The Swedish Armed Forces breeding program for German Shepherd Dogs – the next step

Per Arvelius, Breeding Manager
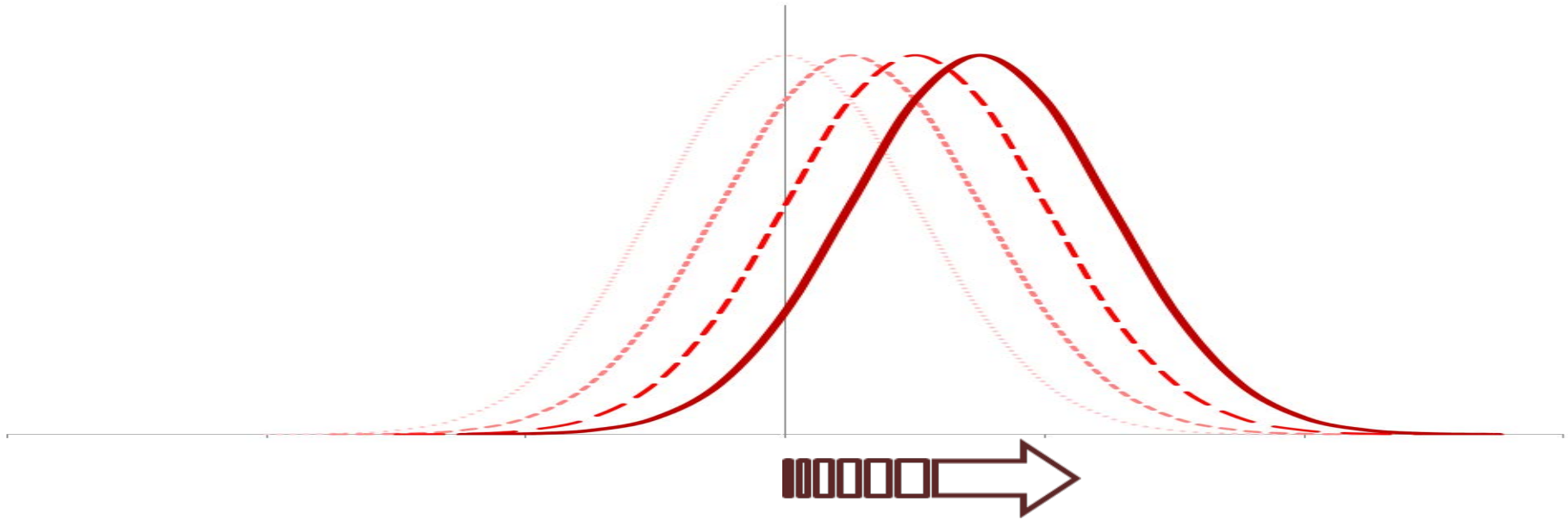
IWDC 2017

Outline

1. The Swedish Armed Forces breeding program for German Shepherd Dogs has been successful…

2. …but improvements are possible: Planned development

3. Challenges

Why breeding???

Genetic improvements are accumulated, because every round of selection starts from the level obtained by previous selection!

(Also, better guarantee for access to high quality dogs)

The Swedish Armed Forces Breeding Program

- The goal is to provide the Armed Forces with its full need of dogs (~30/year), and half of the need of the Swedish Police (~40/year). Norway, Denmark, Finland…

- Started in 2004, first litter 2005

- Germans Shepherds only

- Until now, 2000 puppies. Today >200 dogs born annually

- (Almost) closed breeding colony, 70-80 females and 15 males

Production of Military Working Dogs

Bitch arrive to breeding station 3 weeks prior to whelping

Puppy born

Production of Military Working Dogs

Bitch arrive to breeding station 3 weeks prior to whelping

⬇

Puppy born

⬇

8 weeks old - puppy to foster home

⬇

Foster home support program

⬇

12 months old – hip and elbow X-ray

⬇

15-18 months old – temperament test and veterinary examination

Production of Military Working Dogs

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Puppy born

8 weeks old - puppy to foster home

Foster home support program
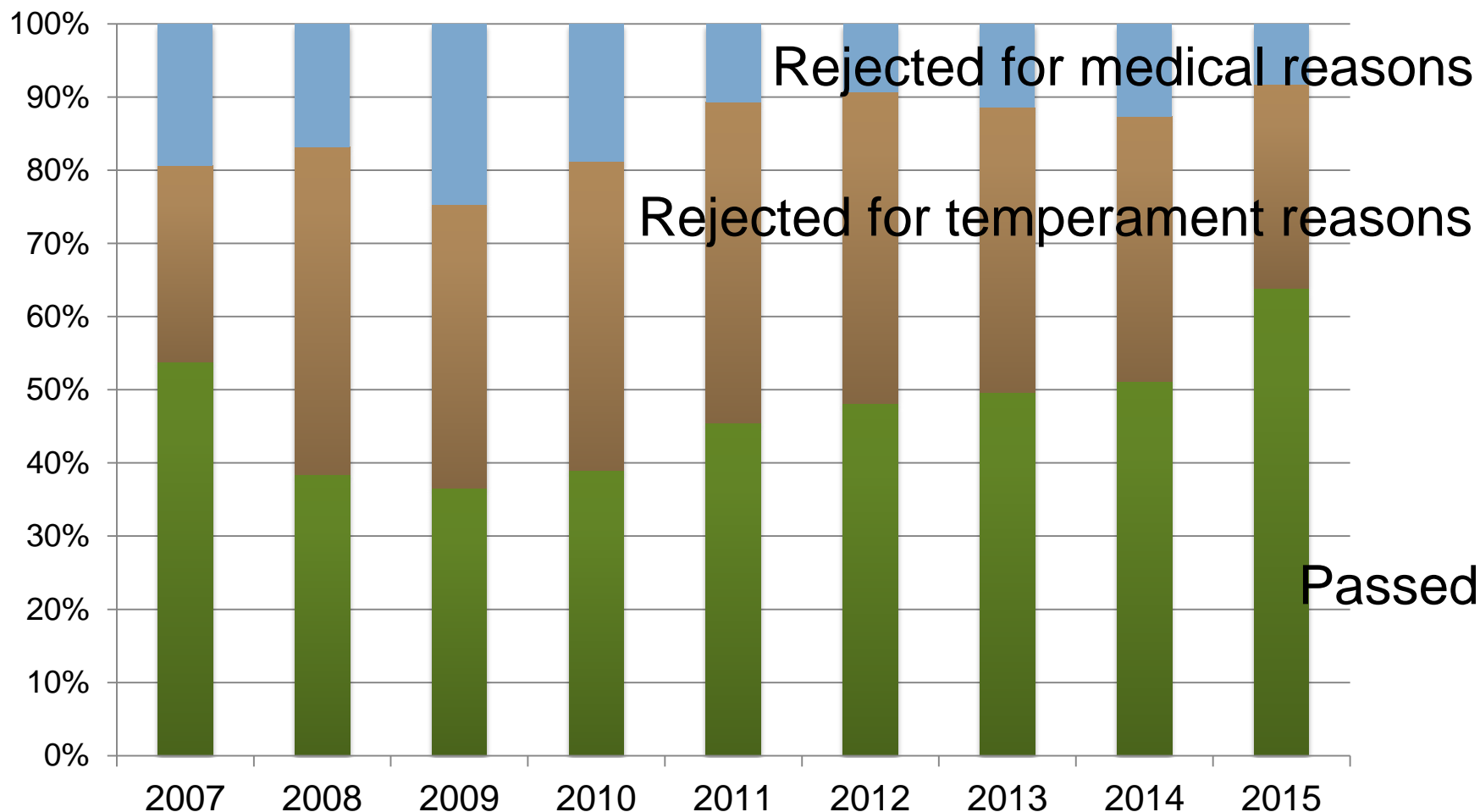
12 months old – hip and elbow X-ray

