

23.1 Evolutionary and comparative perspectives: evidence and transfer

Name: _____ Class: _____ Date: _____

Total: 8 marks

KEY WORDS inclusive fitness • fixed action pattern

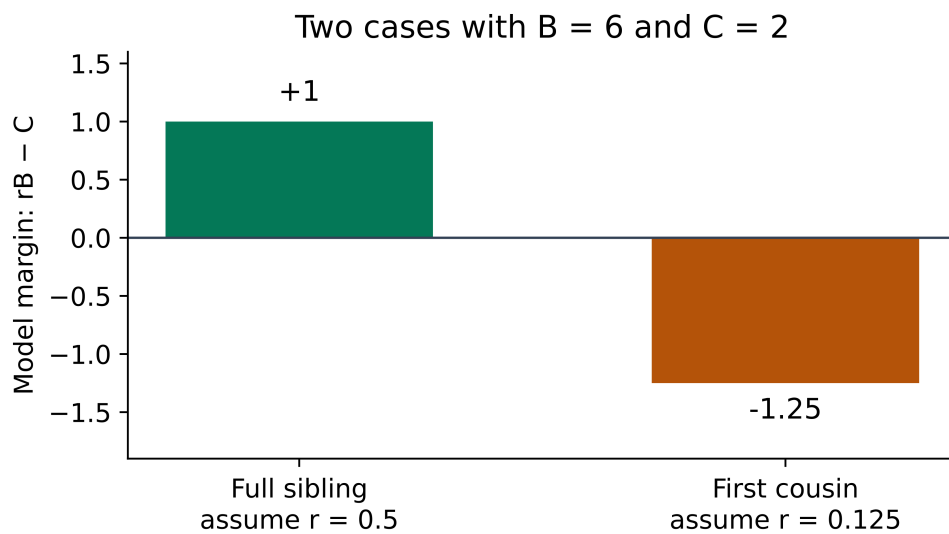
Objective

Apply kin selection and inclusive fitness to helping; Recognise fixed action patterns and sign stimuli in ethology; Evaluate evolutionary explanations against learning accounts. Original practice and authored marking guidance.

1 Key knowledge and worked examples

inclusive fitness : Reproductive success counting both direct offspring and the reproduction of relatives weighted by relatedness. **fixed action pattern** : An invariant species-typical sequence released by a specific sign stimulus.

Hamilton's inequality is a model of selection under stated costs, benefits and relatedness, not an instruction about human duty. Inclusive fitness concerns effects on genetic representation through self and relatives. Fixed action patterns describe characteristic sequences in classic ethological models; real behaviour can vary with state and context. Evolutionary function and immediate learning mechanisms can complement each other. A plausible adaptive story requires evidence that distinguishes it from alternatives.



Comparable reproductive units; these are model values, not observed choices.

Worked case. In a fictional fitness model, $B=8$, $C=3$ and $r=.5$. Test the inequality. Repeat for $r=.125$.

$rB > C$. For $r=.5$, $rB=.5 \times 8=4 > 3$, so the stated condition holds. For $r=.125$, $rB=.125 \times 8=1 < 3$, so it does not. Benefits and costs must use compatible fitness measures. Relatedness alone cannot rank helping when B or C differs across cases.

2 Practice

2.1 Under Hamilton's rule, helping is favoured when: [1]

A. benefit exceeds cost B. $rB > C$ with relatedness r C. the recipient shares the group D. the helper is older E. costs are zero

2.2 A bird courts a painted model with an oversized tail while ignoring real mates. The model works as: [1]

A. a conditioned stimulus B. a supernormal sign stimulus C. an imprinting object D. a negative reinforcer E. a discriminative operant cue

2.3 Revisit the worked case. State one conclusion its evidence supports and one stronger conclusion it does not support. Explain the difference. [2]

3 Exam-style questions

3.1 An animal quickly learns one fear association. Explain why this can be compatible with both learning and an evolutionary account, and what evidence is needed. Give the interpretation, supporting reasoning, a relevant alternative or limitation, and an appropriate check. [4]

Solutions

2.1 Answer: B. The benefit must be weighted by relatedness before comparing with the cost. The other options do not satisfy the stated defining conditions.

2.2 Answer: B. Exaggerated features of a releasing cue form a supernormal stimulus hijacking a fixed action pattern. Compare the exact process, design or evidence, rather than an associated keyword.

2.3 Use the worked case evidence to support a bounded claim and explain why a causal, universal or stronger claim needs additional evidence. The claim must fit the specific design and observed process.

3.1 Experience supplies the association; evolved predispositions could affect how readily particular associations are learned. Compare acquisition across relevant stimuli with exposure, salience and reinforcement controlled, and use comparative evidence where justified. Speed alone cannot establish an ancestral history or eliminate all learning alternatives. Award B1 each (authored) for the interpretation, its reasoning, a relevant limitation/alternative and an appropriate check, up to four points. Accept a different justified answer satisfying these demands.