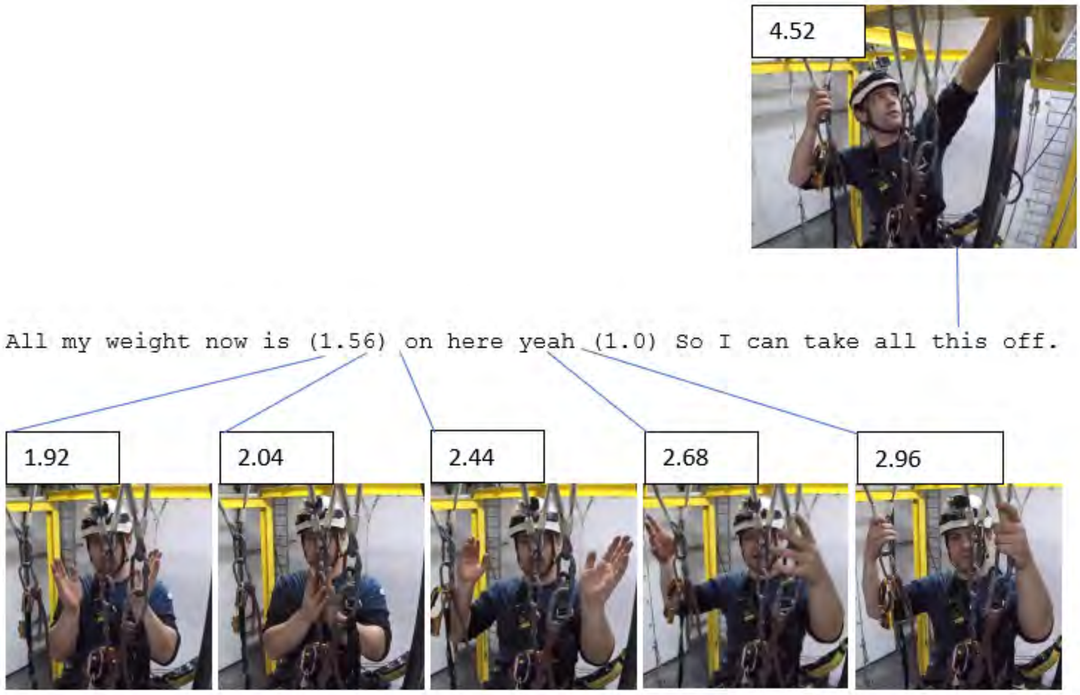
4. Capturing multisensoriality in flight

Now we wish to demonstrate how these practical solutions generated data to support the analysis of multisensoriality at work: firstly, by considering an instructional demonstration that attends to the tactile and kinaesthetic properties of rope work, and, secondly, with a correctional sequence that rests on the visible and audible properties of bodily effort or strain.

4.1 Demonstrating the distribution of body weight

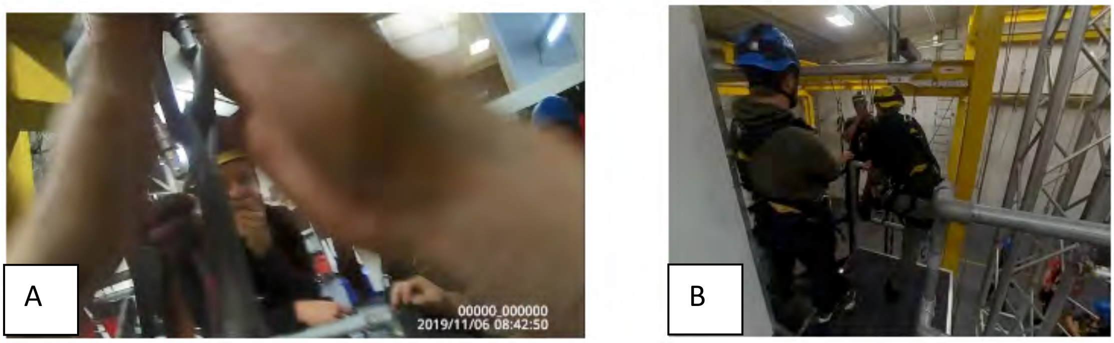
First, consider Figure 9 which depicts an instructor hanging in his harness from a high girder. He is connected to the girder with three separate points of contact that connect his harness to the three steel cable ‘strops’ that hang over the girder. One of these points of contact is a ‘short link’ of nylon webbing that has a carabiner on each end, and the other two are longer pieces of nylon rope called ‘cow’s tails’ that are tied to his harness on one side and have a carabiner at the other end. He is also connected with two hooks to the ladder that he has just climbed. Thus, he is hanging in mid-air connected to five anchor points. In this short sequence, he indicates which of his three points of contact to the girder must be supporting his weight before he is able to safely remove his connections to the ladder.

