Joint attention skills in wild Arabian babblers (*Turdoides squamiceps*):

A consequence of cooperative breeding?

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Table S1. Inter-observer reliability tests.

Criterion	Signal	Reliability measure (Cohen's Kappa/ Spearman's rank correlation coefficient)	Number of episodes tested	P value	Statistical test
Sensitivity to the attentional state of the recipient	BABBLER WALK	K=0.86	17	<0.005	Unweighted Cohen's Kappa
Duration of signalling behaviour*	BABBLER WALK	r_s= 0.93	23	<0.001	Spearman's rank correlation
Persistence of signalling	BABBLER WALK	K=0.93	22	<0.001	Unweighted Cohen's Kappa
Elaboration of signal	BABBLER WALK	K =1.00	22	<0.001	Unweighted Cohen's Kappa
Presence of a voluntary response	BABBLER WALK	K =1.00	23	<0.005	Unweighted Cohen's Kappa
Recipient's response type	BABBLER WALK	K =0.80	23	<0.001	Unweighted Cohen's Kappa
Gaze alternation (yes/no)	OBJECT PRESENTATION	K =1.00	14	<0.001	Unweighted Cohen's Kappa
	BABBLER WALK	K =1.00	22	<0.001	
Signaller's post gaze alternation behaviour	OBJECT PRESENTATION	K =1.00	14	<0.001	Unweighted Cohen's Kappa
	BABBLER WALK	K =1.00	22	<0.001	
Duration of coordinated joint engagement between interlocutors*,**	OBJECT PRESENTATION	r_s= 0.92	14	<0.001	Spearman's rank correlation
	BABBLER WALK	r_s= 0.86	17	<0.001	

* Duration measurements of signalling behaviour and coordinated joint engagements were extracted from video recordings with an accuracy of within one second. Since some recordings started several seconds after the beginning of signalling behaviour, reported durations are occasionally underestimates.

** Note that our definition for coordinated joint engagement is a rigorous modification of the original criterion [1,2], which only captured the duration of signalling behaviour regardless of whether the recipient responded or not.

1. Carpenter, M., Nagell, K. & Tomasello, M. 1998 Social cognition, joint attention and communicative competence from 9 to 15 months of age. *Monogr. Soc. Res. Child Dev.* **63**.

2. Bakeman, R. & Adamson, L. B. 1984 Coordinating attention to people and objects in mother-infant and peer-infant interaction. *Child Dev.* **55**, 1278–1289. (doi:10.2307/1129997)

Table S2. Random slopes included in LMMs and GLMMs.

	OBJECT PRESENTATION	BABBLER WALK
Persistence of signalling		Random slopes were not included
Elaboration of signal		Random slopes were not included
Duration of signalling behaviour		Recipient's behaviour within signaller and social group
Responses to signals		Condition within response type
Co-orientation of attentions	Recipient's behaviour within signaller, social group and recipient	Recipient's behaviour within social group and recipient

Table S3. The use of BABBLER WALK toward adult conspecifics.

28.03.2012	A male from one social group performed BABBLER WALK towards a female of a neighbouring group and tried to lead her into his group's territory. She did not follow him. The male and the female were brother and sister, formally members of the same social group.
20.02.2014	This is the end of the day in which the female laid the last egg out of four. The group flew to its roosting tree at dark. The female stopped and flew back to the nesting tree in order to incubate the eggs for the first time. A subordinate male followed after her and stayed with her at the nesting tree for a minute. Then both of them flew back toward the group. The female stopped in the middle of the way and the male performed BABBLER WALK and tried to lead her to the rest of the group. After several attempts she followed him to the roosting tree. But a few minutes later she returned to the nest and slept there alone.
27.03.2014	An alpha male of one group performed BABBLER WALK toward a female of a neighbouring group and tried to lead her into his group's territory. She did not follow him.

Table S4. Mean results of 1000 Generalized Linear Mixed Models examining the effect of the recipient's behaviour (cooperative/ uncooperative) on the probability of the signaller to persist with signalling behaviour (n=112 episodes per model).

Term	Estimate	SE	χ^2	d.f	p
Intercept	14.78	6.221			
Recipient (cooperative)	-26.687	27.075	-3	1	0.046

Footnote: the large absolute estimates arose from data close to causing complete separation, the response to in part vary only little within the levels of the random effects.

Table S5. Mean results of 1000 Generalized Linear Mixed Models examining the effect of the recipient's behaviour (cooperative/ uncooperative) on the probability of the signaller to elaborate its signalling behaviour (n=100 episodes per model).

