Feed-a-Gene

Adapting the feed, the animal and the feeding techniques to improve the efficiency and sustainability of monogastric livestock production systems
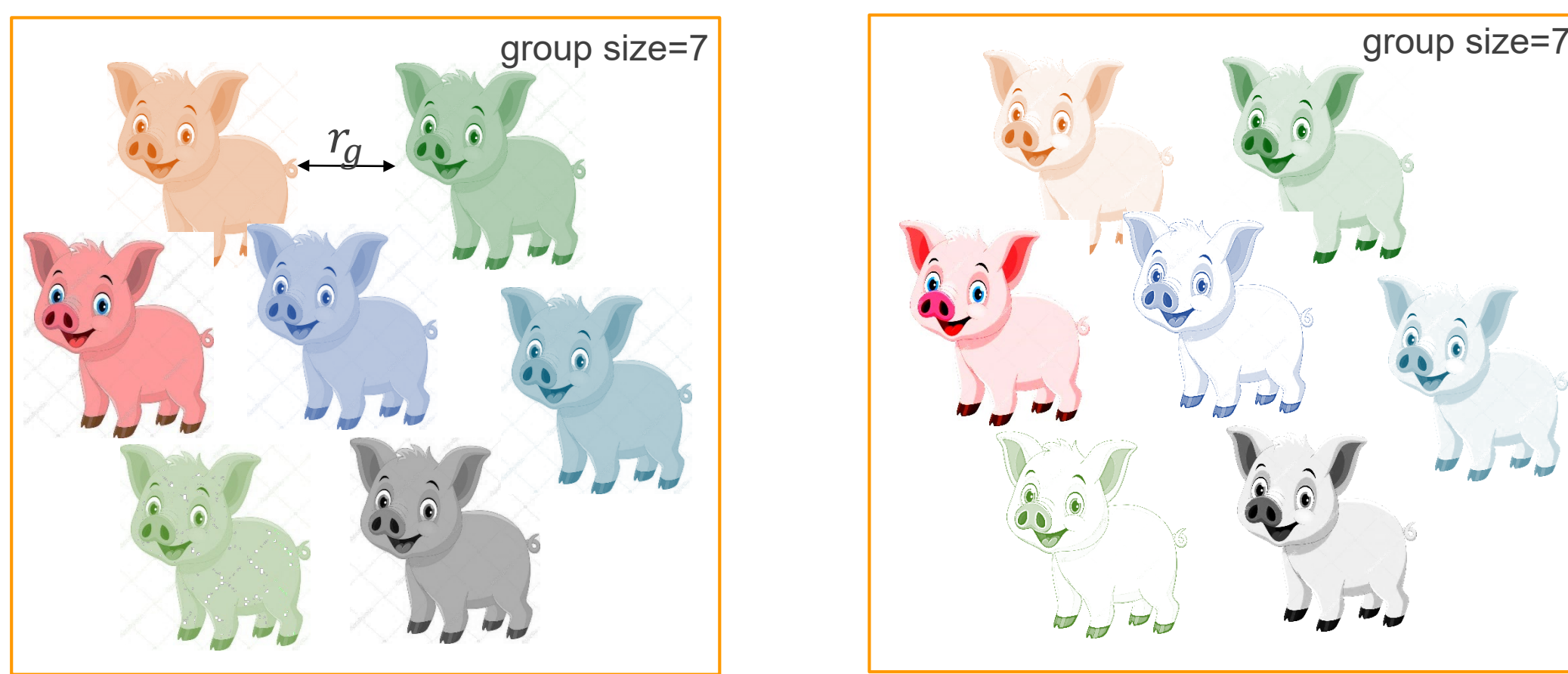
Simulation response to selection
for socially affected traits

