Campbell & Fiske (1959)

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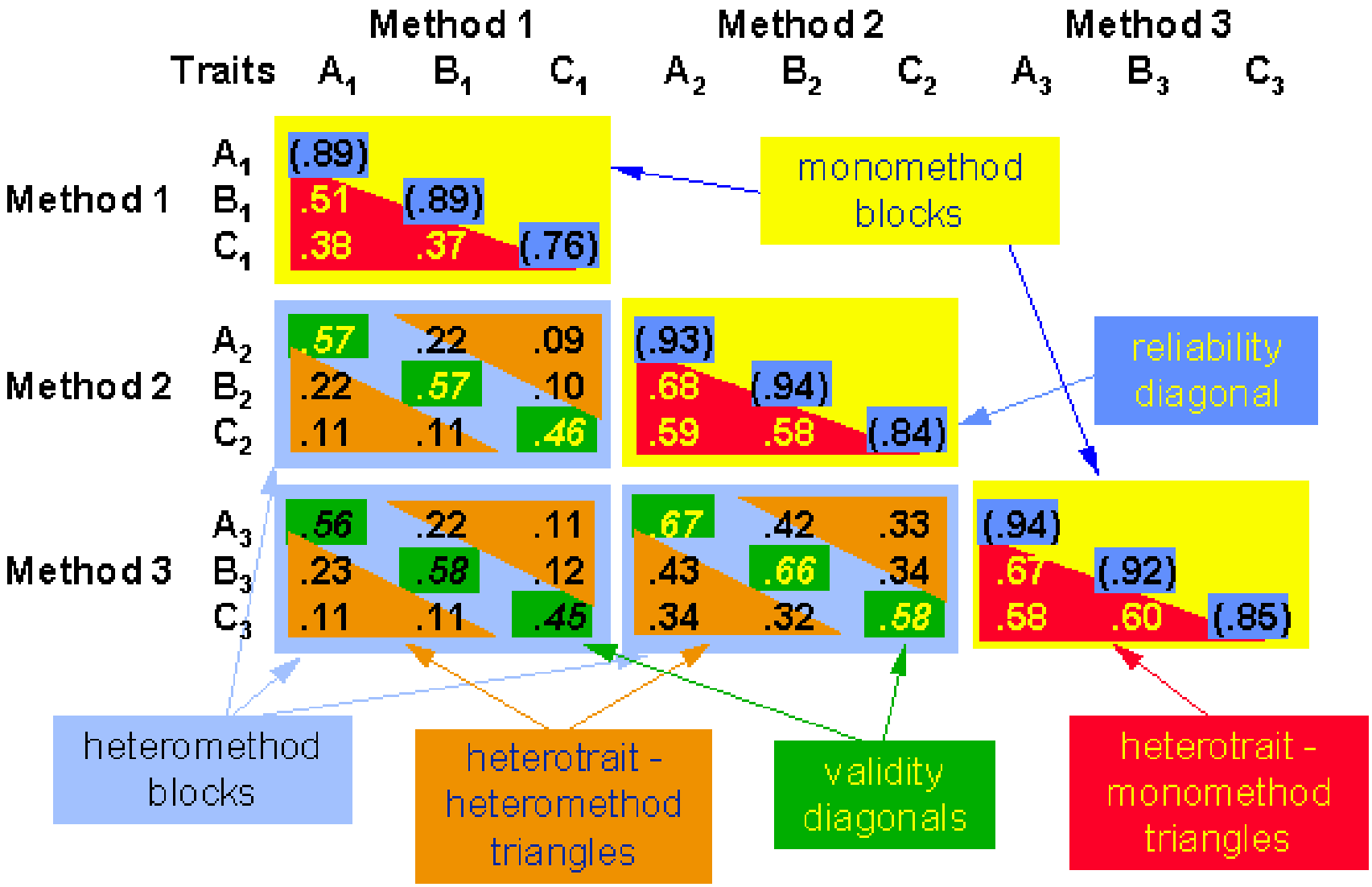
Critical Multiplism

- Applies the notion of multiple operations to all facets of research
  - Stimuli
  - Methods
  - Measures
  - Variables
  - Hypotheses
- About generalizability and discriminability
  - Bounds

MTM…wha?!?