15-18 months old – temperament test and veterinary examination

Training of dog for 1 year, or selected for breeding (bitches)

Training of dog together with future handler for 16 weeks

Service (some males used for breeding)

Retirement

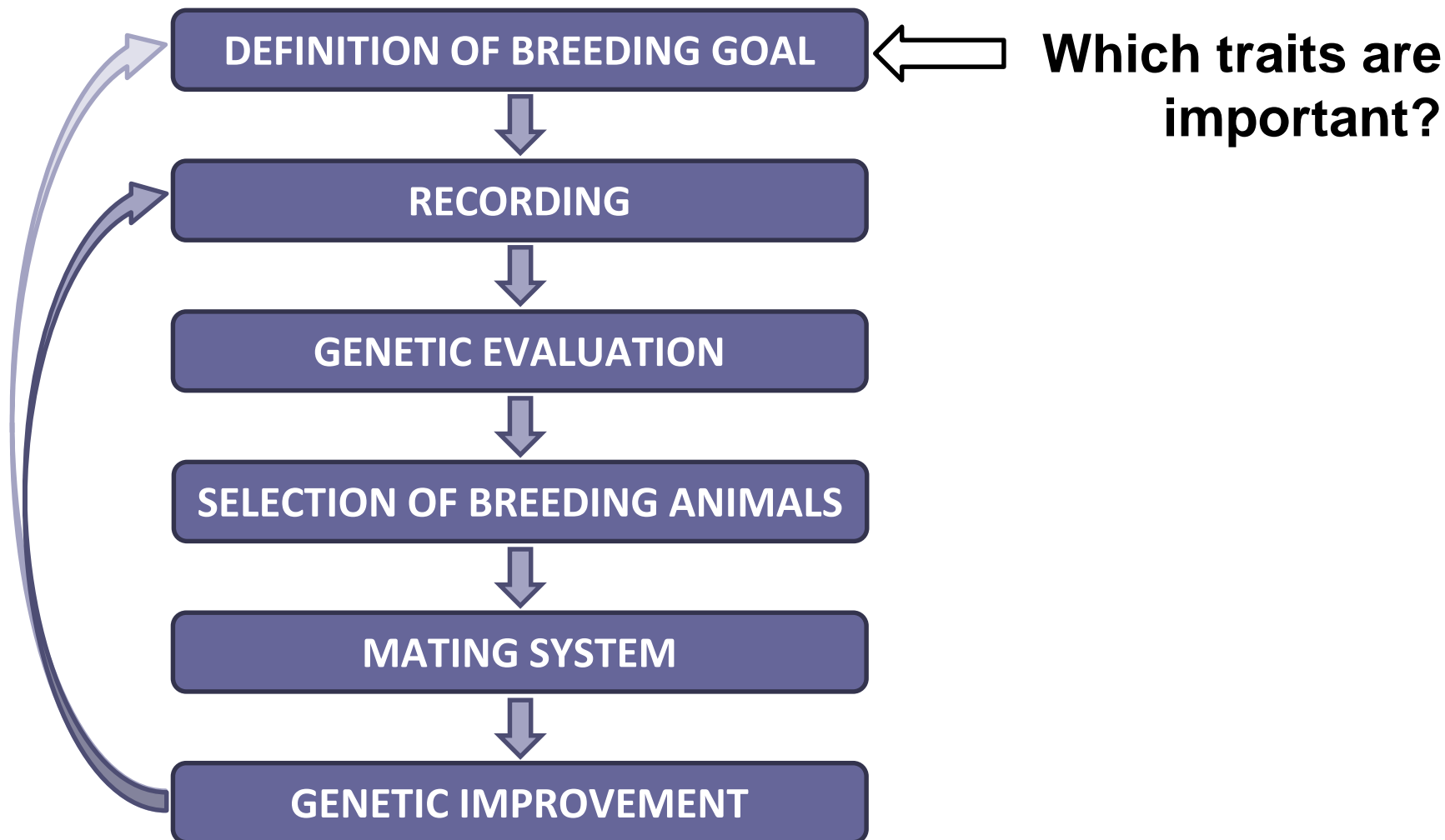The proportion of dogs rejected for training or breeding at test (15–18 months old) has decreased

Outline

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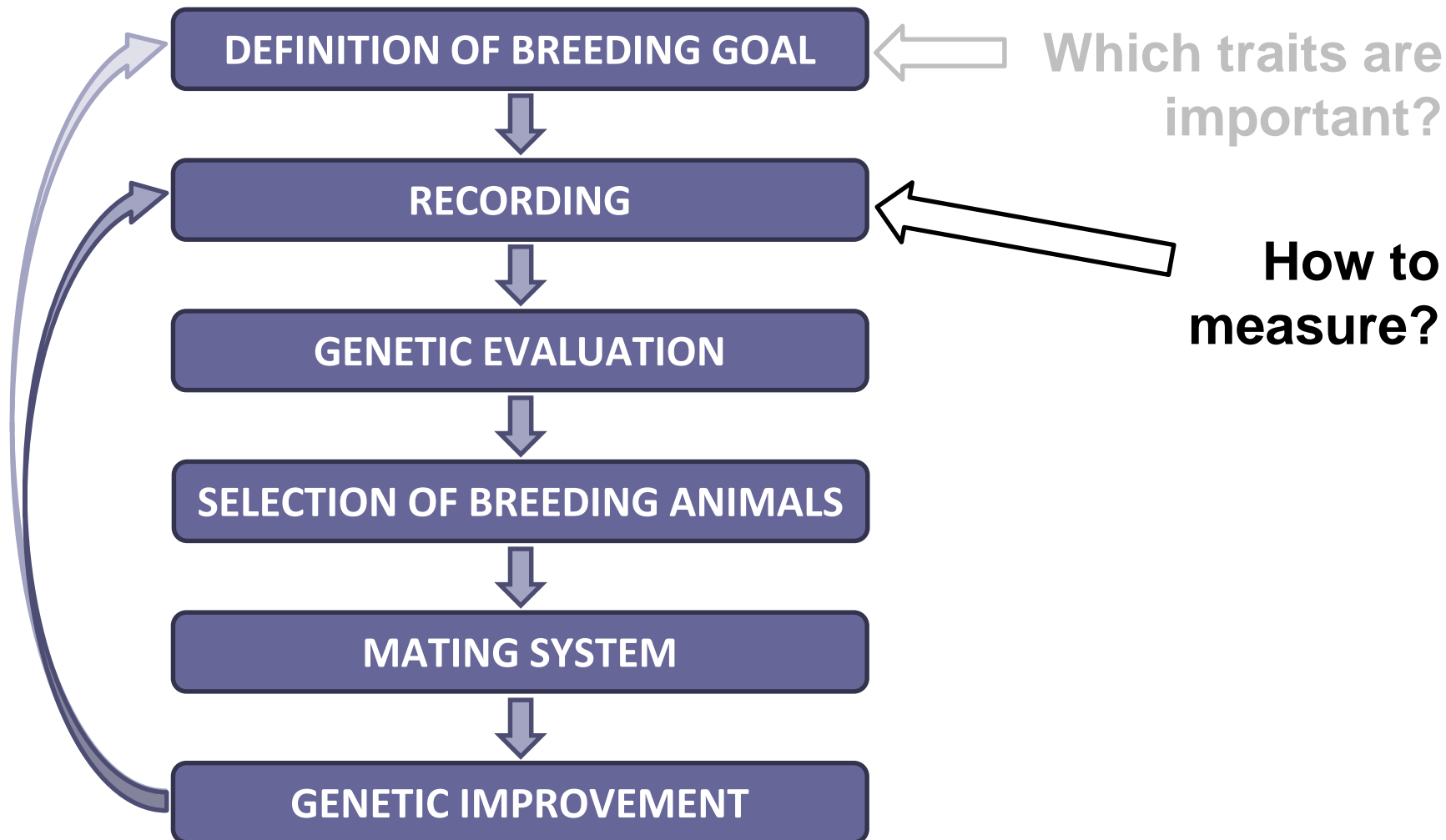2. …but improvements are possible: Planned development