Individual selection

Selection criterion:
phenotype of the candidate 🐷 raised in groups
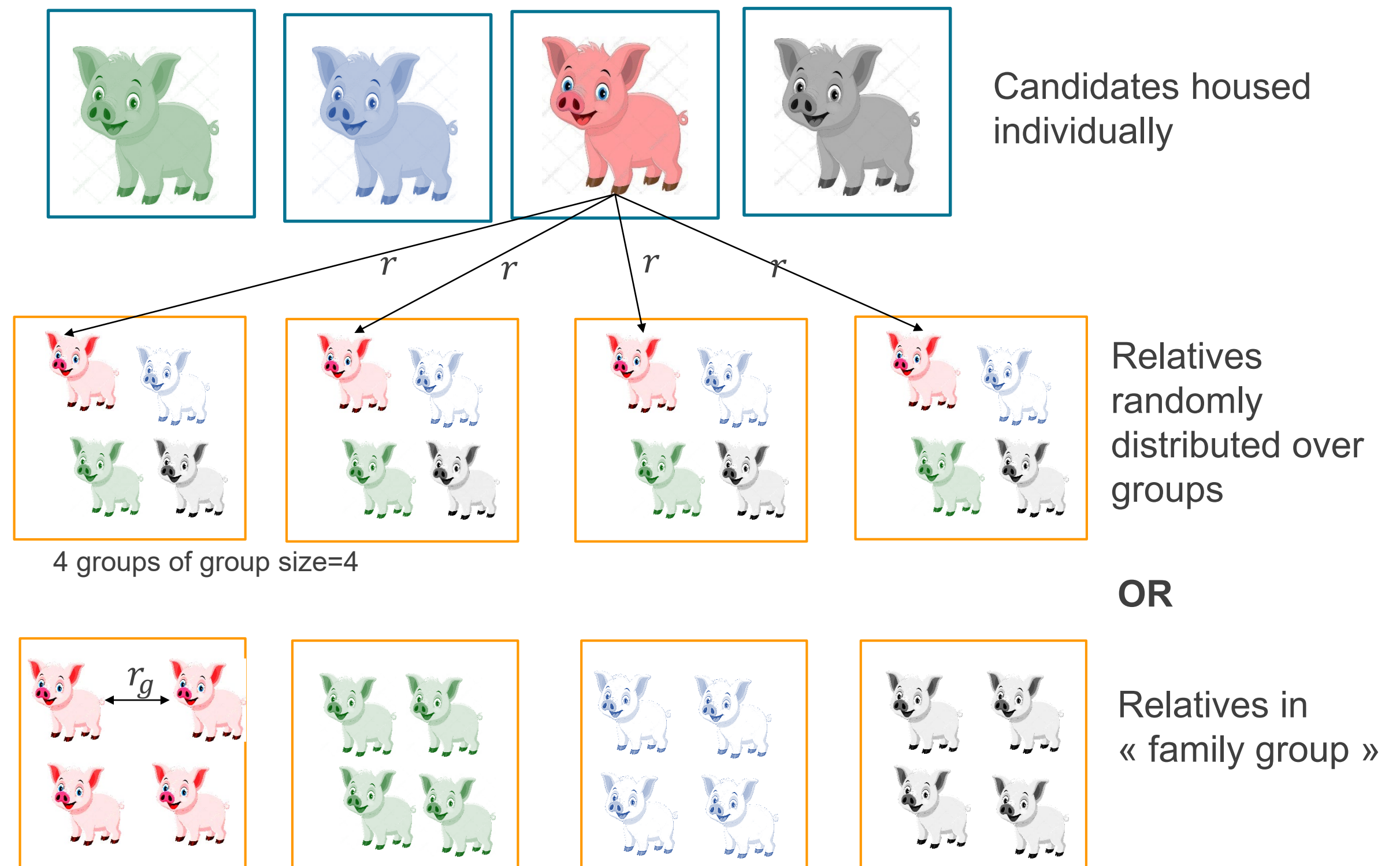
group size=7

group size=7

r_g

Individuals with the best phenotype are selected as parent of the next generation

Response to selection will depend on:
➢ Genetic parameters (direct, social heritability and their correlation)
➢ The group size
➢ Mean relatedness $\overline{r_g}$ within group

Selection based on relatives

Selection criterion:
mean phenotypes of relatives to the candidate raised in group