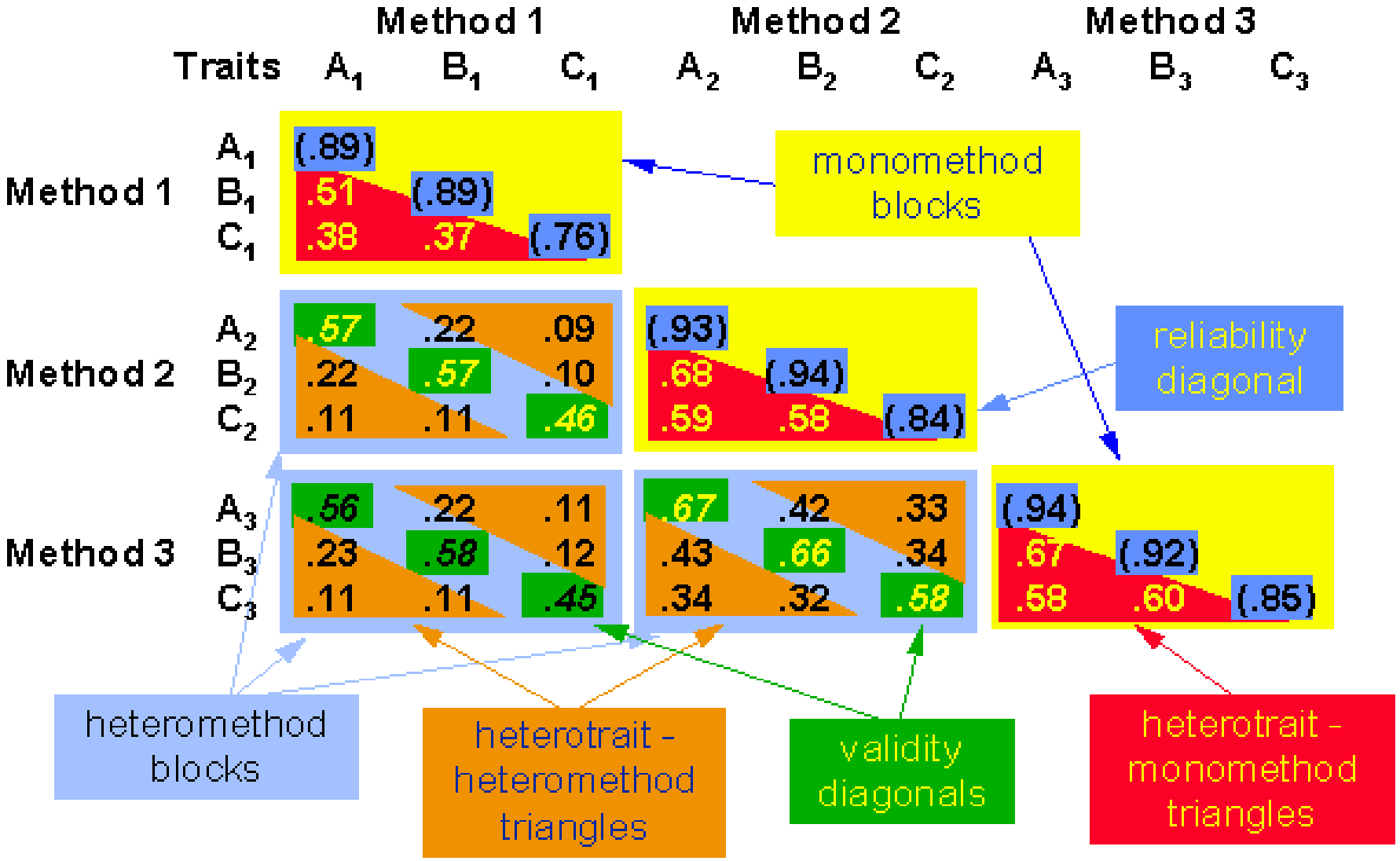
- Multitrait-multimethod matrix
  - Just as it sounds
  - Independent traits & Independent methods

- Allows us to parse out effects
  - True commonalities (reliabilities)
  - Method effects
    - Response bias, factors inherent to the testing form, etc.

