Distributed Marking in Sport Corrections: A Conversation Analysis of Synchronized Swimming

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Abstract

This paper is an empirically based contribution on the communication of corrections in synchronized swimming. Our claim is that marking is a socially orgnanized skill that can be found in sports corrections. Conversation Analysis provides the framework to locate the pathways of communication modalities in real professional trainings. Through video-aided ethnographic work, which includes observation and interviewing the Spanish Olympic team for four months, we captured standardized communication patterns. We analyzed the video of the training sessions with ELAN software for micro-interactions. Our results show that the modalities of speech, marking, gesture and gaze appear in synchronized swimming. There is an epistemological asymmetry between the trainer and the swimmers as experts in different domains. Still, we found instances of distributed marking through analysis of gaze behavior. Marking for others in synchronized swimming has a cognitive function that goes beyond individual reflexivity and recall. Corrections in sports training are a product of socially managed turn taking.

Introduction

Professional environments such as Olympic sports trainings require continuous adjustments and corrections. How does a trainer correct the swimmers of an Olympic synchronized swimming team? Our research question calls to mind the need for acknowledging the social root of expert communication. A review of recent theories on the cognitive abilities of agents (Clark, 2008; Kirsh, 2013) and of professional interactions (Cicourel, 2006; Rogers, 2006; Tulbert & Goodwin, 2011) makes clear the need of models that integrate empirical findings from naturalistic settings. The added value of these studies is that they explain how reasons are constructed locally allowing for an integrated explanation of action (Muntanyola-Saura, 2014).

The gap in explaining real world environments applies to sports trainings such as Olympic Synchronized swimming. We look at the conversational components of interaction in training as distributed elements for communication and thought. Conversation Analysis (CA) (Sacks, Schegloff & Jefferson, 1978, Broth & Mondada, 2013) puts forward how in any professional interaction there is one and only one person speaking at a given time, while speaker change recurs with minimal gap and minimal overlap (Have, 1999).

Our analysis is multimodal because corrections go beyond speech, including other actions such as facial expression (Broth & Mondada, 2013), orientation shifts and gesture (Streeck, 2008). Marking a type of modality that adds on to speech, gesture, tool-use, gaze and body posture (Kirsh et al, 2009). It has two functions: selecting the most relevant aspects for cognitive processing on the one hand, and communicating movement on the other. Our specific research question is how marking behaves as a modality in sport corrections and to which extent it can be considered an instance of socially distributed cognition (Hollan et al, 2000). We look into the location of marking in turn taking and how it combines with other modalities such as gaze and talk. We gathered our data from a video-aided cognitive ethnography on the Spanish synchronized swimming Olympic team that took place from March to July 2012. We applied ELAN software for analysis of small-scale interactions to 400 hours of video. CA allows us to make explicit gaze as a kind of action (Mondada, 2009; Tulbert & Goodwin, 2011) and locate marking as a cognitive strategy (Kirsh et al, 2009).

Theoretical Background

Turn taking indicates the mutual comprehension of what is being communicated: not only engaging, but also keeping the conversation going shows the dynamic nature of human communication. Verbal corrections are prevalent among dancers as embodied demonstrations that contrast right and wrong performances (Keevallik, 2010). Synchronized swimmers do not create new movements following an open ended compositional structure, as is the case with contemporary dancers (Muntanyola, 2014), but follow a tariffed score. Olympic trainings are a clear example of goal-oriented institutional talk. The common goal of the trainer and the swimmers, defined by FINA, is performing a self-choreographed routine of 3min 30 sec (+- 15 seconds) that gets the top score by the judges. This restriction defines an epistemological asymmetry (Heritage, 1997) based on the difference in expertise among the participants. Synchronized swimmers embody a choreography that the trainer herself cannot perform, which gives them the exclusive status of experts as athletes. In dance, corrections can involve the choreographer's vocalizations communicating form or 'quality', (Kirsh et al, 2009), informal comments and gazes by fellow dancers during trainings (Muntanyola, 2014), hands-on adjustments or marking the movement with the body (Muntanyola & Kirsh, 2010). In sports, there have been less effective examples of correction-use: exceptions Finlay & Faulkner (2002) and

LeCouteur & Feo (2011) where verbal communication is weighted against other forms of communication.