Candidates housed individually

r r r r

Relatives randomly distributed over groups

4 groups of group size=4

OR

r_g
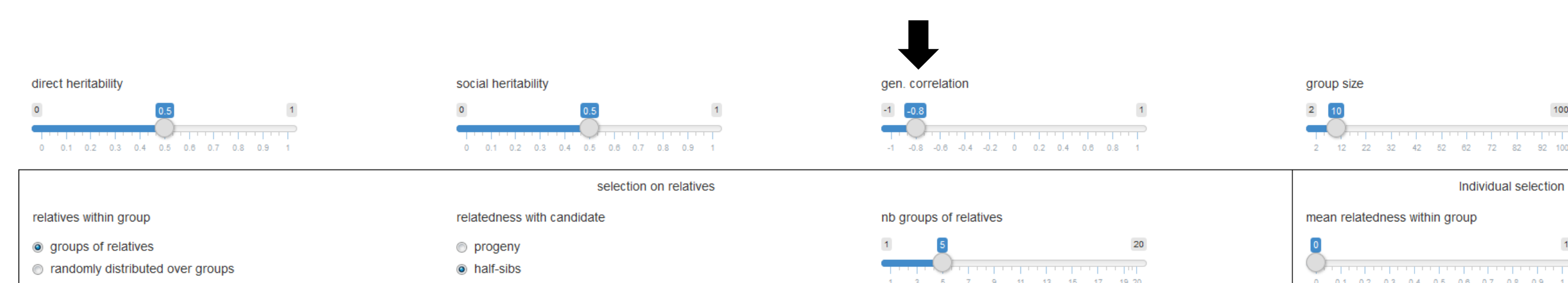
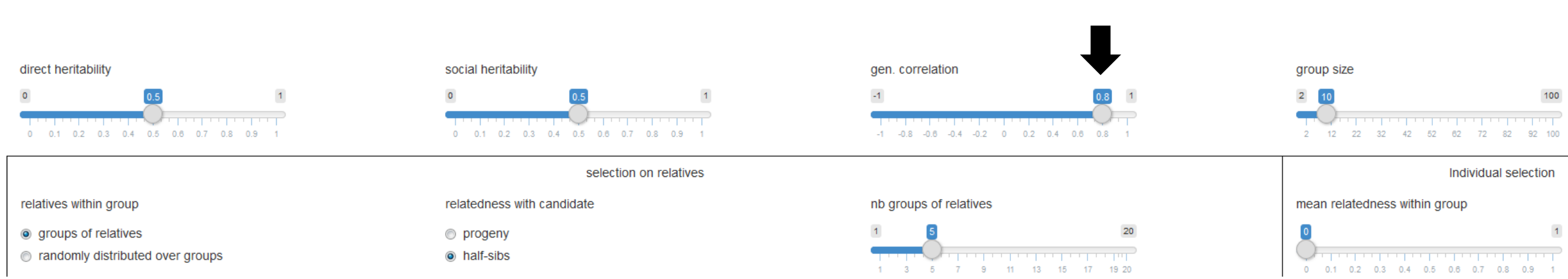Relatives in « family group »