Figure 9. Demonstrating position of body weight on equipment



The first point to make is that we can see that the instructor is fully in view. And yet, the local mobility of participants in the setting makes it very difficult to anticipate where these kinds of learning conversations and demonstrations will arise. Indeed, the 360° camera (Figure 10, Image B) does not provide a clear view of the demonstration at all (although it does present the wider context). The instructor's helmet camera is angled to record trainees he will be supervising from a distance and thus is too high to record much of his own manual demonstration. Meanwhile, the instructor's bodycam image does provide a rather useful view of his hands and, maybe more importantly here, reveals some of the visible responses of the students' during the demonstration (Figure 10, Image A). However, the fact that the instructor secures the attention of the trainees means that the student's helmet-mounted cameras offer a very clear view of the demonstration. This allows us to explore the design of the demonstration depicted in Figure 9.

Figure 10. Views from the body camera and 360° camera at 2.04 s



Returning to Figure 9, the student's helmet-mounted camera enables us to explore how sensory experiences are made publicly available in the course of the instructor's demonstration. In particular, consider the strip of three images that follow 'All my weight now is' (at seconds 1.92, 2.04 and 2.44). Here, the instructor claps two hands on the gear, but the nylon sling does not move and stays taut. Thus, it becomes visible and available that this is where his weight is supported – it reveals the tension in the sling that would otherwise remain invisible to the students. The instructor then grabs two other ropes (at seconds 2.68 and 2.96), which shake a little, revealing how they are not supporting his weight, but he indicates that they do provide back-up points of connection if the main rope fails.

These interactional displays of tension in the ropes – tension that he experiences between rope and body – reveal both that he is fully connected to the girder and that this is the moment when he can safely 'take all this off', referring to his now redundant connections to the ladder (image at second 4.52). Our use of multiple helmet-mounted cameras ensures that this occasioned demonstration is available for analysis. The cameras deliver for us because instructors often call on students to watch their demonstrations of technical work from within a similar range of distances and angles. Having witnessed many of these embodied demonstrations as a student, the lead researcher was able to position each camera so that its field of vision would suitably frame the bodies of the others during those interactions. As a result, we can see that while the distribution of the instructor's body weight is experienced bodily, his demonstration of that phenomenon rests on the visibility of his hands clapping against a rope that does not move. There is a separation of sense experience and sense demonstration.

4.2 Identifying signs of bodily effort and strain

Next, consider Figure 11, which begins with a puzzle to motivate our analysis. Joe has just completed a manoeuvre, and the instructor asks, 'how was that Joe?' (line 1). Interestingly, even though Joe responds 'yeah, was alright (line 2), the instructor says, 'So the reason why you <u>felt like it wasn't high enough</u> is because you didn't have that connected to the anch (0.3) to the alpine butterfly' (line 3).

There is nothing obvious in line 2 that reveals a problem for the trainee, but nevertheless the instructor identifies a problem 'felt' by the trainee. The puzzle is this: which resources are used by the instructor to identify what the manoeuvre 'felt like' for the trainee? To explore, we need to rewind the tapes to examine the manoeuvre itself (see Figure 12).