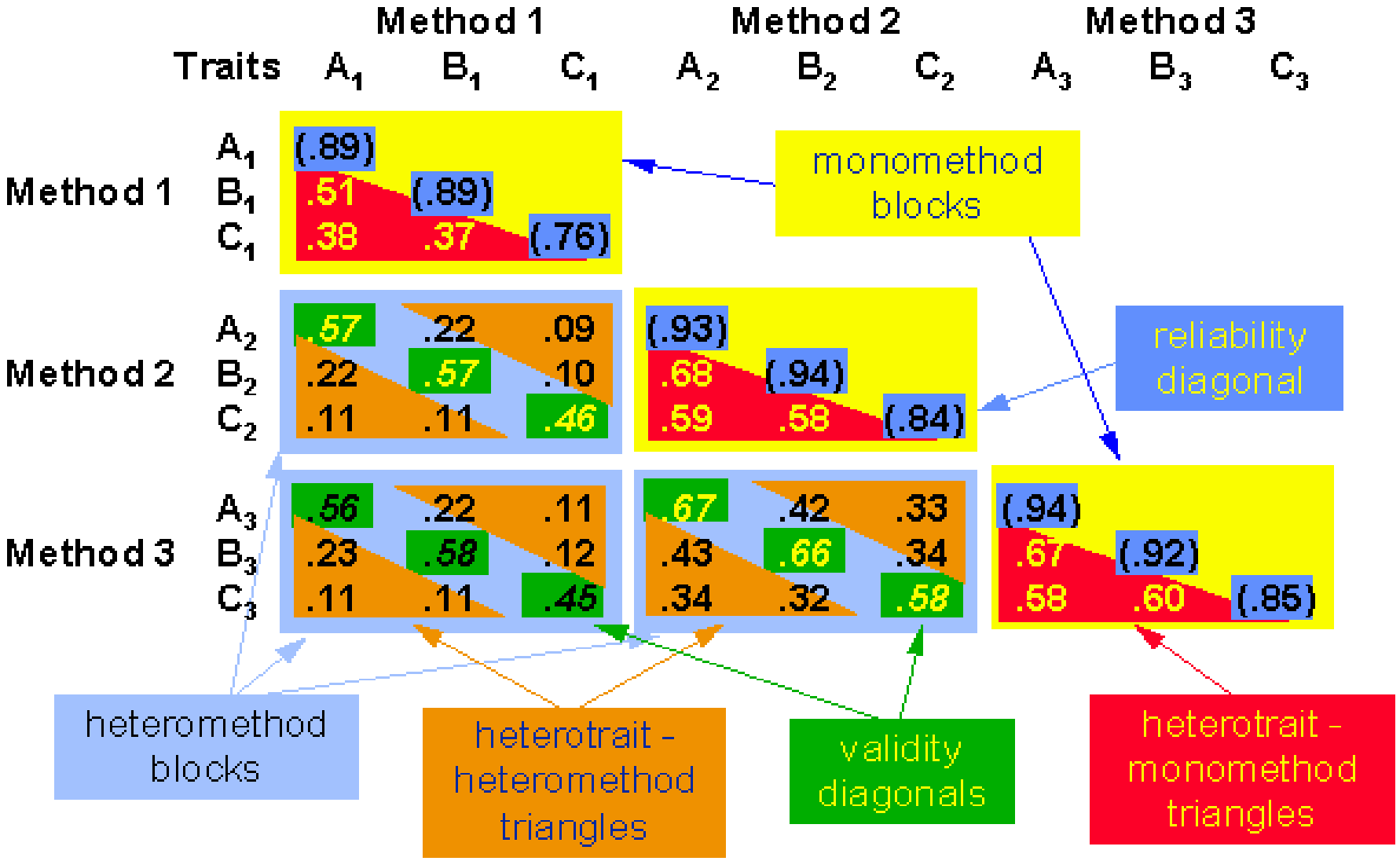

Method 1
Method 2
Method 3
Traits
A1
B1
C1
A2
B2
C2
A3
B3
C3
Method 1
Method 2
Method 3
(.89)
.51
(.89)
.38
.37
(.76)
monomethod blocks
.57
.22
.09
.22
.57
.10
.11
.11
.46
(.93)
.68
(.94)
.59
.58
(.84)
reliability diagonal
.56
.22
.11
.23
.58
.12
.11
.11
.45
.67
.42
.33
.43
.66
.34
.34
.32
.58
(.94)
.67
(.92)
.58
.60
(.85)
heteromethod blocks
heterotrait - heteromethod triangles
validity diagonals
heterotrait - monomethod triangles