Studies in language, movement and perception (Senghas, 2003, Premack, 2004) show how specific cognitive mechanisms interact with the social environment. The intersubjective nature of our- biologically defined- cognitive capacities arises from our capacity to judge and evaluate the actions of others' as our own (Tomasello, 2003). In Noë (2004) gaze is an activity of exploration that is mediated by sensorimotor skills. Thus, the gaze becomes a kind of action, like gesture and movement. In Gibsonian terms, the agents afford a field of possible actions according to their interaction with socio-technical systems such as scientific laboratories (Alac, 2014) call centers (Heath & Luff, 2012), and medical settings (Cicourel, 2006). The analysis presented here looks at synchronized swimming as a setting for another type of socio-technical system, that of sports corrections. We explore how gaze behaves together with other modalities that take place in sports corrections, such as marking. Since gaze is as a socially organized modality, we also take marking as a socially defined skill.

Marking is a common modality to dancers and athletes, and also musicians (Kaastra & Kirsh, 2013), scientists and physicians. Muntanyola & Kirsh (2010) explore thinking with the social body and define marking as a key modality in dance. Marking happens when "a dancer creates an externalized version of some aspect of a phrase, attends to it while making it, and because of the constraints that are graspable while working with his or her body, she uses the marking process to understand something deeper about the intended structure of the phrase" (2010:10). It allows them to train their moves without doing the full thing. Marking has two functions: on the one hand, it can be part of the cognitive process that helps remembering better, in a more complete or reflexive way, the meaning and the pathway through the dance steps. Expert performers in their different domains select aspects such as weight, speed, direction or dynamics, which is what the swimmers and the trainer in synchronized swimming are dealing with. On the other hand, marking allows dancers and athletes to communicate moves with their bodies without using speech, and in a more complete way than gesturing or sonification. Both markings imply a change of plane that constitutes a Klein transformation (Muntanyola & Kirsh, 2010). In terms of shape, marking can be small, only moving fingers, hands and arms in a smaller scale than the actual move, or large, which involves moving the whole body.

The ethnography of dance rehearsals introduced a third distinction, related to gaze direction, which is marking for self or marking for others. Gaze to one's body indicates the need for recall or reflection, while gaze to other participant bodies stands in for coordination or communication. The separation of the functional, expressive and directive dimensions allows for a careful analysis of distributed cognition (Hollan et al, 2000). Cognitive distribution comes with the agent's need to project into the spatial and temporal environment conceptual arrangements that simplify choice,

perception, or computation (Clark, 2008; Gibbs, 2006). Distributed marking will happen only when the cognitive function of marking, both small and large, is directed towards the other participants in the system. Distributed cognition is a by-product of the individual's cognitive needs together with the immediate physical and linguistic environment.

Methods

We present a CA analysis of a video ethnography of the Spanish Olympic synchronized swimming team. We structured the excerpts by Turn Constructional Units (TCU) as defined by Sacks et al (1978) to analyze the interactions taking place between the trainer and the duet of the Spanish Olympic team. We consider the trainer as well as the swimmers experts in their domains, with superior knowledge about their activity. We provide detailed video analysis of multimodal interactions within the team during training sessions. Detailed knowledge of the observational field was possible through note taking and video capture at the High Performance Center for 4 months in 2012. The observations and daily interviews took place in the spring of 2012, with 2 cameras.
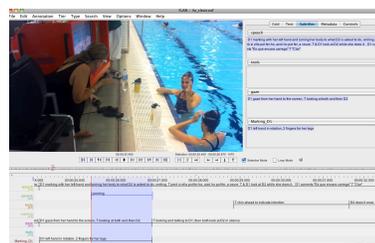

Figure 1: Video analysis with ELAN software.