3. Challenges

Principles of a breeding program

DEFINITION OF BREEDING GOAL ⇐ **Which traits are important?**

↓

RECORDING

↓

GENETIC EVALUATION

↓

SELECTION OF BREEDING ANIMALS

↓

MATING SYSTEM

↓

GENETIC IMPROVEMENT

Development

- Better definition of breeding goal (e.g., improved definition of suitable temperament; investigate reasons for vet. treatments, retirement, and genetic correlations btw traits; include robustness and longevity…)

SWEDISH ARMED FORCES

Principles of a breeding program

DEFINITION OF BREEDING GOAL ⟵ **Which traits are important?**

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RECORDING ⟵ **How to measure?**

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- Better definition of breeding goal (e.g., improved definition of suitable temperament; investigate reasons for vet. treatments, retirement, and genetic correlations btw traits; include robustness and longevity…)

- Earlier/better temperament assessment

Earlier/better temperament assessment

- Development of temperament test (sociability, variation, standardization, age, validation…)
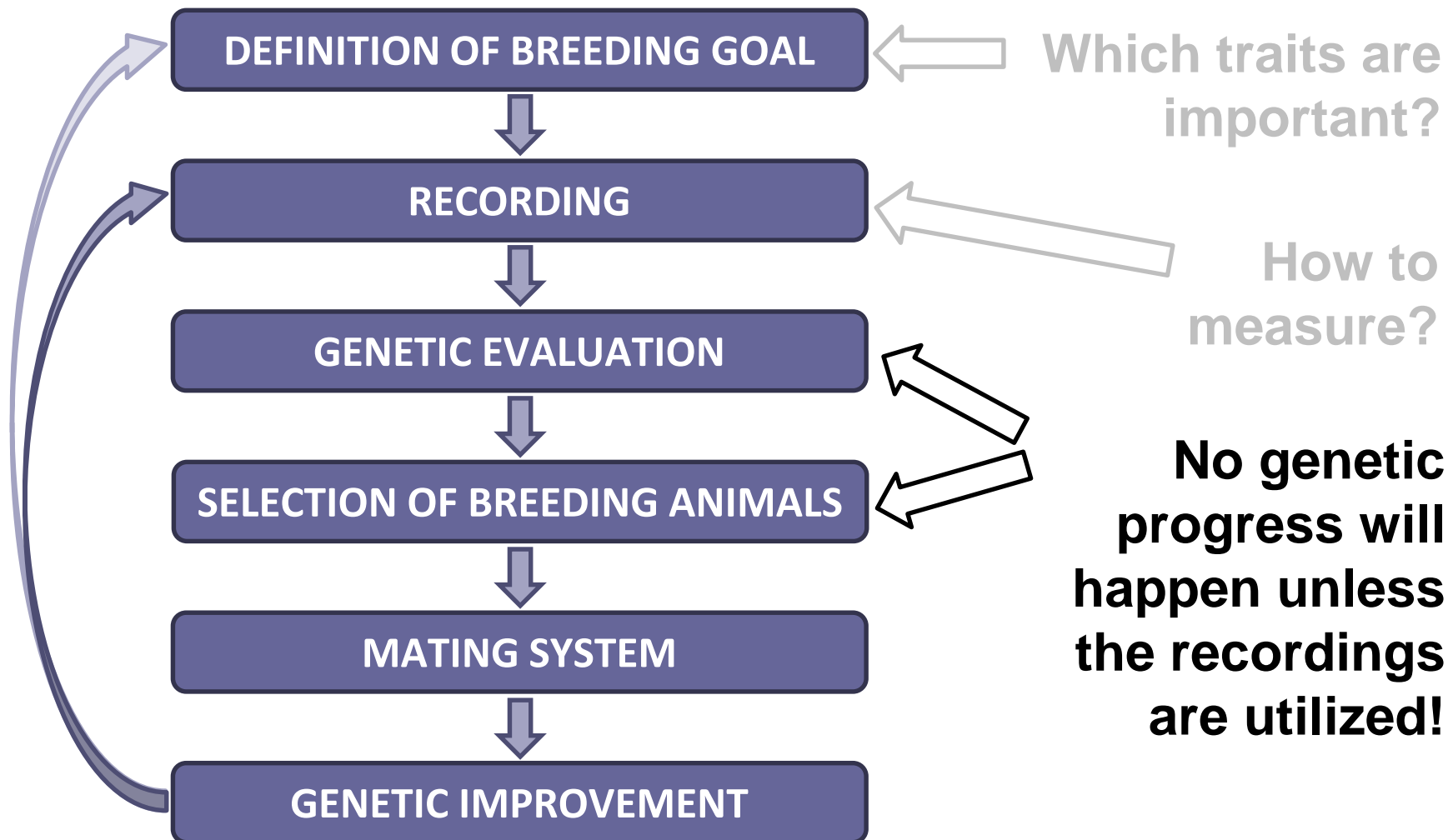
Measured traits…

…goal traits?

Earlier/better temperament assessment

- Development of temperament test (sociability, variation, standardization, age, validation…)

- Questionnaires (to foster homes or to foster home consultants?)

Principles of a breeding program

DEFINITION OF BREEDING GOAL ← **Which traits are important?**

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RECORDING ← **How to measure?**

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GENETIC EVALUATION

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GENETIC IMPROVEMENT

No genetic progress will happen unless the recordings are utilized!

Development

- Better definition of breeding goal (e.g., improved definition of suitable temperament; investigate reasons for vet. treatments, retirement, and genetic correlations btw traits; include robustness and longevity…)

- Earlier/better temperament assessment

- Develop Estimated Breeding Values (EBVs) and start using these for selection

Why EBVs? Selecting the *genetically* best animals enhances genetic improvement!