Ideal scenario

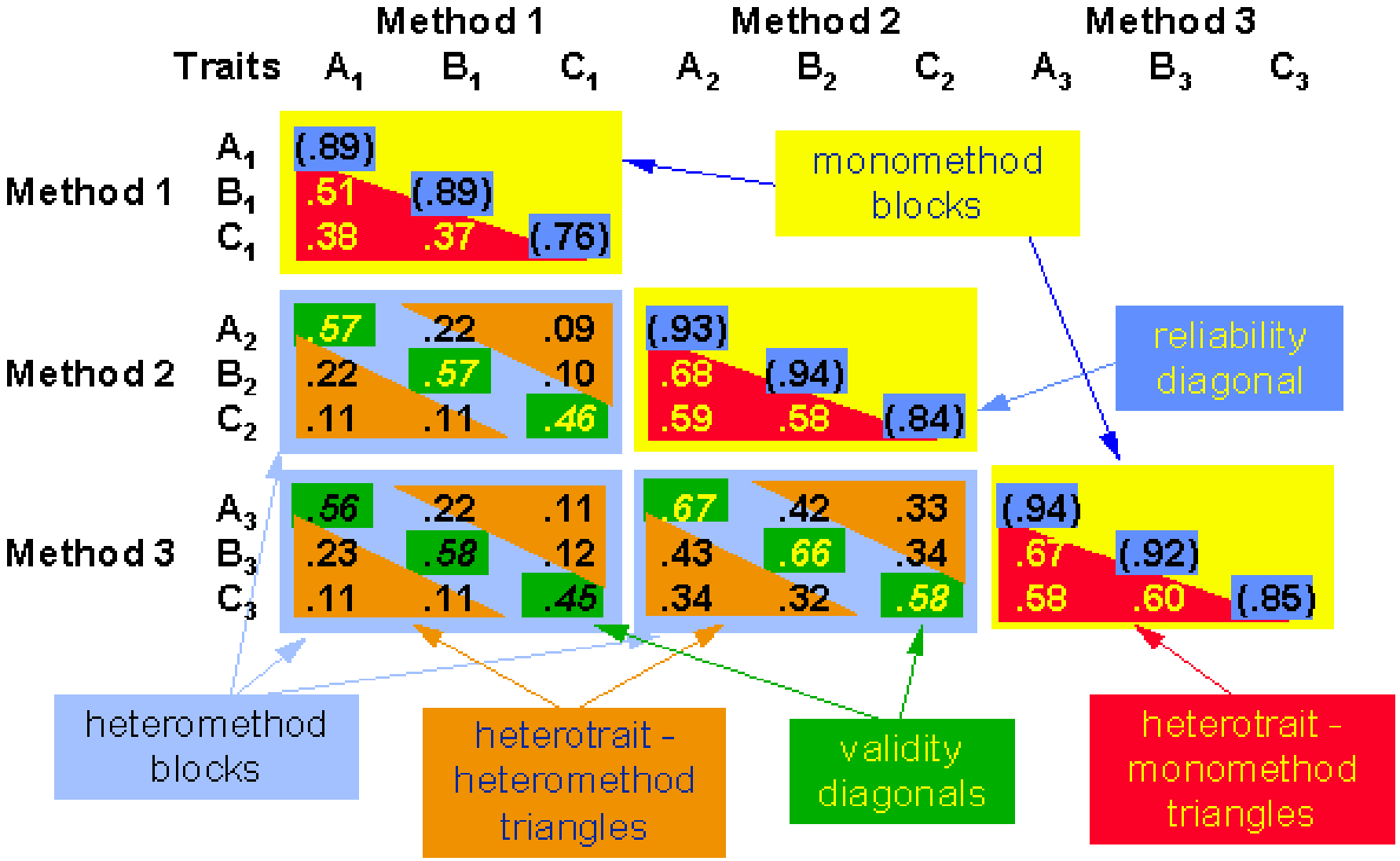
- Reliability diagonals should be close to 1.0
- Validities should be much greater than zero
- Reliabilities > Validities > Heterotrait-heteromethod triangles
- Trait measured by different method > Different trait measued by same method
- Pattern should be consistent among heteromethod blocks