Response to selection will depend on:
➢ Genetic parameters (direct, social heritability and their correlation)
➢ The group size
➢ The number of groups
➢ Relatedness with candidate (offspring $r = 0,5$ or half-sibs $r = 0,25$)
➢ relatedness within group ($r_g = 0$ for relatives randomly distributed over groups. We considerd $r_g = 0,5$ for offspring (they are full-sibs) and $r_g = 0,25$ for half-sibs of the candidate)
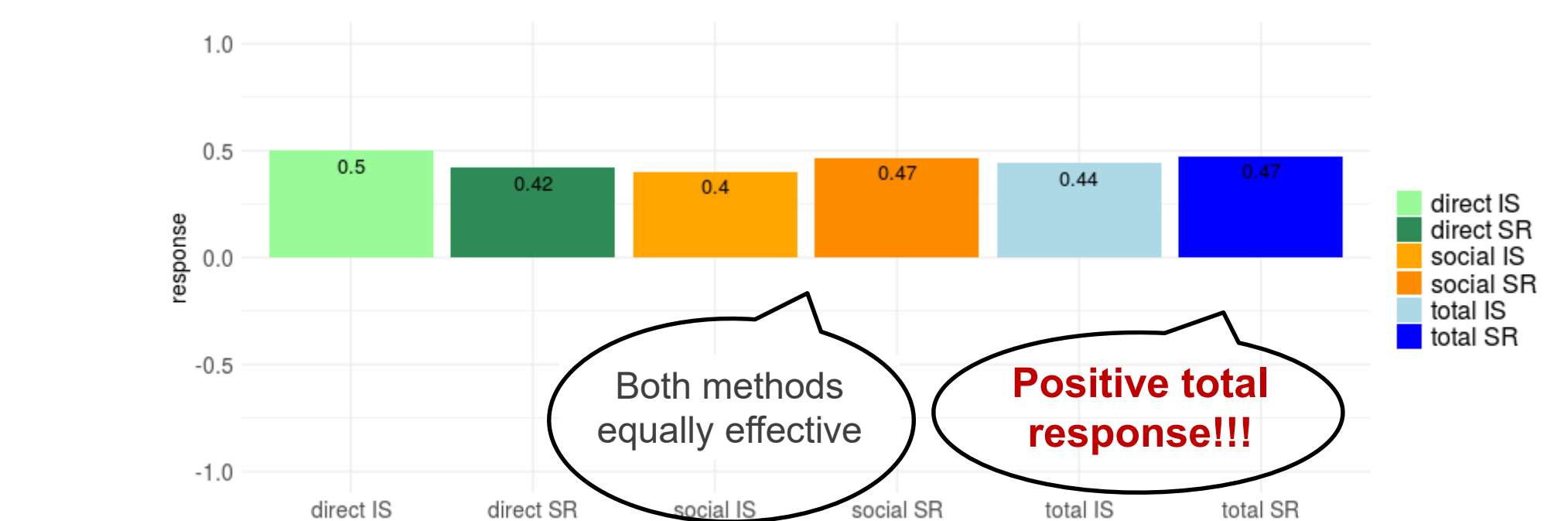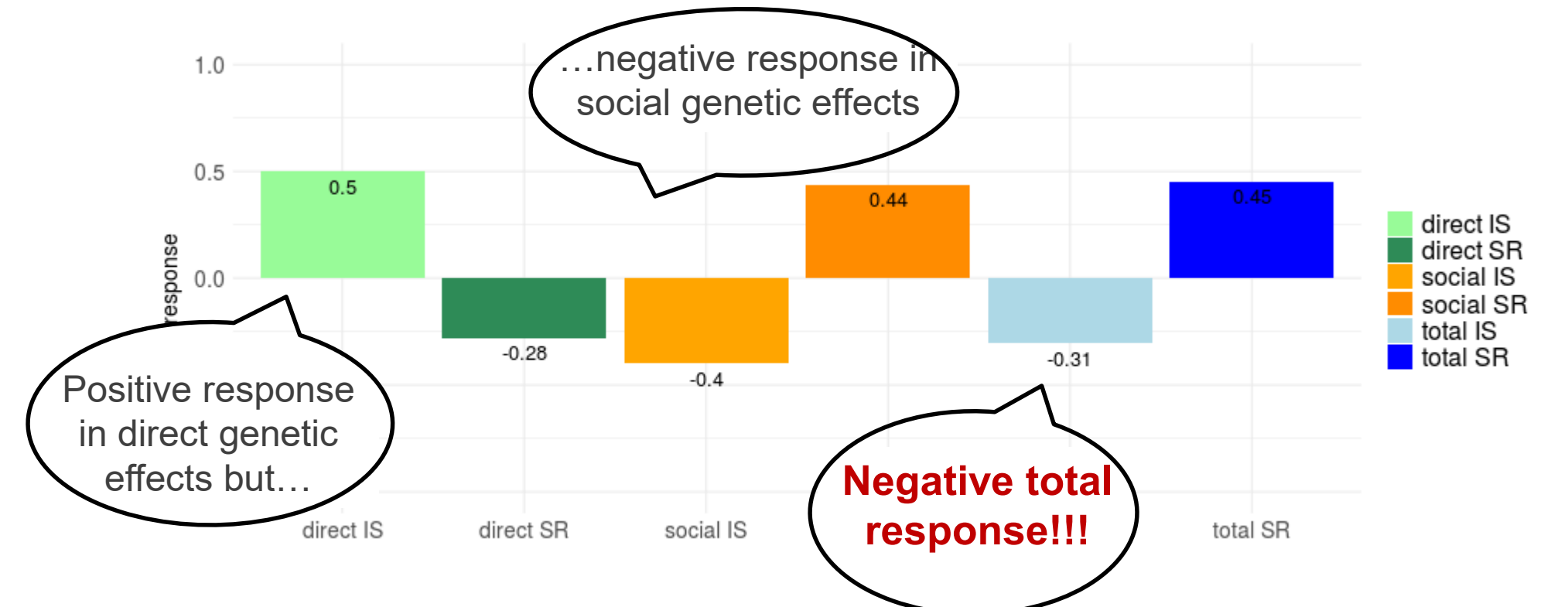
For socially-affected traits…