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Parent generation
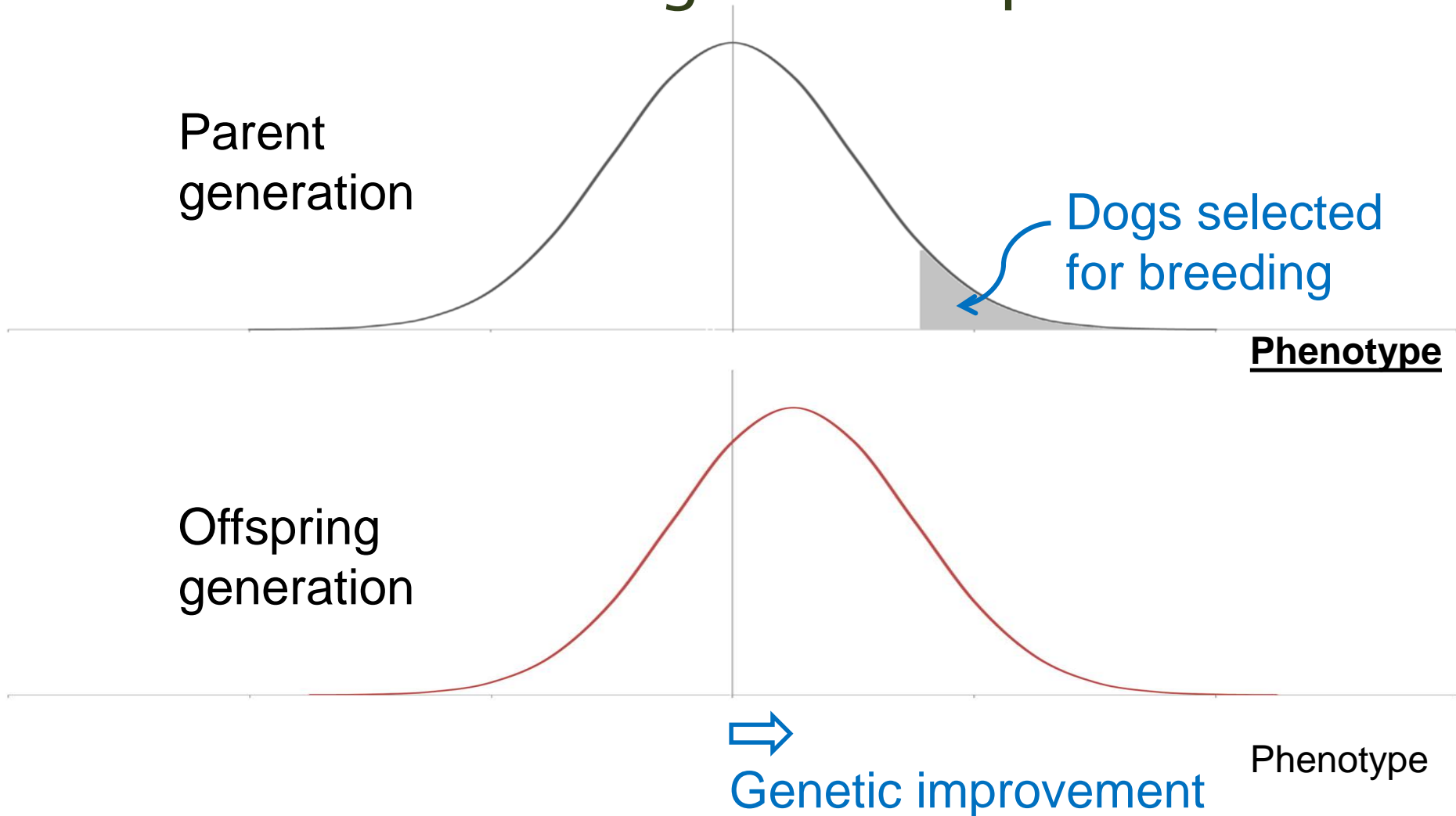
Dogs selected for breeding

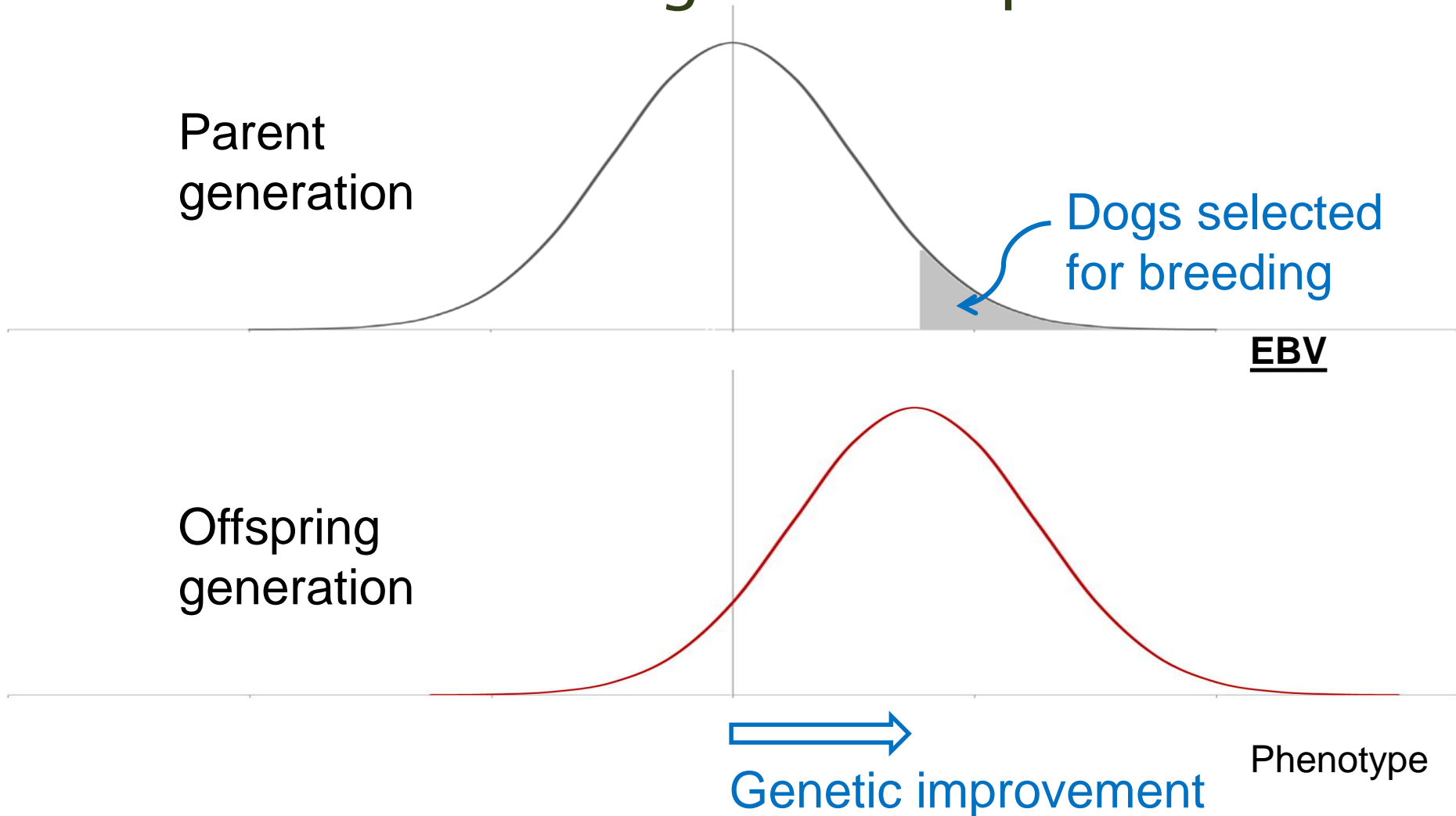**Phenotype**

Offspring generation

Genetic improvement

Phenotype

Why EBVs? Selecting the *genetically* best animals enhances genetic improvement!

