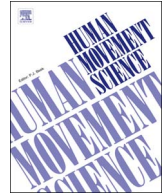


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Full Length Article

## Joint action in an elite rowing pair crew after intensive team training: The reinforcement of extra-personal processes

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### ABSTRACT

The present study is a follow-up case report of the study from R'Kiouak and colleagues (2016). From the initial study that analyzed how individual experts rowed together while they never had practiced together, we seized here the opportunity to investigate how both rowers synchronize after having intensively practiced joint action through a national training program in which they were invited to take part. The joint action of 2 individual expert rowers, which composed a coxless pair crew, was tracked on-the-water at the end of a team-training program. We first determined how each rower experienced the joint action at each instance of oars' strokes during a 12 min race. A phenomenological analysis evidenced several categories of how rowers shared lived experiences of their joint action. From mechanical data captured through an automatic recording device, we then scrutinized the mechanical signatures that correlated with each phenomenological sample. By comparing the present case report to the initial study, results suggested that, after the training program (a) rowers shared more meaningful experience of their joint action, and (b) only the boat velocity's index contributed to explain why oars stroke were alternatively lived as effective or detrimental. The present case report thus suggests that joint action training in rowing might imply an increase in the joint sense-making activities, probably associated with a change from an inter-personal to an extra-personal meaningful mode of co-regulation of the joint action.

### 1. Introduction

Human collective behaviors emerge in part thanks to synchronization processes. To create, maintain and/or disrupt such synchronization, individuals regulate their behaviors with regards for what they perceive as the emerging needs of the collective activity (Bourbousson & Fortes-Bourbousson, 2016). Based on how they experience the accuracy of their real-time activity, humans adapt online by maintaining or changing their involvement. This adaptive and regulatory activity allows to obtain the states of Actor(s)/Environment (A/E) coupling that are required/expected regarding the current joint task (i.e., collective coordinative task). In the literature two very distinct processes can be found that ground the way interactors regulate their joint action, which are the inter- and extra-personal modes of co-regulation (R'kiouak, Saury, Durand, & Bourbousson, 2016).

First, the “*inter-personal*” mode of co-regulation accounts for individual activities that are synchronized through informational resources that are available *between* the given actors. In other words, each participant guides his/her own action and how he/she adapts to the current needs of the joint action by taking into account the behavior of his/her teammate and/or the resulting states of dyadic synchronization. In terms of the experience that each teammate makes of his/her A/E coupling, such a co-regulation implies

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that teammates are sensitive to the dynamic behavior of the partner and adapt it in this regard. For example, this mode of co-regulation is implied in interpersonal coordination of movements when participants are asked to move their limbs to achieve some expected states of dyadic synchronization (see Gipson, Gorman, & Hessler, 2016; Schmidt & Richardson, 2008 for reviews).

Second, the “extra-personal” mode of co-regulation accounts for participants adjusting the dynamics of their activity through informational resources that are available in their material and physical environment, without regard for the behaviors of the other participant(s). Such a mode of co-regulation has been well documented by Grassé (1959) in the *stigmergic* theory in the animal world. To illustrate, Grassé explained how social termites’ behaviors could exhibit complex collective properties without a direct between-agents synchronization being needed (Christensen, 2013; Dipple, Raymond, & Docherty, 2014; Susi, 2016; Theraulaz, 2014), and even without co-agents being aware of others’ activities. Such processes require that traces of others’ activities are made available within the environment or a material as the boat in rowing (Millar, Oldham, & Renshaw, 2013), and the interactors needing only to be dynamically aware of such environmental traces.

