

カラスの優劣交渉場面における 自律神経の機能

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Social structure: **linear hierarchy**

($h' = 0.83$, $K = 0.82$, $\chi^2 = 43$, $p = .002$)

		loss								
		<i>W</i>	<i>Or</i>	<i>WW</i>	<i>RY</i>	<i>rb</i>	<i>s</i>	<i>y</i>	<i>g</i>	
win	<i>W</i>		250	114	82	177	27	80	55	785
	<i>Or</i>	4		38	56	118	16	26	45	303
	<i>WW</i>	4	7		16	14	4	9	18	72
	<i>RY</i>	8	2	9		10	4	8	17	58
	<i>rb</i>	8	3	2	0		5	48	17	83
	<i>s</i>	1	1	4	2	7		15	11	41
	<i>y</i>	6	1	2	3	7	4		5	28
	<i>g</i>	3	4	0	1	4	7	3		22
			34	268	169	160	337	67	189	168

- Males are dominant over females
- Strict more among males

Aggressive / Submissive behavior

Aggressive behaviors

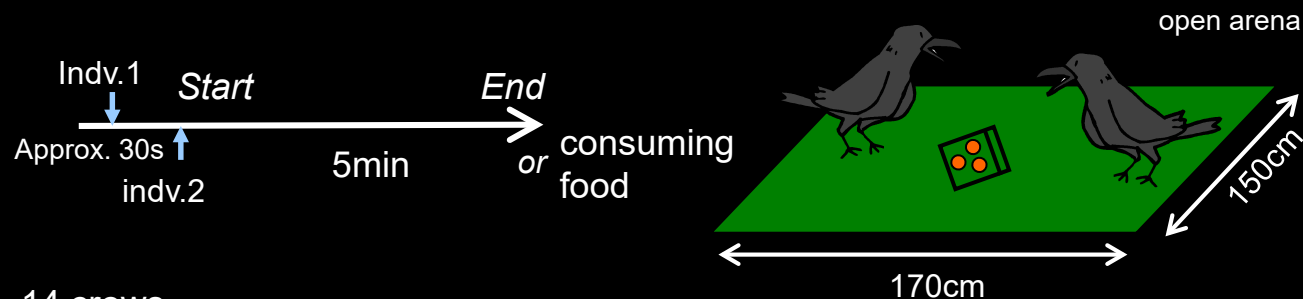
- “Peck” ; pecking the opponent
- “Jab” ; pushing the bill toward the opponent
- “Approach” ; rushing toward the opponent
- “Aggressive call” ; high-pitched vocalization without head drooping



Submissive behaviors

- “Fuzzy head” ; ruffling the head feather
- “Avoid” ; moving away from the opponent
- “Begging call” ; low-pitched vocalization with head drooping

Dyadic encounter paradigm

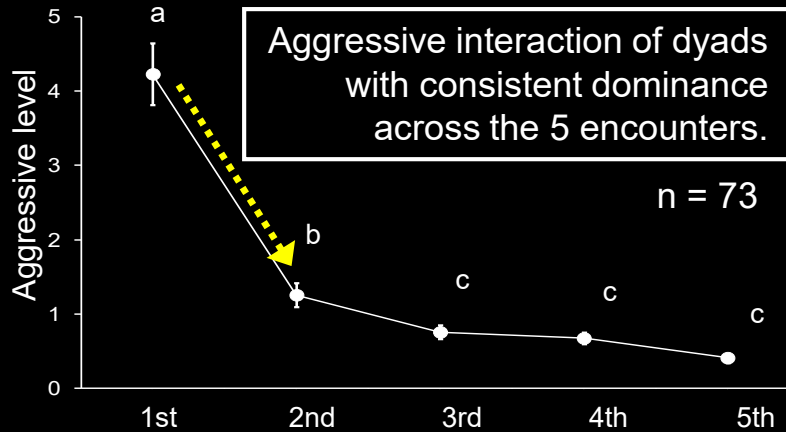


- 14 crows
- 5 encounters x 91 dyads (= 455 encounters)
- Inter-encounter interval of each dyad was 3 days ~ a week.
- Encounters were video-recorded and analyzed offline.