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- International collaboration

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Challenges…example 1:

Logistical issues and lack of demand makes it difficult to keep production high enough to recruiting breeding animals from own production and at the same time avoiding inbreeding-related problems

Solution = international collaboration?
- Sharing genetic material -> possibilities for lower inbreeding rate and higher selection intensity -> faster genetic progress
- Increased demand by selling dogs abroad (primarily to other Scandinavian countries)

  ✓ Bonus = each program less vulnerable…

Challenges...example 2:

Dogs who consume many foster homes have a higher success rate in training
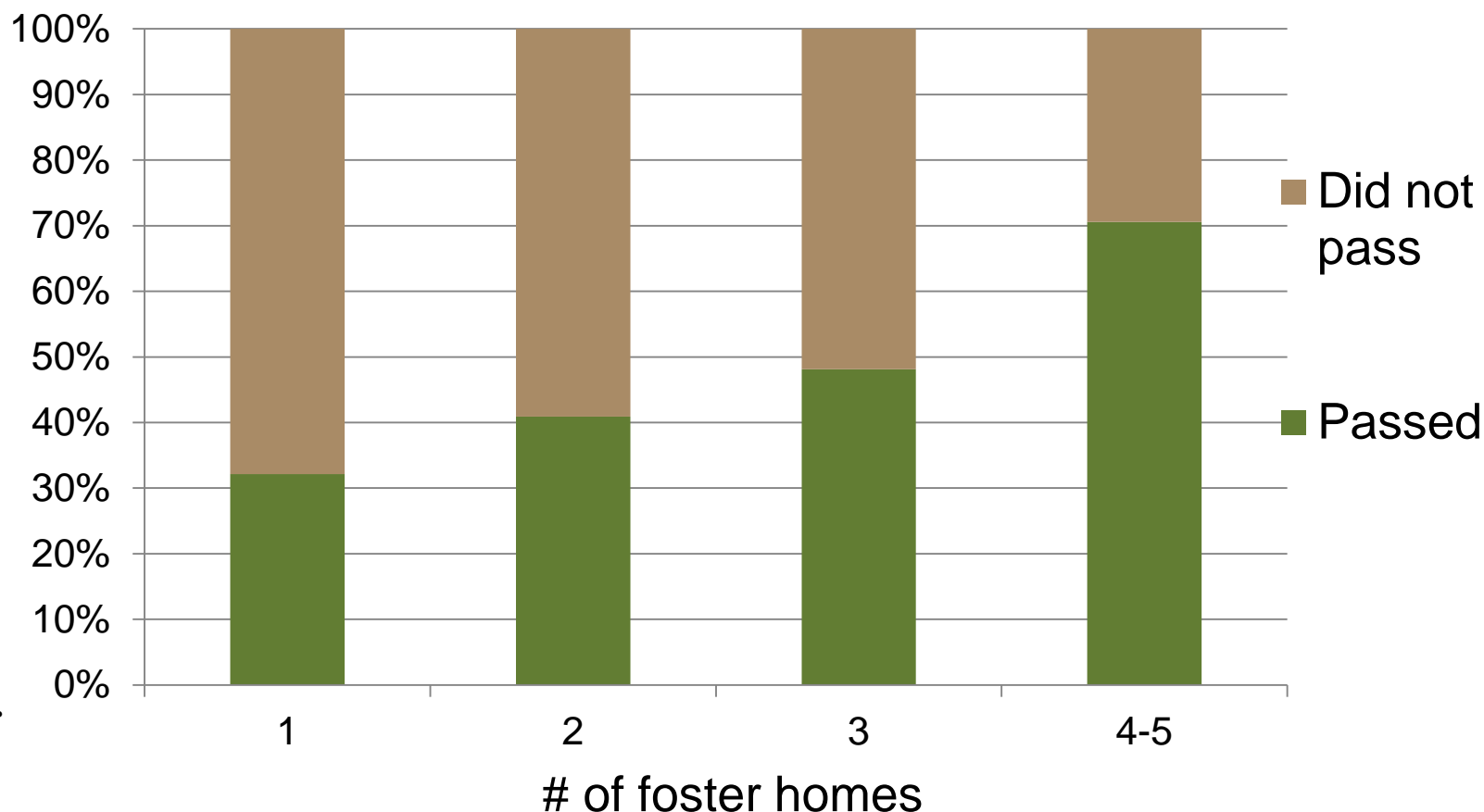
Challenges…example 2:

- Dogs with a desired temperament for MWD/Police dogs are more likely to be discarded by host families

- Breeders of companion dogs are not likely to select for traits desired in MWD/Police dogs

- Improving temperament have to be combined with adapting methods of raising and training the dogs

Questions, suggestions…

The Swedish Armed Forces Dog Training Center – HISTORY

1911: First dogs in training for military use

1936: The Army established the first dog unit

Since **1952**: Patrol dogs, Mine Detection Dogs and Explosives Detection Dogs have served in Gaza, Sinai, Lebanon, Bosnia, Kuwait, Cambodia, Kosovo, Laos and Afghanistan

1980: The Air Force established today's Dog Training Center

Since **2004**: (New) breeding program

>100 years of dog service!