In order to work with the video, we used ELAN® software (Figure 1). The Max Planck Institute originally developed ELAN for Psycholinguistics for the analysis of micro-gestures and interactions, which makes it suitable for transcription of movement. Our unit of analysis is the turn taking among the trainers and the swimmers during training, as part of Activity Relevant Episodes (Barab et al, 2001). We divided the standard training process into seven phases. We labeled a new phase every time the swimmers performed a section of the choreography. We exported the codification to statistically account for a standardized process of rehearsal, with speech, tools, actions and duration of ARE in figure 2.

0'								
Interactive Phases	Prep	p1	T1	P2	T2	P3	T3a	T3b
Speech	S		S		S		S	S
Tools	T	T			T			
Duration	1,1	0,3	1,7	0,8	0,3	0,8	0,3	6,1
%	3,98	1,16	6,09	2,89	1,1	2,71	1	21,39

								28'
T3c	P4	T4a		P5	T5a	p6	P7	Coda
		S		S	S			S
		T						T
3,8	1	8,3		0,9	0,8	0,3	0,7	1,2
13,51	3,59	29,17		2,99	2,96	1	2,57	4,05

Figure 2: A training process in synchronized swimming.

From this first standardized pattern we selected phase T4a of the training process, where the trainer is correcting one of the participants of the duet (S2) on the correct position of her hip. This snippet is relevant because of its central location, sufficient duration and rich multimodal patterns. The Jeffersonian transcript conventions provide a literal transcription of the interactions line per line; its primary aim is to help the reading of the original interaction in its natural setting (Figure 3). ELAN snapshots complete the accounts for all modalities of communication.

talk	Speech is in bold (translated from Catalan)
[]	Overlapping talk
=	Latching
WHAT	Louder voice
(())	Described phenomena
()	String of talk for which no audio could be achieved

Multimodal details have been transcribed to the following conventions. Actions (including gesture and marking) are described in the following line and are synchronized with talk thanks to a series of landmarks.

**	Delimitates one participant's actions descriptions (S1)
** **	Delimitates one participant's actions descriptions (S2)
--->	Gesture or action described continues across subsequent lines
>---	Gesture or action described begins before excerpt's beginning
++	Delimitates one participant's actions descriptions (T)
Gaze	Description of direction of gaze
S1	Participant is identified when she is not the current speaker

Figure 3: Jeffersonian Transcript Conventions

Results and Discussion

In the interaction we analyze here, the trainer (T) is giving instructions to the duet (S1 and S2) from the Spanish Olympic team. The episode lasts 3 minutes and 25 seconds, and produces 15 seconds of the Olympic choreography. The interaction begins with S1 and S2 in the center of the swimming pool. After a 30 second performance, the trainer corrects, by the side of the pool, one of the members of the duet (S2) because her hip is too low. This dynamic is repeated four times, until the trainer considers that the swimmers understood what she wants and thus they move on to the next phase of the choreography.

1.Focused Attention   2. Structured Understanding
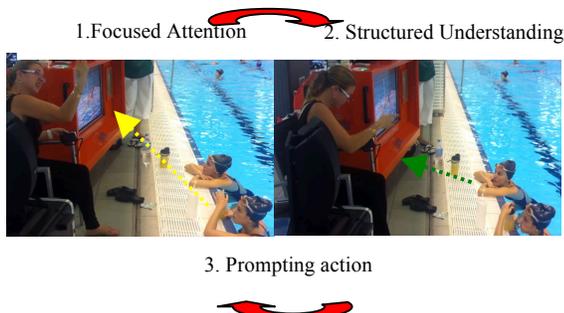
3. Prompting action

Figure 4: The Multimodal Interactive System of Corrections

Olympic swimmers see themselves on film, since the camera is part of the work process on a daily basis (see Figure 4). The athletes have both underwater and above water cameras. The trainer (T) stops the action (the swimmers' performance) and immediately shows on the

