Psychology 405: Psychometric Theory: Validity problem set (with answers)

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Outline

Validity

There are 50 applicants for a position, you have reason to believe that 40% will succeed on the criterion. You accept a particular number (defined below) how many of the ones you accept will succeed if

23. You accept 40% randomly.
24. You accept 30% using a test with a validity coefficient of .5
25. You accept 40% using a test with a validity of .5?

The four outcomes of a decision

Table: The four outcomes of a decision. Subjects above a particular score on the decision axes are accepted, those below are rejected. Similarly, the criterion of success is such that those above a particular value are deemed to have succeed, those below that value to have failed. All numbers are converted into percentages of the total.

		Decision = Predicted Outcome		
		Accept	Reject	
Outcome	Success	Valid Positive (VP)	False Negative (FN)	Base Rate (BR)
	Failure	False Positive (FP)	Valid Negative (VN)	1 - Base Rate (1-B
		Selection Rate (SR)	1-Selection Rate (1-SR)	

Accuracy = Valid Positive + Valid Negative

Sensitivity = Valid Positive /(Valid Positive + False Negative)

Specificity = Valid Negative / (Valid Negative + False Positive)

Phi = $\frac{VP - BR*SR}{\sqrt{BR(1-BR)*SR*(1-SR)}}$ $VP = BR * SR + \phi * \sqrt{BR(1-BR) * SR * (1-SI}$

Finding predictions

23. You accept 40% randomly. $.4 * .4 * N = 16\%$ of $50 = 8$
24. You accept 30% using a test with a validity coefficient of .5?
    - BR $= .4$
    - SR $= .3$
    - $\phi = .5$
    - $VP = BR * SR + \phi * \sqrt{BR(1 - BR) * SR * (1 - SR)} =$ $.4 * .3 + .5 * \sqrt{.4 * .6 * .3 * .7} = 23\%$ or 50 * .23 $= 11.6$
25. You accept 40% using a test with a validity of .5?
    - BR $= .4$
    - SR $= .4$
    - $\phi = .5$
    - $VP = BR * SR + \phi * \sqrt{BR(1 - BR) * SR * (1 - SR)} =$ $.4 * .4 + .5 * \sqrt{.4 * .6 * .4 * .6} = 23\%$ or 50 * .28 $= 14$