Figure 11. Correcting Joe

```
01 I:  How was that Joe?(1.0)
02 T:  Yeah.h.h was alright↑ (4.7)
03 I:  So the reason why: you felt like it wasn't high enough is because you
04     didn't have that connected to the anch(0.3) to the alpine butterfly.
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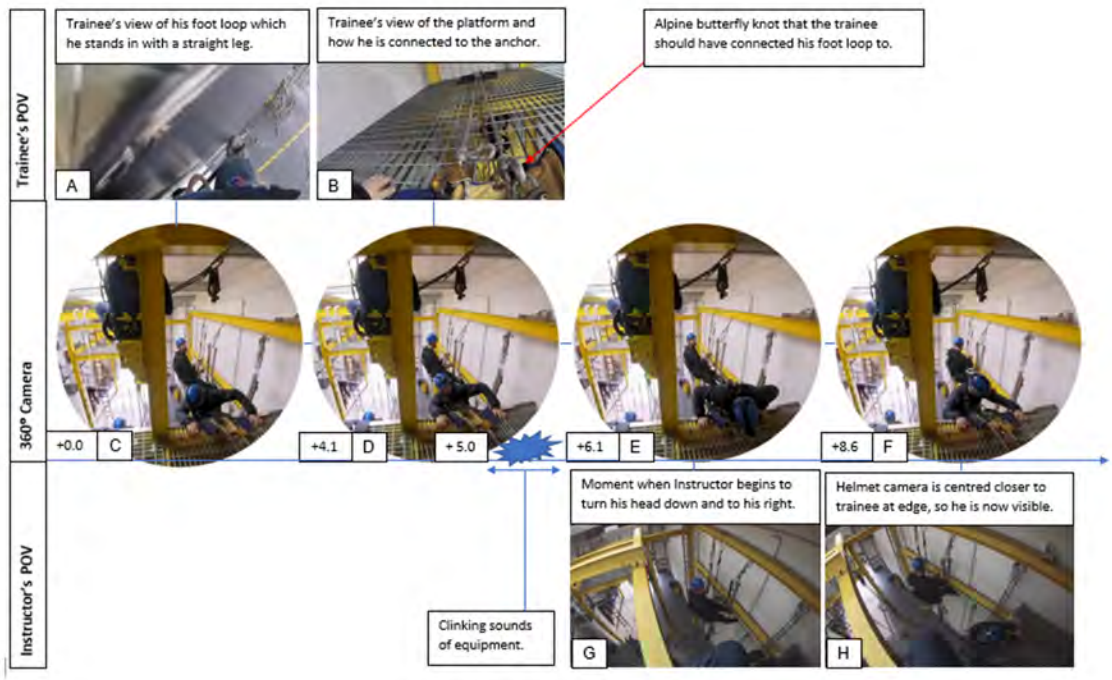
Figure 12. Three perspectives on one error



Here, the earlier discussion of our re-positioning of the 360° camera becomes relevant, as we are able to bring together three different views on the scene in order to make sense of it. After reaching the lip of the platform, the trainee spends a few seconds surveying his situation before attempting to climb onto the platform itself. When he looks down at his right foot (Figure 12, Image A), we can see that his leg is completely straight as he stands in his foot loop. As he looks back up (Figure 12, Image B), we can see that the edge of the platform is roughly level with his chest and that he is connected to the knot with a different carabiner than the one which has his foot loop on it. If his foot loop had been connected to the actual knot instead of the rope which hangs below it, as it was, then his right foot would be much higher and he would easily be able to get his waist over the edge by simply standing up on his right leg. But because the trainee is unable to reach the ledge from his current position, he tries to jump up to the platform, like how one might exit a swimming pool. Unfortunately, he is only able to get his chest over the edge (Figure 12, Image E) before slumping back down again (Figure 12, Image F).

Of course, the instructor does not have this viewpoint - so how can he possibly resolve the problem? Well, firstly, the 'jump' (which occurs between images D and E) makes a lot of noise as the equipment on the trainee's harness rattles and some of it bangs against the side of the platform. From the instructor's helmet camera, we are able to see him start to turn towards the trainee following the noise (Figure 12, Image G) and look directly at him by the time the trainee's body drops back down (Figure 12, Image H). The instructor continues to monitor the trainee from this moment on. Thus, he is able to watch as the trainee successfully climbs onto the platform on his second attempt, this time by placing his left foot on a girder to propel himself upwards.

Recent work in conversation analysis has explored ‘strain grunts’ and the ways in which bodily effort is made available through talk (Keevallik & Ogden, 2020). In this extract, however, we are exploring how bodily effort, or strain, is audible and visible to the instructor in other ways (e.g. from hearing the noise of the equipment hit the ledge; from seeing the trainee’s body slump back after an attempt to leap onto the ledge; from watching as the trainee then thrusts his body upwards by placing his left foot on a girder). The instructor can connect those signs of effort to the fact that the foot loop is not connected to ‘the alpine butterfly’ knot. The signs of bodily effort and strain, coupled with the instructor’s view of the trainee’s body in relation to the ledge, provide resources for the instructor to be able to claim, and claim unproblematically, that the trainee ‘felt like it wasn’t high enough’.

The use of multiple cameras captured both a moment of correction and also enabled us to recover the resources that the instructor could use to identify how the relative position of equipment felt for a trainee. This was only possible because the helmet cameras were angled in a way that framed both materials in the trainee’s environment and how his body engaged with them to reveal such qualities of feeling that relate to the task. However, having access to the various viewpoints is clearly not sufficient for analysis. Embodied competence in the specific manoeuvre helps us to make sense of what can be found on the video and the implications of those features (the straight leg, the position of the carabiner, etc.) for understanding the ongoing action. Indeed, this segment of video illustrates how the researcher’s competence in the setting makes possible the recovery and analysis of sensory experience at work.

5. Discussion

Our initial interest in rope access work was to explore how trainees are instructed to practice safety in an extreme workplace setting. However, through active participation in the scene, we quickly recognised that teaching and learning rest heavily on a range of sensorial resources that are subtle and easily overlooked. To bring them into our interactional analysis, we needed to collect video that renders these subtle resources available to us. But, while the unique adequacy requirement is rarely explicitly invoked in relation to video-based studies of interaction, we suggest that fulfilling this requirement supported us in both collecting our data, and, indeed, in making sense of them.