screens what has gone wrong. The swimmers (S1, on the left side of the image, is the most experienced swimmer, and S2, on the right side of the image, the youngest) swim to the side of the pool and wait for the trainer to show them the corrections. The trainer selects and views the snippet where the correction needs to be made based on her expert criteria, looking at the camera and pressing the rewind button, in figure 5. This directed action of attention comes with the manipulation of cognitive tools (Hutchins, 2005) and constitutes the first phase of a Multimodal Interactive System (Alac, 2014). The trainer in line 01 points out the figure that is wrong in this particular choreography. In the next turn, in 02, T verbally calls the attention of S2 on the wrong move. There is a question and then an imperative and pointing. The trainer points to the small screen of her video camera, while the swimmers look at the large screen. This pointing gesture reinforces the trainer's perception of the action.

```
01    T  +presses camera button to forward video+
            +Looks at the camera        ---> (1.5)
S1    * grabs her bottle and drinks   --->*
S1    * stares at the screen by the swimming pool --->
S2   ** stares at the screen by the swimming pool --->
T     >---Upward hand gesture --->
            +Looks at S2            --->+
02    T Do you see it? Ok? Look here
            +Looks back to camera --->
            Pointing to video screen--->+
```

Figure 5: Excerpt 1; MIS Phase 1 (11-19 Seconds).

Figure 6 includes lines 03 to 10: this is the second phase of the MIS. S2 in line 03 hesitates and pauses while small marking. In line 04, the trainers' previous verbal info is reinforced by 0,3 seconds of showing the step again on the screen. She manipulates the camera while S2 looks at her mistake again. Both the trainer and S2 use embodied modalities: the former's cognitive tool is the manipulation of technology and the latter relies on her own body as a tool for understanding. The trainer structures the information that the swimmers perceive, disciplining their perceptions by applying professional vision (Goodwin, 1994). This is a general phenomenon: Other forms of disciplined perceptions are present in workplaces such as in pre-clinical dental education (Hindmarsh et al, 2014). In synchronized swimming structuring happens by verbalizing the body part (the leg) that is not in the right position (lines 06-07). Such information is backed up by the image that shows on the large screen.

```
03    S2      Yes but:           (2.0)
            ** small marking right hand for her legs --->**
04    T        +Looks at S2--->+
                +gaze to camera              --->+
            + rewinding the video twice with no sound   --->+
S1            *with the second rewind, stops drinking --->*
05            *Taking into account that all the time you close
[both legs]*
```

S1 marking with both hands for legs, crossing hands --->*

S1 *looks at her hands--->* turns to the left   -->*
06   T   YOU CLOSE, you close:
              +FF the video twice with no sound +
S1   * looks at screen --->
S2   **grabs the bottle--->**
07   T   but you don´t raise the pelvis =
              +Marking her right arm for S2 leg+
              +Looking at S2-->
08   T   = You mustn't lower your pelvis=
              +Gaze to her right hand--->
            +Marking right arm 2 fingers--->+
09   T   = You must close   from here=
            +Rotating right hand 2 fingers, then again--->+
                          +looks at S2--->+
S2   ** looks at T--->   **nods--->**
10   T = You must close (So) in fact this element =
              +Raising right arm and 2 fingers--->+
              +Gaze to her right hand--->+

Figure 6: Excerpt 2: MIS Phase 2 (12-26 seconds).

Then, the trainer shows the wrong position four more times, correcting verbally (loudly in 06), gesturing and marking as illustrations for emphasis (upward hand gesture as a rising leg in 09-10). Held gestures enhance salience and observability (Tulbert & Goodwin, 2011; Mondada, 2014), and refine/reinforce what is being said in speech by selecting a specific aspect. As introduced in the theory section, marking has a double function, as a cognitive aid towards perfecting a move and as a communicative modality. In Muntanyola & Kirsh (2010) direction of gaze is an indicator of marking for self or for marking for others. This differentiation reappears in synchronized swimming. The trainer's is marking for self when her gaze is reflexively fixed on her own hand (08, 10), while she marks for others when she looks twice at S2 to communicates a new aspect of the correction (07, 09). In the swimmers case they both small mark with their hand (s) standing in for their legs and look either at the screen (03), which is yet another representation of the corrected move, or to their own hands (05).