The Swedish Armed Forces Dog Training Center – TASKS

- Administration of all Military Working Dogs within the Armed Forces

- Supplying the Armed Forces - and the Police - with capable dogs

- Training and educating personnel in dog service

- Development of the dog service

- Collaboration with other countries and governmental organisations

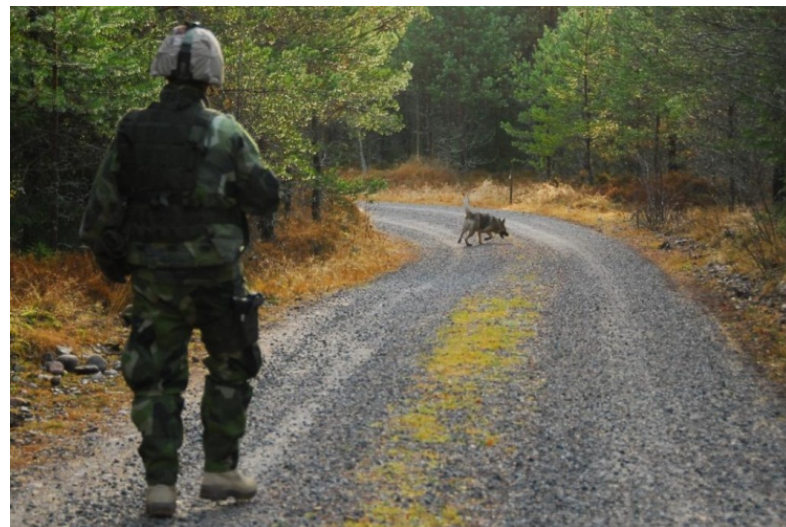- **Breeding of dogs (German Shepherd)**

Patrol dogs

Detecting, searching and tracking people. Used over wide areas and in buildings, on or off leash. Used within all branches of the fighting service
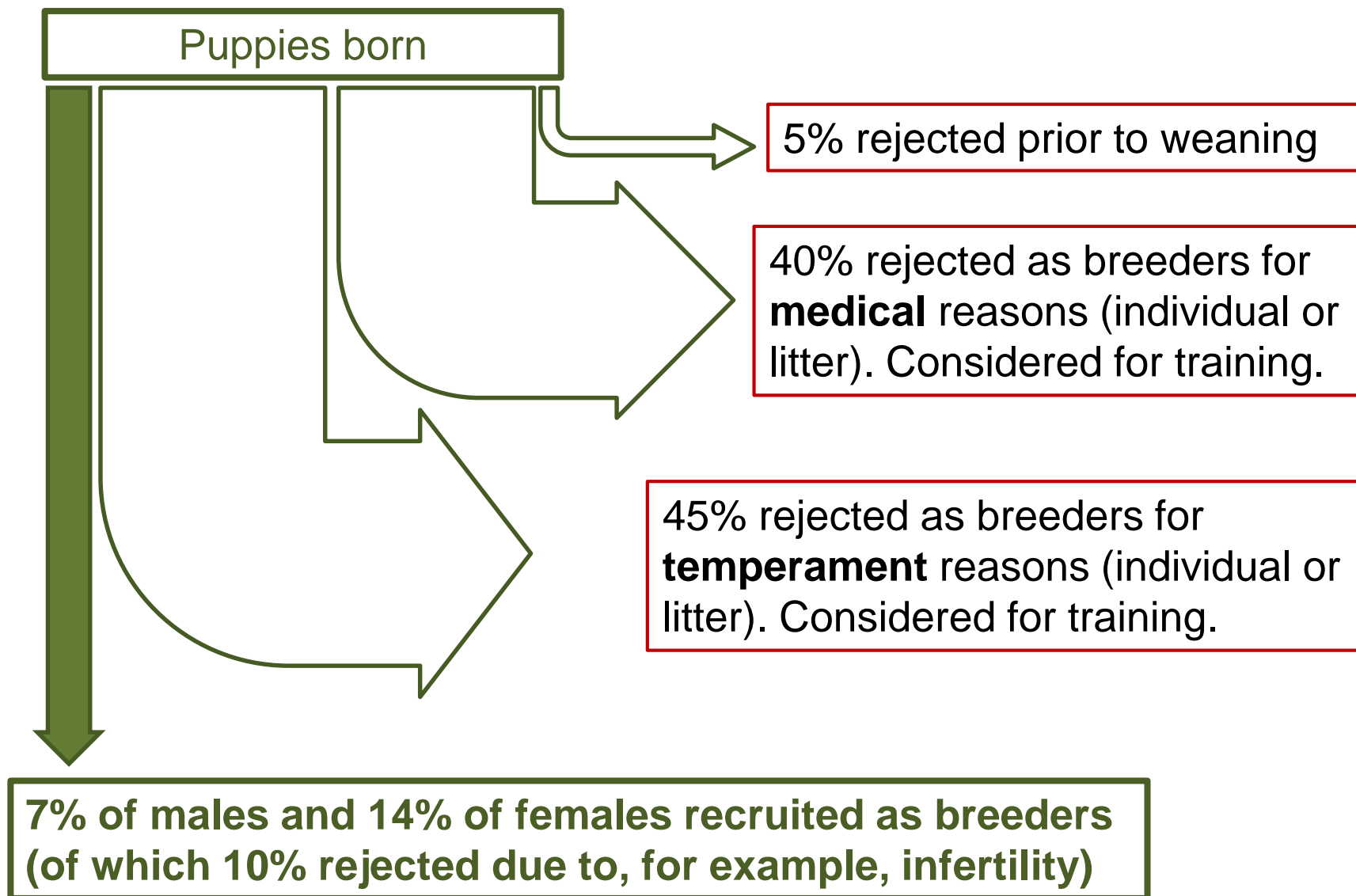
Explosives detection dogs

Detecting firearms, and commercial, military and home-made explosives

From puppy to breeder

Puppies born

5% rejected prior to weaning

40% rejected as breeders for **medical** reasons (individual or litter). Considered for training.

45% rejected as breeders for **temperament** reasons (individual or litter). Considered for training.

7% of males and 14% of females recruited as breeders (of which 10% rejected due to, for example, infertility)

Temperament test

15-18 months old – temperament test and veterinary examination

The ratings made during the test can be aggregated into three composite traits

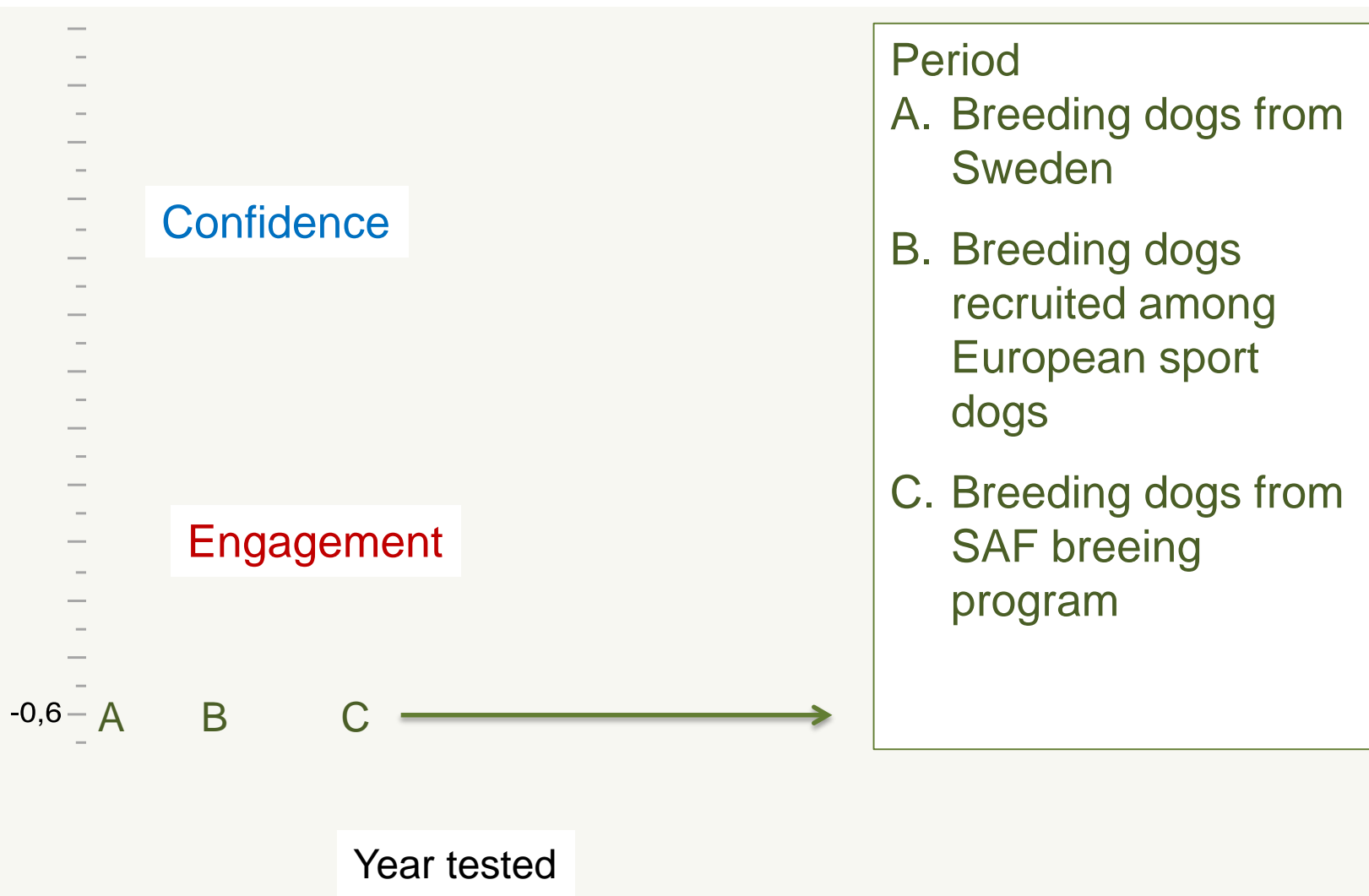**Engagement** and **Confidence** predict training outcome, **Aggression** does not

Wilsson and Sinn, Appl. Anim. Beh. Sci. 141 (2012) 158-172

Characteristics of dogs with high/low levels of Engagement and Confidence

	Low	High
Confidence	Fearful, insecure, dependent, sensitive, easy to train in obedience tasks, easy to control	Courageous, stable, independent, insensitive
Engagement	Phlegmatic, no desire to play or to chase objects/prey	Lively, energetic, responsive, needs to be activated