Reliability diagonals should be close to 1.0



Validities should be much greater than zero



Reliabilities > Validities > Heterotrait-heteromethod triangles

What goes into a score?

- Observed Score = True Score + Error

- Also true that:

$$\sigma^2_{Observed} = \sigma^2_{True} + \sigma^2_{Error}$$

- If our method is attempting to measure σ^2_{True}
  - The error/bias of our method is within σ^2_{Error}
  - So:

$$\sigma^2_{Observed} = \sigma^2_{True} + \sigma^2_{Method} + \sigma^2_{Error}$$

- If we are measuring a trait

$$\sigma^2_{Observed} = \sigma^2_{Trait} + \sigma^2_{Method} + \sigma^2_{Error}$$

- And:

$$\text{Pearson's r} \propto \sigma^2$$

- So:

$$r_{Observed} \propto r_{Trait} + r_{Method} + r_{Error}$$

- Reliabilities: same trait, same method

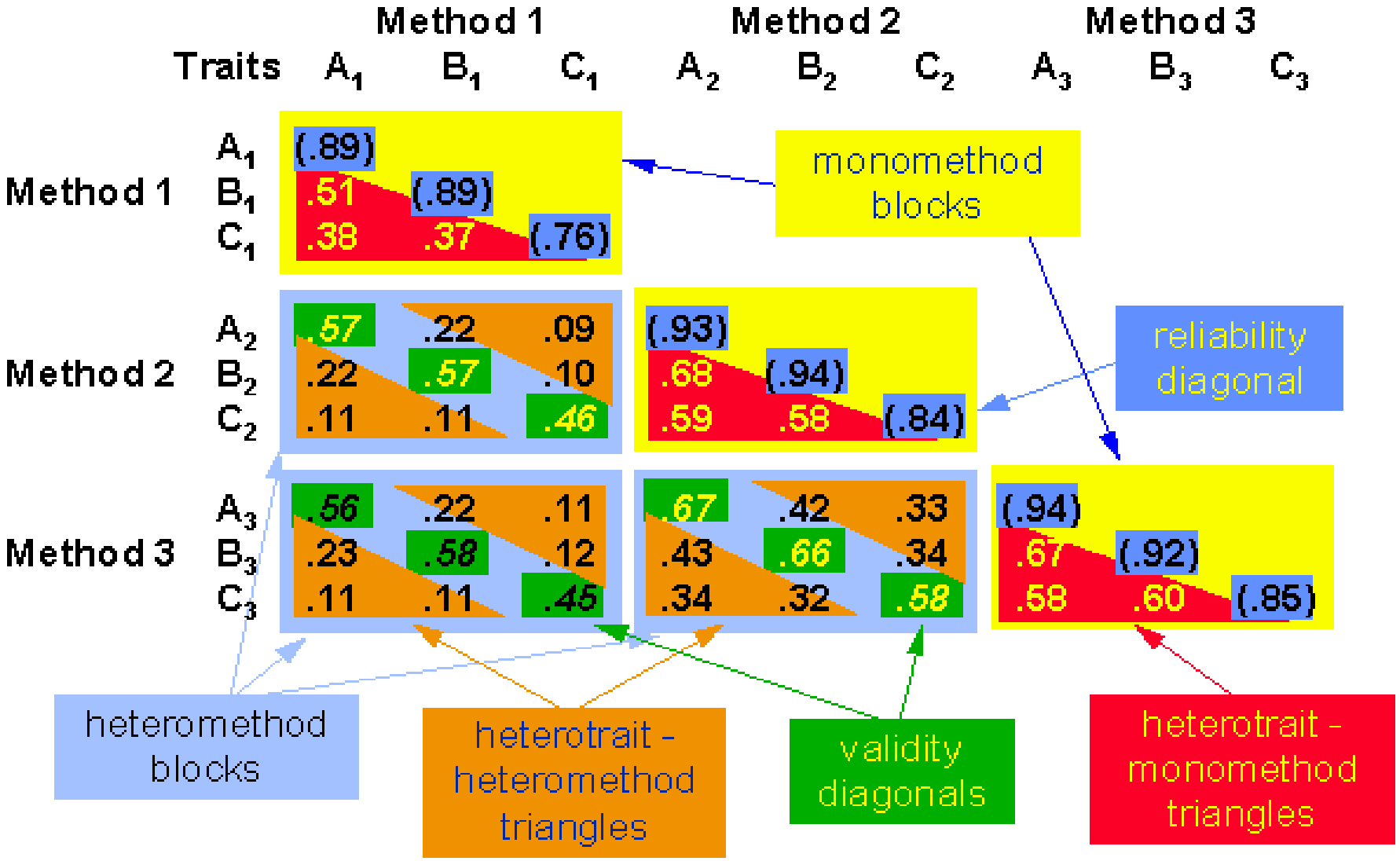
$$\boldsymbol{r_{Observed} \propto r_{Trait} + r_{Method}} + r_{Error}$$