The third phase of the MIS (27-33s.), which is not included in this paper, closes with the trainer verbalizing the strategic objective of obtaining the maximum score in the Olympic Games. She links this specific correction to a shared and overreaching goal such as getting a higher punctuation. Such an utterance sets a common goal for all the participants. The turn design in phase 2 and 3 of the MIS shows an asymmetric distribution of local knowledge, or epistemic asymmetry (Heritage, 1997). The trainer has the upper hand thanks to the manipulation of technology and her expert interpretation of the filmed performance. Still, on line 5 of excerpt 2 a relevant phenomenon puts into question this epistemic asymmetry. S1 stops drinking and while S2 is watching her mistake she self-selects and starts speaking

and marking. The initiation of a new turn by S1 in line 5 breaks the existing balance and identifies her as partaking in the professional vision of the trainer.

In the next phase (34-42 seconds, not included in this paper) S2 follows the trainer's instructions and performs the corrected move twice, without getting out of the water. Both the trainer and S1 align their bodies in the same angle and direction to watch the performance. S2's body becomes their common object of perception. S1 self-selects and evaluates S2 by describing what S2 is doing wrong: *She is charging her leg*. S2 puts her weight on her hip without tensing her leg.

The trainer agrees verbally, and when S2 gets out of the water, in excerpt 3 (Figure 7; 43-73 sec.), she loudly corrects S2, rephrasing in more precise terms what S1 just said, saying what S2 is not doing right (holding her body with her leg) (lines 1-2). The correcting sequence is similar to excerpt 2, with speech and marking as main modalities. Again, when taken as features in turn design, the analysis of gaze enables us to understand the form of participation characteristic of the setting. S1 and S2 look back at the trainer while she talks. T looks back while speaking when wanting to stress the content of what is being said.

S2   looks at T--->
1   **T S2! You are not holding your body with the leg**
     + Vertical right hand towards her own body   --->+
     S1   *looks at T--->
2   **T It is not like that, you turn your hip.**
        +Marks hands & wide arms   --->+
                          +Gaze to S1--->   (2.0)
        +Right arm upper right & lower left
        +Gaze towards her own hands-->+
3   **T And it stays here::**
        +Gaze towards S2-->
         + Scissor cutting with hands & 3 lifts right foot+
4   **S1   Yes**
              opens wide her arms--->
              *Gaze towards S2--->
              +T gaze towards S1--->+

5   **S1 And you leave the leg: and then
     you see this thing here**
        Rotates clockwise, straight arms
        Turns & collapses arms facing S2*
                    T looks at S2
+T moves forward with her body, still looking at S1+
6   **So you because you let this hip go**
        * Aligns with S2, opens arms--->*
        *Rotating body clockwise, angled arms
7 **S1 You have to move back and the leg stays, then**
        pushing her left arm *closing both arms*
8   **S2 nods**
9   **S1 Yes, where you look the hip remains**

open hand, straight arm
 *Looking at her arm   --->
 Turning counterclockwise, straight right arm
                    looks at S2-->
10   **T Ok?**
            Figure 7: Excerpt 3 (43-73 Seconds).

In line 04 a third party, S1, breaks the epistemological asymmetry a second time. There is an interesting shift in the trainer's gaze in line 02 that anticipates the turn: the trainer looks at S2, conveying a communicative intention as in excerpt 2, but in 02 she looks briefly at S1. This is a different situation to what we describe in excerpt 2, where the trainer interrupts or self selects her turn verbally while the swimmers are still talking or marking. The trainer in 02 leaves a wide linguistic space, a suspension (Oloff, 2013). It is an invitation to step in and explain to S2 further so that she understands what needs to be corrected. In this same turn she turns the gaze to her own hands while marking, and in the next turn she continues marking and looks at S2. As shown in dance rehearsals and in excerpt 2 gaze to hands indicates the need for recall or reflection, while gaze to another participants has a communicative function. This type of marking and gaze behavior indicates that the trainer is waiting for S1 to step in. S1 picks up the invitation (line 04) and explains the dynamics of the step to S2.