Term	Estimate	SE	χ^2	d.f	p
Intercept	1.755	1.301			
Recipient (cooperative)	-6.383	3.940	-3.17	1	0.013

Footnote: the large absolute estimates arose from data close to causing complete separation, the response to in part vary only little within the levels of the random effects.
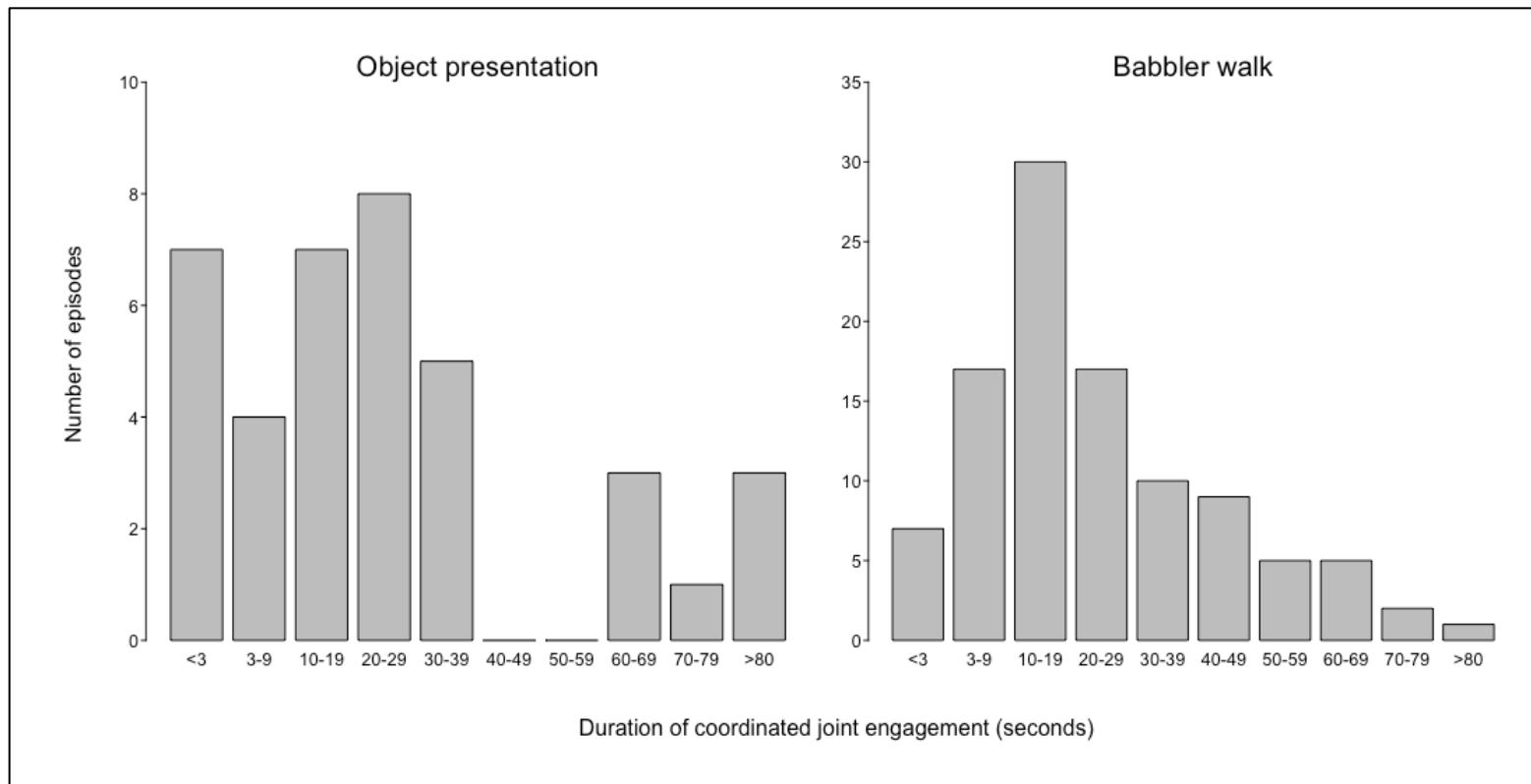
Figure S1. Duration of coordinated joint engagement following a voluntarily response to a signal.

Number of episodes of coordinated joint travel according to their duration (in seconds) after a voluntary

response to OBJECT PRESENTATION (n=38) and BABBLER WALK (n=103) signals.