- Validities: same trait, different method

$$r_{Observed} \propto \boldsymbol{r_{Trait}} + r_{Method} + r_{Error}$$

- Heterotrait-heteromethod: different trait, different method

$$r_{Observed} \propto r_{Trait} + r_{Method} + r_{Error}$$

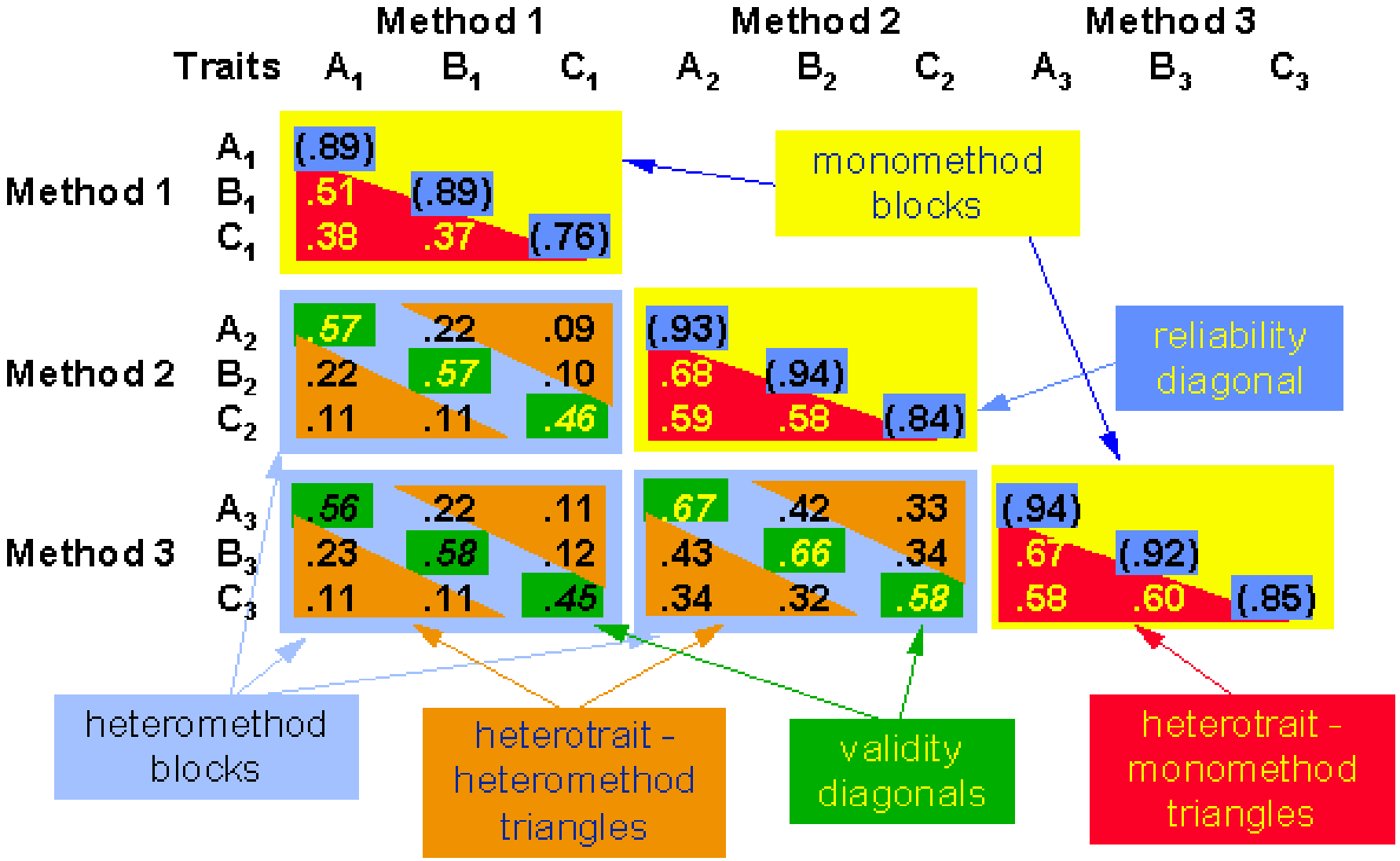


Trait measured by different method > Different trait measured by same method

- We want to validate the trait, not the method, so:

$$r_{Trait} > r_{Method}$$

$$\boldsymbol{r_{Trait}} + r_{Method} + r_{Error} > r_{Trait} + \boldsymbol{r_{Method}} + r_{Error}$$



Pattern should be consistent among heteromethod blocks

Table 5

Results of the 6 Traits × 2 Methods MTMM Analyses in Sample 1 of Study 2

			Self-rating						Parent rating					
Method and trait	*M*	*SD*	EI	NEURO	EXTRA	OPEN	ANT	CON	EI	NEURO	EXTRA	OPEN	ANT	CON
Self-rating														
EI	3.60	0.46	(.78)											
NEURO	3.67	0.93	*−.39*	(.77)										
EXTRA	4.74	0.94	*.15*	*−.08*	(.80)									
OPEN	4.93	0.95	*.30*	*−.12*	*.45*	(.82)								
ANT	5.21	0.74	*.26*	*−.36*	*.29*	*.14*	(.83)							
CON	5.04	0.77	*.55*	*−.46*	*.10*	*.27*	*.47*	(.86)						
Parent rating														
EI	3.57	0.45	**.28**	−.12	.00	.01	.02	.22	(.81)					
