The Effects of Vocalisation on Timing and Force Coordination in a Dyadic Rope-Pulling Task

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1 Introduction

Many work songs were not merely songs about labour, but vocal practices embedded within labour itself. In tasks such as rope hauling, rowing, and waulking, repeated calls may have helped workers coordinate when to exert force and maintain a workable collective pace (Porter, 1994). The present study tested a minimal, sensorimotor version of this idea in a controlled dyadic rope-pulling task. Specifically, it asked whether simple repeated vocal cues improve immediate timing and force coordination, whether coordination differs when one versus both partners vocalise, and whether a longer cue ("heave") differs from a shorter cue ("ta"). This reduction does not capture the full social, affective, motivational, or hierarchical dimensions of work songs; rather, it isolates one candidate sensorimotor function: vocal cueing as a resource for coordinating effort.

2 Methods

Twenty-five dyads completed repeated 30-second rope-pulling trials while attempting to synchronise both the timing and force of their pulls. Participants pulled separate ropes, with each rope's force output measured independently. Because participants were not mechanically coupled through a shared rope, they could not feel one another's force directly; task-relevant visual movement cues were also reduced with an occluder. Each dyad completed a no-vocalisation baseline and a 2×2 within-dyad vocalisation design crossing number of vocalisers, one versus both, with cue type, "heave" versus "ta." In vocalisation trials, participants pulled on "heave" or "ta" and released on "and." Condition order was counterbalanced.

3 Results

The main dyadic outcomes captured two aspects of coordination: temporal coordination and force coordination. Temporal coordination was measured by mean absolute peak asynchrony and variability of peak asynchrony; force coordination was measured by peak-force efficiency ratio and force overlap ratio. Individual mean peak force was analysed separately to test whether vocalisation also affected force output. Relative to silence, vocalisation improved all dyadic coordination measures: dyads showed lower average peak asynchrony, lower variability in asynchrony, higher peak-force efficiency, and greater force overlap, with all baseline contrasts significant at p values $< .001$. Coordination was also consistently better when both participants vocalised than when only one did, with significant effects across all primary coordination outcomes, p values $\leq .010$. By contrast, "ta" and "heave" did not differ reliably on the primary coordination outcomes, and vocalisation did not increase individual peak force.

4 Discussion

These findings suggest that repeated vocalisation can serve as an effective coordination resource in rhythmic joint effort. In the present task, vocal cues appeared to provide an ongoing scaffold for maintaining coordination across repeated pulls, helping partners anticipate and align their actions when direct haptic information and rich visual movement cues were limited. This extends evidence that vocal interaction can stabilise rhythmic joint action (Miyata et al., 2021). Exploratory analyses further showed that the both-vocalisation conditions produced progressive shortening of inter-pull intervals, consistent with joint rushing (Wolf and Knoblich, 2022). This suggests a possible functional trade-off in labour-like coordination: jointly produced vocal rhythm may support precise local synchronisation, whereas solo-led cueing may help regulate pace over longer stretches of work.

References

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