…Individual selection may completely fail to improve the trait when direct-social genetic covariance is sufficiently negative
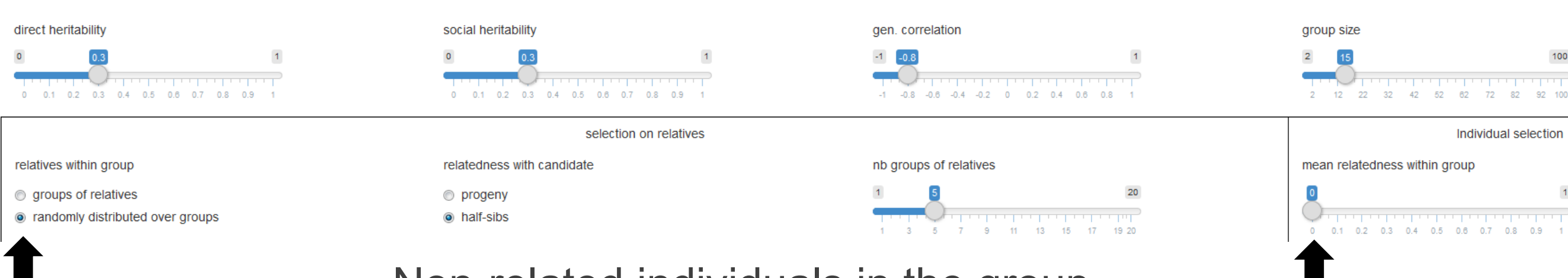
direct heritability
social heritability
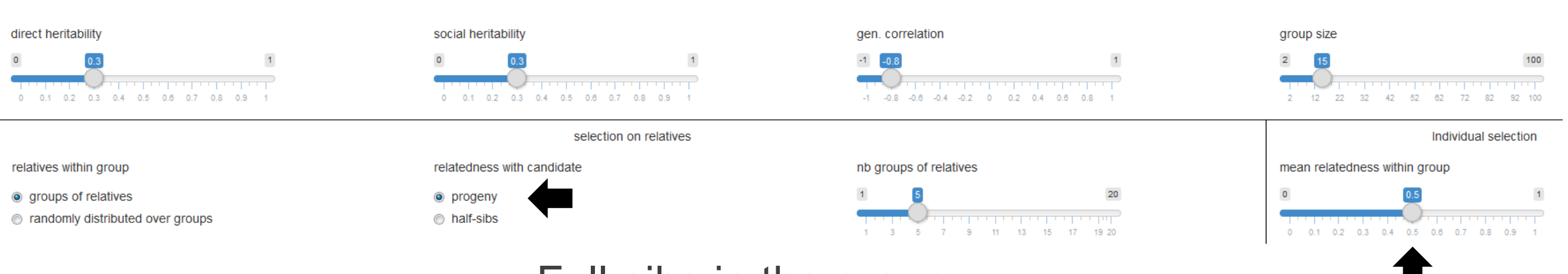gen. correlation
group size
selection on relatives
relatives within group
relatedness with candidate
nb groups of relatives
Individual selection
mean relatedness within group

Negative direct-social genetic covariance

…negative response in social genetic effects

Positive response in direct genetic effects but…

Negative total response!!!

0.5   -0.28   -0.4   0.44   -0.31   0.43

direct IS   direct SR   social IS   social SR   total IS   total SR

Positive direct-social genetic covariance

0.5   0.42   0.4   0.47   0.44   0.44

Both methods equally effective

Positive total response!!!

…Relatedness between interacting individuals is a key factor determining response to selection

Non-related individuals in the group

Negative total response!!!

0.39   0.12   -0.31   -0.09   -0.26   -0.08

direct IS   direct SR   social IS

Full-sibs in the group

Selection accounting for social effects much more effective than individual selection

-0.16   -0.44   0.34   0.66   0.37

Positive and higher total response!!!

direct IS   direct SR   social IS   social SR   total IS   total SR