Dominance definition

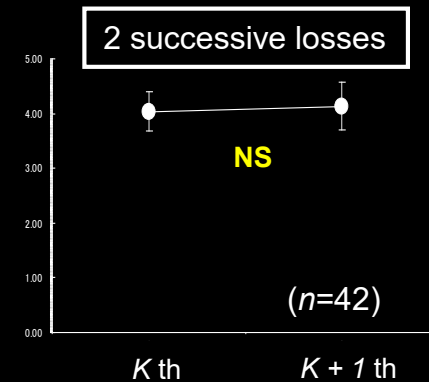
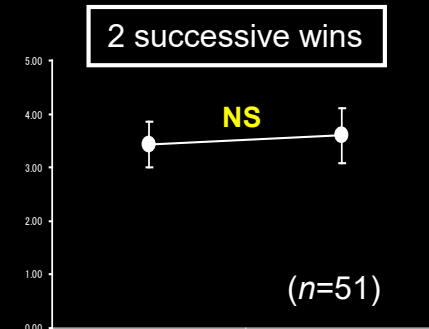
- Dyads with 5/0 or 4/1 win/loss outcomes in each dyad were considered as DOM/SUB

Dominance is based on the memory “win/loss” and “whom” by subordinates in dyads



Reduction of aggressive interaction

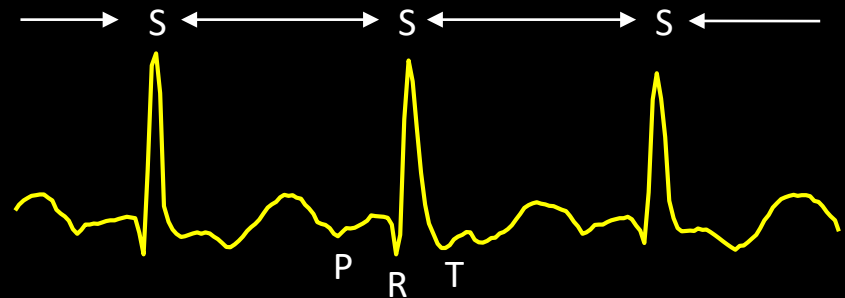
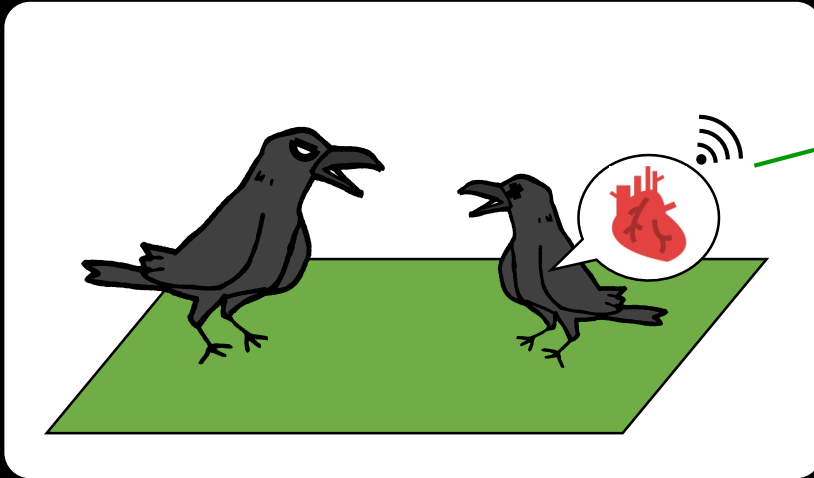
- 1) occurred between the 1st and 2nd encounters.
→ Involvement of memory
- 2) did NOT occur when opponents were different.
→ Opponent specific (i.e. **individual recognition**) !



(Izawa & Watanabe, 2008)