Studies in human movement science have mainly described the inter-personal mode of co-regulation, and to a lesser extent explored the stigmergic approach, even though they have suggested that discussing extra-personal mode of co-regulation should be of promising interest (Avvenuti, Cesarini, & Cimino, 2013; Millar et al., 2013). To our knowledge, only one empirical study has been conducted that explored the way in which inter- and extra-personal modes of co-regulation can both occur in human collective spatiotemporal behaviors (R'kiouak et al., 2016). Adopting an enactivist approach to social coupling (Laroche, Berardi, & Brangier, 2014), the authors tracked both modes of co-regulation in a real-world rowing setting. R'kiouak et al. (2016) selected expert rowers that never practiced together and pointed out that both modes of co-regulation seemed to be alternatively achieved by the rowers in their ongoing adjustments, while each of them being inferred from distinct levels of consciousness.

To infer the given modes of co-regulation from the data, authors first performed a qualitative analysis of the lived experiences of rowers at each instant of the race, and then scrutinized the mechanical correlates of how they experienced the effectiveness of their joint action. For the most part of the race under study, the joint action of the crew was meaningless for both rowers at the level of the pre-reflective experience of their activity (i.e., the rowers did not pay attention to their joint action), while the mechanical indicators of boat velocity and coordination did not exhibit any synchronization impairment. Since no salient, meaningful experience of joint action supported these portions of the race, the results thus led authors to assume that crew coordination could be achieved through extra-personal processes in such a case. Interestingly, when the given rowers sometimes simultaneously experienced their joint action as salient, meaningful to them, the mechanical indicators that at best contributed to explain differences between strokes experienced as effective *versus* detrimental were found at the inter-personal level of analysis. In such portions of the race, authors thus proposed that meaningful inter-personal processes might have occurred, in place of the meaningless extra-personal processes that were proposed each time joint action was meaningless to them. The authors (R'kiouak et al., 2016) thus concluded that both rowers under study were capable of actively co-regulating their joint action using a meaningful inter-personal mode of co-regulation, and this mode occurring on a background of meaningless extra-personal mode of co-regulation. Based on an opportunity to renew the investigation with the same unique crew, the present study was built from these initial findings.

The present investigation replicated the same design, and was carried out with the same participants, after a national team-training program in which they were invited to take part. During the program, the rowers were intensively trained to row together, while they never had rowed together before (i.e., at the time of the initial study, called “pre-program race” in the next sections). Following principles of an action research-like design (Chein, Cook, & Harding, 1948; Whitehead & McNiff, 2006), the present study (called “post-program race” in the next sections) was conceived as an evaluation of the effects of such a program, and offered the training staff the opportunity to diagnose their interventional effects. In terms of scientific objectives, the present follow-up case report investigated how changes in inter- and extra-personal modes of co-regulation of joint action could be inferred from a mixed data design applied to a single test race, occurring after an intensive team training practice.

Our hypotheses are based on the results of previous studies that have suggested that experts can adopt a pronounced extra-personal mode of co-regulation, through a regulation of their joint action that becomes mainly meaningless (Millar et al., 2013). In this way, we hypothesized a transformation of the rowers’ joint action co-regulation in terms of (a) an enhancement of the meaningless extra-personal mode of co-regulation, as observed by an increased proportion of the race in which joint action was meaningless, and (b) a qualitative change of the meaningful co-regulation processes exhibited by rowers, evolving from inter-personal to extra-personal nature, as observed by boat level indicators being the best candidates to explain differences in salient, meaningful experiences of effectiveness by the rowers (Millar et al., 2013). Together, these expected results prognosticate both rowers having being trained to perform joint action in a more ubiquitous extra-personal mode of co-regulation, being both meaningless and meaningful.

## 2. Method

### 2.1. Participants and procedure

A junior men’s coxless pair (age: 17 years) participated in this study, with the bow rower seats to the bow of the boat and the stroke rower seats to the stern of the boat (see Fig. 1). Both participants were the same as in the initial study that served as a comparison point for the present investigation (R'kiouak et al., 2016). The data collection occurred in a single 12 min race at 18–19 strokes per min (spm) after rowers took part to an intensive national team training program that lasted one-and-a-half-month and that was conducted by the national staff. This training period consisted in 22 sessions of joint crew rowing (each of them lasting around 1 h), tightly managed by the national coach that provided individual and crew on-water feedbacks. Participants, the persons

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