Test results for Engagement and Confidence have improved

Confidence

Engagement

-0,6 — A   B   C

Year tested

Period
A. Breeding dogs from Sweden

B. Breeding dogs recruited among European sport dogs

C. Breeding dogs from SAF breeing program

Development

- Create better structure regarding how information is recorded, stored and utilized. **Develop database!**

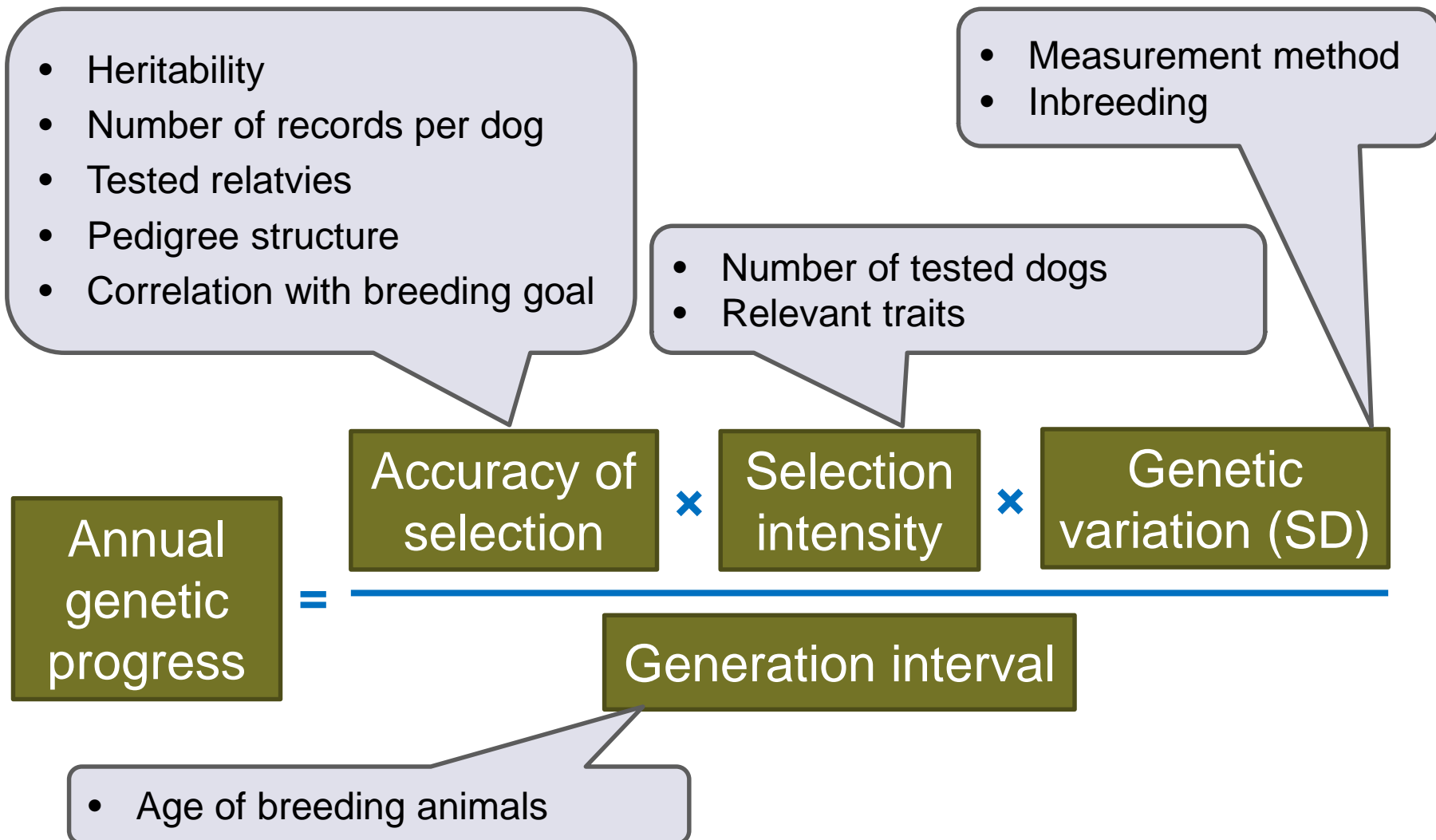 **…otherwise nothing else will work smoothly.**

Why EBVs?

Purpose of breeding = genetic improvement, which requires selecting the **genetically** best animals as parents

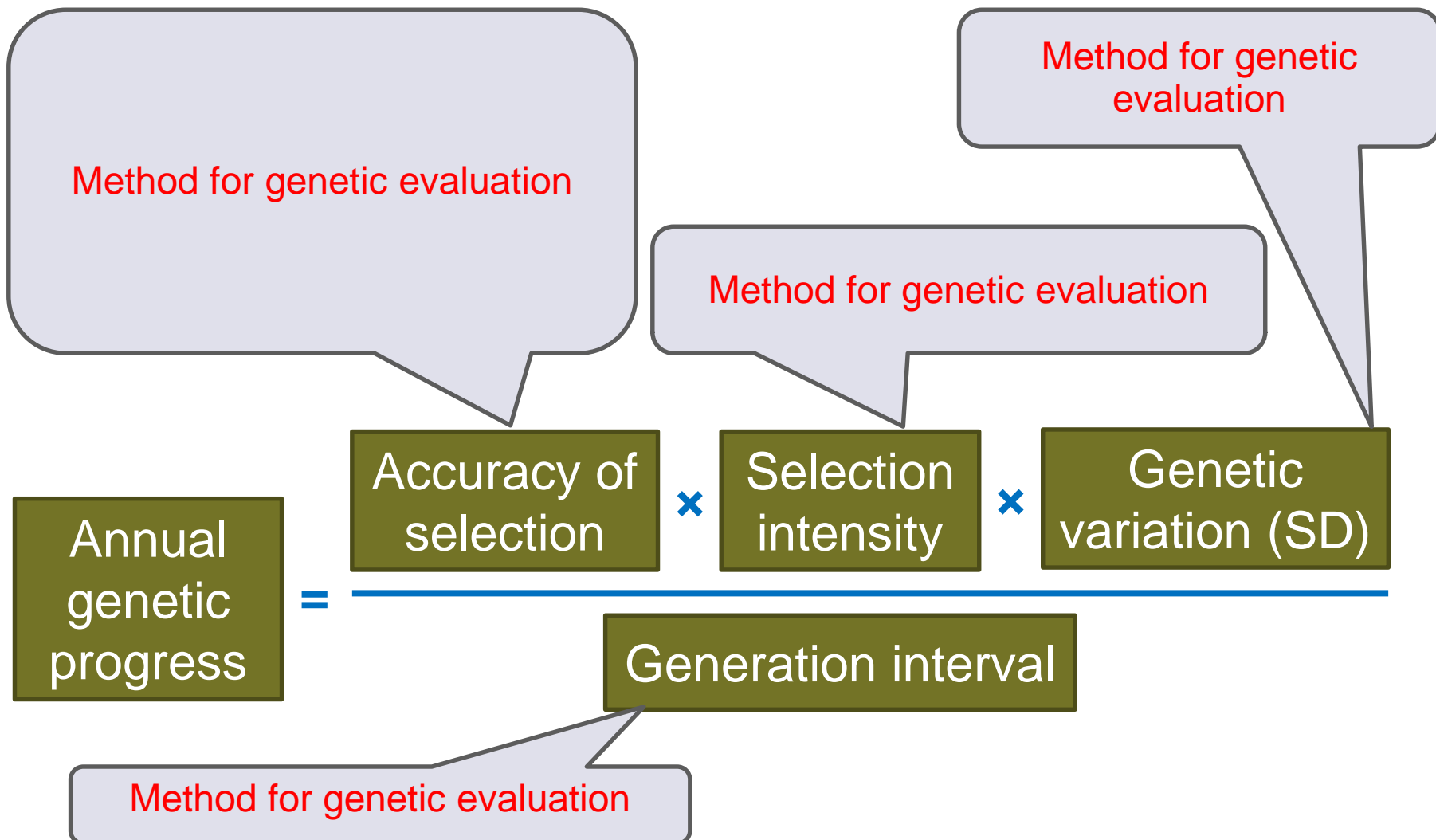But: A **phenotypically** good dog is not necessarily **genetically** good (and vice versa)!