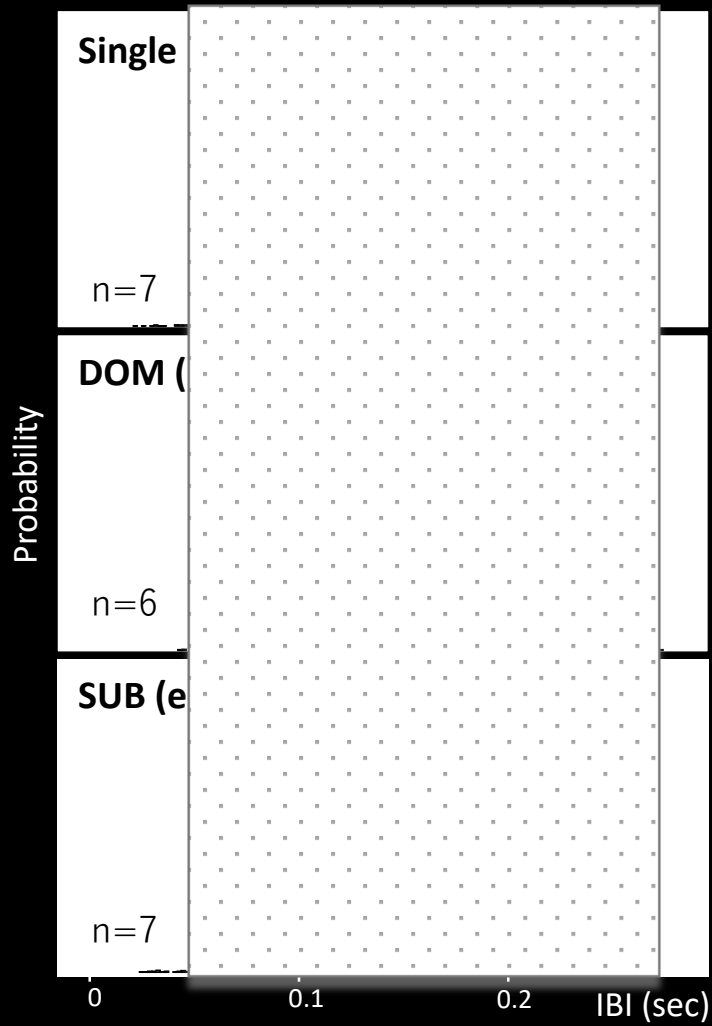
(Takeda, Morita & Izawa, in prog)

Recording ECG from freely behaving crows



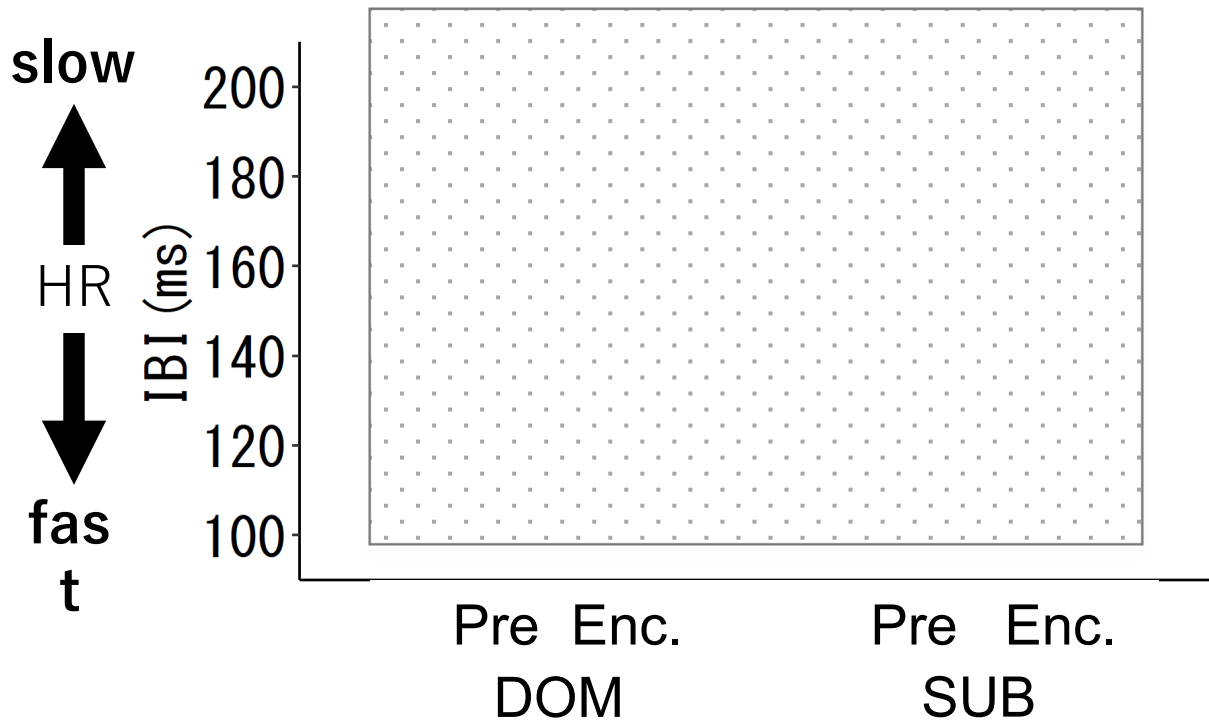
Analyzing

- Inter-beat interval (IBI; S-S interval)
- RMSSD:
an index of **PNS activity**
(relative to **SNS activity**)