S1 continues her turn with an "and" (05) which puts her as the extension of the trainer's discourse. She proceeds to first mark, and then verbalize, the specific micro steps of the wrong trajectory that involves a low hip, a body that stays in the wrong place and a leg that is in a weird angle. S1's utterance and gaze towards S2 positions her in line with the trainer (05-09). The swimmer marks the same move, this time in a larger scale, and she verbalizes in detail the point where S2's hip is too low. Her large marking has a communicative function, as indicated by gaze direction. In 09 the swimmer says yes again, looks at S2 and continues her large marks in the water. During the turn, the trainer is looking at S1, and S1 is looking at S2, who gazes back at S1. Most importantly, the trainer's gaze follows an exchange between S1 and S2, and S1 adds verbally the use of a visual cue (*Where you look*) to help S2 in keeping her in the right place (line 09). The trainer waits until S1 finished large marking and showing the step to S2 to ask for confirmation from S2 (line 10). S1 is thus a cognitive extension of the trainer: her marking is both part of cognitive processing and a communication modality. This is an instance of marking for others with a cognitive function. Modalities such as gaze and marking in this particular arrangement can be considered instances of distributed cognition (Hollan et al, 2000).

Conclusion

We provide a video ethnography of an Olympic synchronized swimming team with a Conversational Analysis (CA) framework. Our unit of analysis is the turn design of corrections in the institutional context of expert sports training. The conversation fragments that we transcribe and analyze with ELAN software for video analysis of small-scale interactions show how the trainer and the swimmers are experts in their specific domain of action. The semantic reference of the transcribed conversation is a swimmer's position of the hip. The technical nature of the training process makes it a Multimodal Interactive System (MIS) (Alac, 2014), with the use of the camera by the trainer and the screen as cognitive tools. Verbal instructions combine with constant manipulation of the video camera and screen. Speech, gesture and tools often overlap in the interaction between the trainer and the swimmers.

The conversation pattern in phase 2 of the MIS points towards an asymmetric distribution of local knowledge, or epistemological asymmetry (Heritage, 1997). Decisions in this setting are made on the basis of the trainer's goal with respect to the swimmers' attention. The trainer has the upper hand thanks to the manipulation of technology and her expert interpretation of the filmed performance. The power of expert interpretation in film appears as well in Goodwin's analysis of Rodney King's trial (1994). The institutional design of the conversation defines the turn taking dynamic down to the micro level. In analyzing marking, we applied the three analytical dimensions defined in Muntanyola & Kirsh (2010): function, shape and direction of gaze. Following the results in dance rehearsals, there seems to be in phase 2 of the MIS of corrections a link between the function of marking and direction of gaze. The structured understanding of the correction includes both marking for self with a reflexive and recall function, and marking for others for communication.

Still, we captured empirically how the epistemological asymmetry of corrections in synchronized swimming translates into a different turn design in excerpt 2 and particularly in excerpt 3, where swimmer 1 marks for swimmer 2 under the trainer's gaze. These are instances of marking both as a cognitive mechanism and as a communication modality. Thus, the link between function and gaze direction in line 05 in excerpt 2 and along lines 05-09 in excerpt 3 work differently. Swimmer 1 small marks first, and large marks later, completing and selecting the information given by their trainer. She is both a cognitive extension, since she marks in further detail what the trainer is saying, and an interpreter, because she filters out the relevant information coming from the performance of the other swimmer. Her expertise as a synchronized swimmer, which the trainer lacks, lies in the skilled use of her own body as an underwater tool. While the trainer provides multimodal and embodied guidance (through speech and marking) the most expert swimmer provides key marking, together with evaluative and detailed speech that specifies the corrections further for swimmer 2. Corrections and adjustments are not merely an attribute or skill of a particular expert, but part of an interactive activity. Thus, this level of analysis puts forward the distributed nature of marking, since a third party, the most expert swimmer in the duet, acts as the eyes and the body of the trainer. The presence of this episode of marking is an empirical evidence not only for multimodal communication, but also for distributed cognition.

Corrections become multimodal and part of a complex cognition system of agents, environmental cues, and social rules of communication and interaction. Conversation

analysis of corrections in synchronized swimming gives us sufficient empirical evidence to explain the mechanisms through which not only athletes, but also dancers, musicians, scientists and physicians think contextually. Distributed marking is a relevant phenomenon that needs to be studied in wider contexts across different professional fields.

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