

Sensation, perception and psychophysics

Supported GRE teaching and original transfer practice

Identify the evidence

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Distinguish thresholds, Weber's law and signal-detection measures

Use the overview measurement lesson VI for research inference.

Concepts 1 (1)

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Psychophysics relates physical intensity to experience. An absolute threshold is a stimulus level meeting a specified detection criterion under specified conditions, often 50% detection; a difference threshold is a detectable change under a stated criterion. Weber's law states that the difference threshold is a constant fraction of the baseline: $\Delta I/I = k$. With $k = .02$, a 100 g weight needs a 2 g change, while 200 g needs 4 g. Fechner proposed that perceived intensity grows logarithmically with physical intensity.

Concepts 1 (2)

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Real detection is noisy, so signal detection theory separates sensitivity from bias. Presenting signal or noise on each trial gives four outcomes: hits, misses, false alarms and correct rejections. Sensitivity d' measures how separated the signal and noise distributions are; the criterion measures the observer's willingness to say yes. A payoff change can move the criterion without changing d' , so hit rate alone is not sensitivity.

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 $\Delta I=kI$. $\Delta I=.03 \times 100 \text{ g}=3 \text{ g}$; $\Delta I=.03 \times 300 \text{ g}=9 \text{ g}$. 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.

Read the reviewed representation

Signal detection: four outcomes separate sensitivity from bias

	Signal present	Signal absent
Respond yes	Hit	False alarm
Respond no	Miss	Correct rejection

Original schematic for Sensation, perception and psychophysics. Illustrative relationships and numbers are not research results.

Attempt an unfamiliar case

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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.

Pause and write the explanation before continuing.

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.

Limit the conclusion

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Treating the difference threshold as a fixed amount rather than a fraction of the baseline, or reading a higher hit rate as better sensitivity when the observer simply says yes more.

Original classroom cases are not official questions or personal clinical advice.

Check yourself

Independent retrieval

People say yes more often after a reward changes. How could signal-detection analysis separate sensitivity from criterion?

Write your reasoning before comparing it with the methods and limits taught in this lesson.