

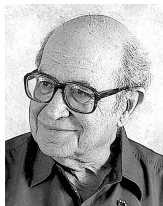
# Review of Jacob Cohen's The Earth is Round ( $p < .05$ )

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# An Introduction to Cohen's Paper

- ▶ Scientific advancement has been hindered by null hypothesis testing (NHST)
- ▶ Researchers often misinterpret p-values resulting in mistakes in what can be concluded
- ▶ Critique the "ritualization" of NHST
- ▶ Focus on real-world relevance



- ▶ Argues for better scientific practices

# On Null Hypothesis Significance Testing

- ▶ Definition: Method of statistical inference by which an experimental factor is tested against a hypothesis of no effect or no relationship based on a given observation
  - ▶ In other words: Null vs Alternate
- ▶ p-values determine the significance threshold
- ▶ NHST dominates science
- ▶ If I present a significant result of a known fact like "The Earth is round," nothing is gained

# A Ritualization of Reasoning ( $p < .05$ )

- ▶ Cohen argues against the rigid reliance on p-values
- ▶ Standard p-value of .05
- ▶ Dichotomous reject-accept decision
- ▶ "The primary aim of a scientific experiment is not to precipitate decisions, but to make an appropriate adjustment in the degree to which one . . . believes the hypothesis . . . being tested" - Bill Rozeboom (1960)

# Misinterpretation of p-values

- ▶ Consider a Scenario
  - ▶ A scientist believes a certain disease does not exist
  - ▶  $H_0: P = 0$
  - ▶ He draws a random sample of 30 cases and finds that 1 person has the disease
  - ▶  $P_S = 1/30 = .033$
- ▶ Does  $H_0$  need testing with a ch-square? How about a Fischer exact test??
- ▶ Cohen among many other scientists knows that academia would complain unless this result had a p-value attached to it

# So, what is wrong?

- ▶ We think NHST tells us, "Given these data, what is the probability that  $H_0$  is true?"
- ▶ What NHST actually tells us, "Given that  $H_0$  is true, what is the probability of these (or more extreme) data?" before asking your question
- ▶ Academics have railed against NHST for many years before Cohen's paper
  - ▶ "a potent but sterile intellectual rake who leaves in his merry path a long train of ravished maidens but no viable scientific offspring" - Meehl in 1967
  - ▶ Joseph Berkson attacked NHST in 1938
  - ▶ Lancelot Hogben's book-length critique appeared in 1957

# The Permanent Illusion

- ▶ Virtual participants: put questions into the Q/A window in WebEx
- ▶ In-person participants: walk to a microphone and wait to be called upon before asking your question
- ▶ Lunch on your own (Student Union food court right next door)x
- ▶ Coffee/cookies available during the poster session (11:30–13:30)
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# The Permanent Illusion cont.

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$$P(D|H_0) \neq P(H_0|D)$$

► Schizophrenic

| Result                 | Normal | Schiz | Total |
|------------------------|--------|-------|-------|
| Negative Test (Normal) | 949    | 1     | 950   |
| Positive Test (Schiz)  | 30     | 20    | 50    |
| Total                  | 979    | 21    | 1,000 |

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