

Exercise walk-through

12.1

Sensation, perception and psychophysics: evidence and transfer

GRE · GRE Subject Test · GRE Psychology

Concepts 2

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Sensation begins with transduction: receptors convert physical energy into neural signals, as photoreceptors convert light and hair cells convert sound pressure. Sensory adaptation reduces response to a constant stimulus. Dark adaptation is the recovering sensitivity of the visual system in low light.

Perception organises input rather than copying it. Gestalt principles group by proximity, similarity, closure and good continuation. Bottom-up processing builds percepts from features; top-down processing applies context and expectation. Categorical perception treats continuous acoustic variation as discrete phonemes: within a category, differences are hard to hear even when physically present.

Reason through the worked case

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With a fictional Weber fraction $k=.03$, estimate the just noticeable difference for 100 g and 300 g baselines.

$\Delta I/I=k$, so $\Delta I=kl$. $\Delta I=.03 \times 100 \text{ g}=3 \text{ g}$; $\Delta I=.03 \times 300 \text{ g}=9 \text{ g}$. The fraction is dimensionless and the result has the baseline's unit. A constant 3 g prediction at both baselines would ignore the proportional model. The approximation does not establish identical thresholds for all observers or intensities.

Check the transfer argument

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A warning can shift the response criterion toward reporting a signal. Compare both hit and false-alarm rates, not hits alone. Sensory adaptation concerns changing sensory response during sustained stimulation; the warning manipulation does not by itself establish that process. A sensitivity analysis could test whether signal/noise separation also changed.

Accept a different explanation when its evidence and limits are justified.

Exercises 2.1·2.2

2.1 With Weber fraction $k=.02$, the just noticeable difference for a 250 g baseline is: [1]

A. 0.02 g B. 2 g C. 5 g D. 25 g E. 50 g

2.2 After a payoff change, an observer says yes more often while the stimulus is unchanged. In signal detection theory, what moved? [1]

A. sensitivity d' B. the response criterion C. the absolute threshold D. the Weber fraction
E. receptor transduction

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2.1 With Weber fraction $k=.02$, the just noticeable difference for a 250 g baseline is: [1]

A. 0.02 g B. 2 g C. 5 g D. 25 g E. 50 g

2.1 Answer: C. $\Delta I = k \times I = .02 \times 250 = 5$ g. The other options do not satisfy the stated defining conditions.

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A. sensitivity d' B. the response criterion C. the absolute threshold D. the Weber fraction
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2.2 Answer: B. Payoffs move the criterion (bias); sensitivity depends on the signal and noise distributions. Compare the exact process, design or evidence, rather than an associated keyword.

Exercises 2.3-3.1

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

3.1 A listener says yes on more signal and more noise trials after a warning. Explain why sensory adaptation is not the only or best initial explanation. Give the interpretation, supporting reasoning, a relevant alternative or limitation, and an appropriate check. [4]

Exercises 2.3-3.1

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

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 A listener says yes on more signal and more noise trials after a warning. Explain why sensory adaptation is not the only or best initial explanation. Give the interpretation, supporting reasoning, a relevant alternative or limitation, and an appropriate check. [4]

3.1 A warning can shift the response criterion toward reporting a signal. Compare both hit and false-alarm rates, not hits alone. Sensory adaptation concerns changing sensory response during sustained stimulation; the warning manipulation does not by itself establish that process. A sensitivity analysis could test whether signal/noise separation also changed. 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.