NEURO	3.56	0.98	−.18	**.34**	.04	−.02	−.18	−.20	*−.30*	(.79)				
EXTRA	4.65	1.04	.06	−.02	**.37**	.21	.02	−.02	*.00*	*.08*	(.83)			
OPEN	4.28	1.10	.15	−.04	.14	**.32**	−.10	.08	*.15*	*.08*	*.55*	(.85)		
ANT	5.34	0.88	.07	−.14	.01	−.02	**.20**	.14	*.16*	*−.16*	*.28*	*.09*	(.85)	
CON	5.13	0.95	.17	−.11	−.13	−.02	.05	**.34**	*.42*	*−.21*	*.11*	*.24*	*.58*	(.90)

Note. The six traits are emotional intelligence (EI), neuroticism (NEURO), extraversion (EXTRA), openness (OPEN), antagonism (ANT), and conscientiousness (CON). The two methods are self-rating and parent rating. The numbers on the diagonal are the coefficient alphas. Numbers in italics are in the heterotrait–monomethod analyses; numbers underlined are in the heterotrait–heteromethod analyses; numbers in bold are the results of the monotrait–heteromethod analyses. MMTM = multitrait–multimethod. Numbers in solid triangles are heterotrait–monomethod correlations; numbers in dotted triangle are heterotrait–heteromethod correlations.

Law, K. S., Wong, C., & Song, L. J. (2004). The Construct and Criterion Validity of Emotional Intelligence and Its Potential Utility for Management Studies. *Journal of Applied Psychology, 89*(3), 483-496.