Decisions around data collection are often rather superficially discussed in accounts of video-based research. And yet, technical decisions around data collection must be closely aligned with developing an understanding of the activities in progress. This is nicely noted in work on interaction among deafblind people, where cameras need to capture whole bodies, because ‘they interlock their legs or touch legs to sense their interlocutor’s body movement and to provide feedback within the unfolding talk’ (Iwasaki et al., 2019, p. 225). Here, we provide a similar discussion of the requirements for collecting data to better understand the sensory experiences that underpin rope access instruction and practice.

Based on an understanding of the embodied practices of rope work, we used various mobile technologies to secure a range of perspectives on the scene. Participation in the training course enabled the lead author to use his experience to make decisions about how cameras might best be mounted on a participant's body without putting them at risk; select angles and perspectives that might work best for different manoeuvres; gain the trust of participants such that data could be collected; and participate in the scene to make contingent adjustments to cameras without risking safety, time, or access. So, the opportunity to collect relevant data in an extreme context of work, like rope access training, has been supported by the lead author's competence in rope access and participation in the training centre itself.

However, as non-experts, the other two authors clearly found that filming interactions between trainees and instructors is not sufficient to make sense of the work at hand. The relationship between action and experience is too complex in these environments for a quasi-external observer to obtain an understanding of the goings-on. For example, the feeling of tension in a rope or the sound of a carabiner clicking shut can be critical for trainees and instructors to assess if a procedure has been accomplished safely. An analysis of the video alone, without the necessary competence in the scene, may not allow the analyst to appreciate the significance of these sensorial experiences.

With video-based research, we must acquire the competence both to describe practices naturally occurring in the field (Jenkings, 2018) and to identify the relevance of conduct in recorded interactions. Indeed, as rope work is a multisensory activity, the recorded materials are not readily intelligible if the researcher is not themselves familiar with the bodily work involved with particular manoeuvres. One technique often used to access participants' experience and practical expertise is to watch data fragments with them to discuss questions that have arisen for the analyst. Indeed, this is a common practice in video-based studies of work (Heath et al., 2010). This is highly appropriate in many settings, and if we could have overcome the data collection problems, we could have adopted this as our main route to develop some degree of vulgar competence. However, this inevitably restricts the scope and level of questions that might be asked and the nature of the fragments chosen for discussion. And, in relation to sensory experiences, interviews alone will struggle to elicit descriptions that capture tacit knowledge and practices, especially if the experts have difficulties articulating phenomena for people who have not experienced them first hand.

Furthermore, as Jenkings (2018) notes, competence is not a binary – something you have or not. While the lead author had previous experience of rock climbing, through his ongoing participation he developed further competence with profession-specific gear, profession-specific bodily manoeuvres, profession-specific rules and procedures, location-specific activities and challenges as well as competence with the adaptation of the recording equipment to the scene. This exposes layers of competence that can be overlooked in generic proposals to adopt the unique adequacy requirement. Whilst Garfinkel and Wieder (1992, p. 182) refer to the need for 'vulgar competence in the local production … of the phenomenon', they leave unspecified the variety of competencies, including practical, technical and embodied competencies, that participants bring to bear in specific situations.

This paper has revealed some of the challenges researchers have to overcome if they wish to produce adequate descriptions of participants' multisensory experience of rope access instruction. It has highlighted that increasing the number of cameras and other technologies enhances the visual perspective and the size of the data corpus but does not alone enable researchers to access members' method. First hand, practical and multisensory experiences of training are required to understand participants' action in their production and design. Indeed, in this highly specialised, extreme work setting, it seems to us that embodied membership is necessary to make sense of even some of the most basic practices of teaching and learning.

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