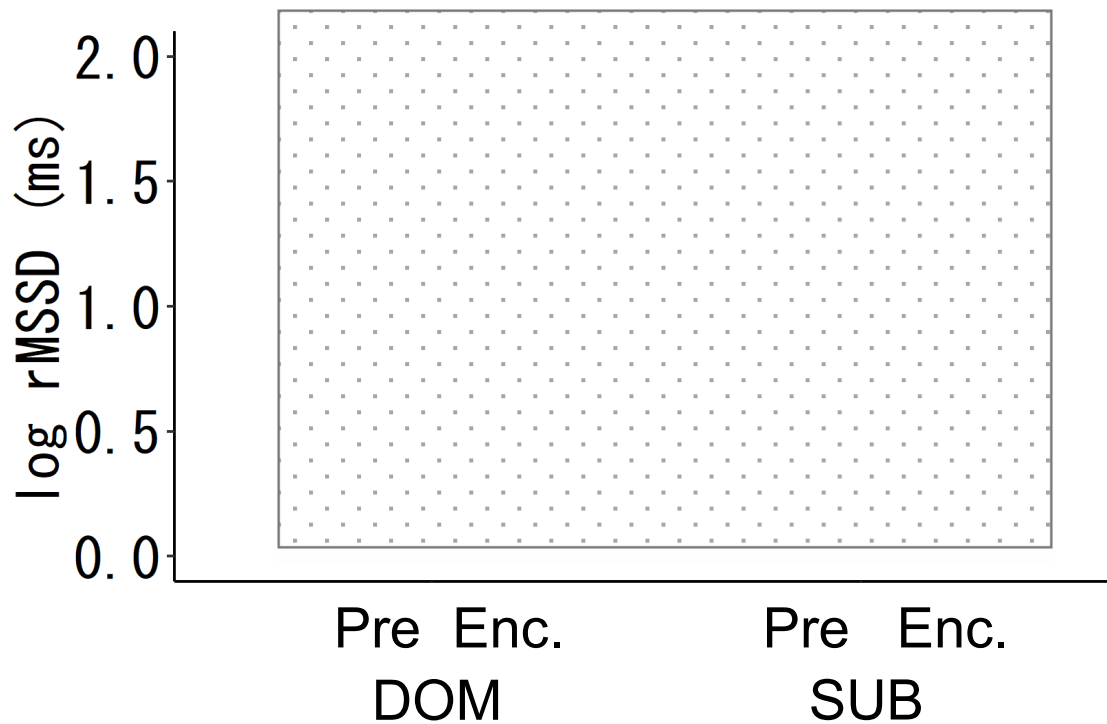


**IBI density histogram:
during dyadic encounters for 5 min**

IBI during encounter.



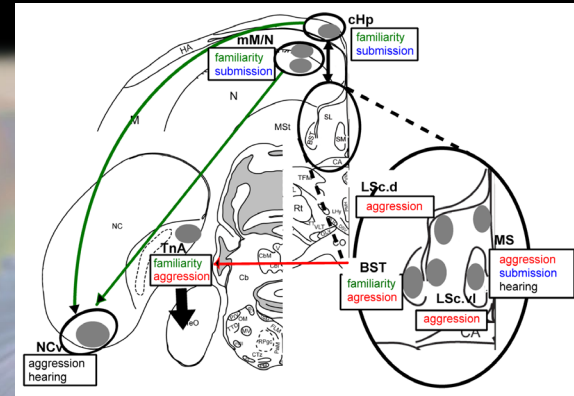
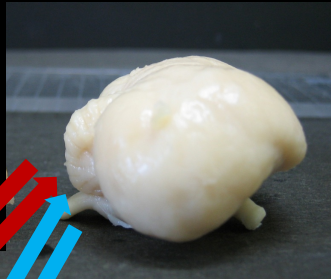
RMSSD during encounter



GLMM (gamma, log)

ANS – CNS plays a crucial role in animal communication

Body (ANS)



- Individual recognition
- Memory of win/loss outcome
- Perception of distance

Brain (CNS)