EBVs are effective – the most objective way to rank animals based on their **genetic** qualities:

- Phenotype adjusted for environmental factors
- Information from relatives taken into account

Factors affecting the rate of genetic progress

- Heritability
- Number of records per dog
- Tested relatvies
- Pedigree structure
- Correlation with breeding goal

- Measurement method
- Inbreeding

- Number of tested dogs
- Relevant traits

$$\text{Annual genetic progress} = \frac{\text{Accuracy of selection} \times \text{Selection intensity} \times \text{Genetic variation (SD)}}{\text{Generation interval}}$$

- Age of breeding animals

Factors affecting the rate of genetic progress

Temperament test

- 12 sub-tests
- Approximately 40 minutes per dog
- 24 behaviour ratings during the test (BR score sheet)
- 14 traits subjectively rated after the test (SR score sheet)

1. Affability
2. Competetiveness
3. Hunting drive
4. Environmental sureness
5. Courage
6. Nerve stability
7. Hardness
8. Liveliness
9. Sharpness
10. Defense drive
11. Cooperativeness
12. Prey drive
13. Curiosity
14. Gun shyness

Behaviour ratings (BR)

Sub-test	Rating	1	2	3	4	5
Visual startle	Flight distance	Escapes >5 m	Escapes 2-5 m	Escapes 1-2 m	Jerks without escaping	No fear response
Visual startle	Aggression	No sign of aggr.	Some signs of aggr.	Several signs of aggr.	Several signs of aggr. and attack	Aggr., attacks, bites

Subjective ratings (SR)

Trait	Definition	1	2	3	4	5
Courage	"The absence of fearful behaviour toward real or imagined danger…"	Insignificant	Weak	Some	Strong	Very strong

Heritabilities

Trait	Heritability	
	BR	SR
Engagement	0.22	0.28
Confidence	0.23	0.19
Aggression	0.18	0.12

Temperament profiles of different categories of dogs
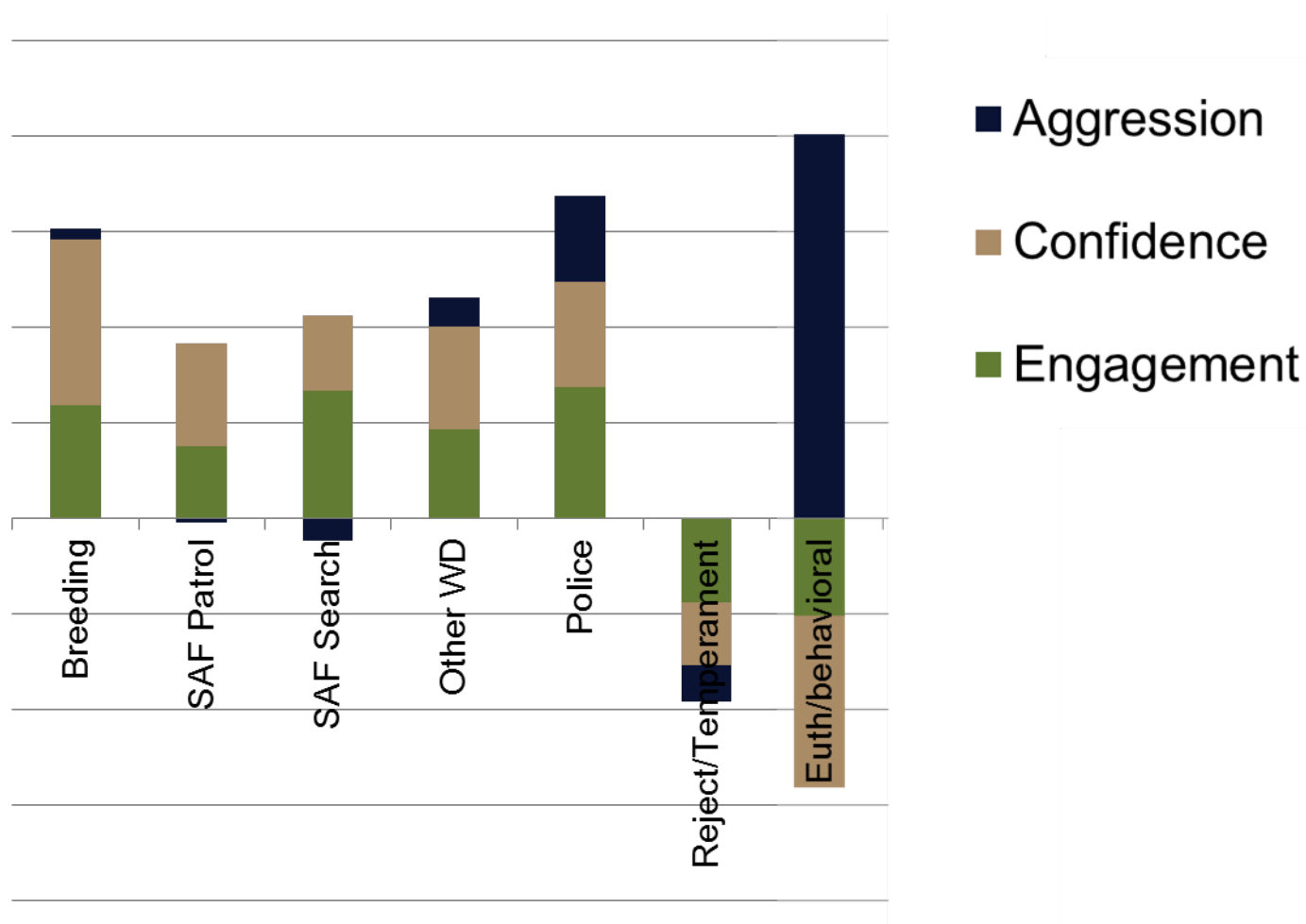
Canine Behavioral Assessment and Research Questionnaire (C-BARQ)

101 questions on frequency or intensity of a dog's typical behaviour. Can be condensed into 15 composite traits.

Thinking back over the recent past, please indicate how often your dog has chased or would chase squirrels, rabbits and other small animals given the opportunity:

0	**1**	**2**	**3**	**4**
Never	Seldom	Sometimes	Often	Always

Please indicate your own dog's recent tendency to display fearful behavior in response to sudden or loud noises (e.g. vacuum cleaner, car backfire, road drills, objects being dropped, etc.):

No fear/anxiety: Mild—Moderate fear/anxiety   Extreme fear:

No visible   cowers; retreats or

signs of fear   **0**   **1**   **2**   **3**   **4**   hides, etc.

Development

- Better definition of breeding goal (e.g., improved definition of suitable temperament; investigate reasons for vet. treatments, retirement, and genetic correlations btw traits; include robustness and longevity…)

- Earlier/better temperament assessment

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- International collaboration

- Genomic selection? Optimal Contribution Selection?

SWEDISH ARMED FORCES
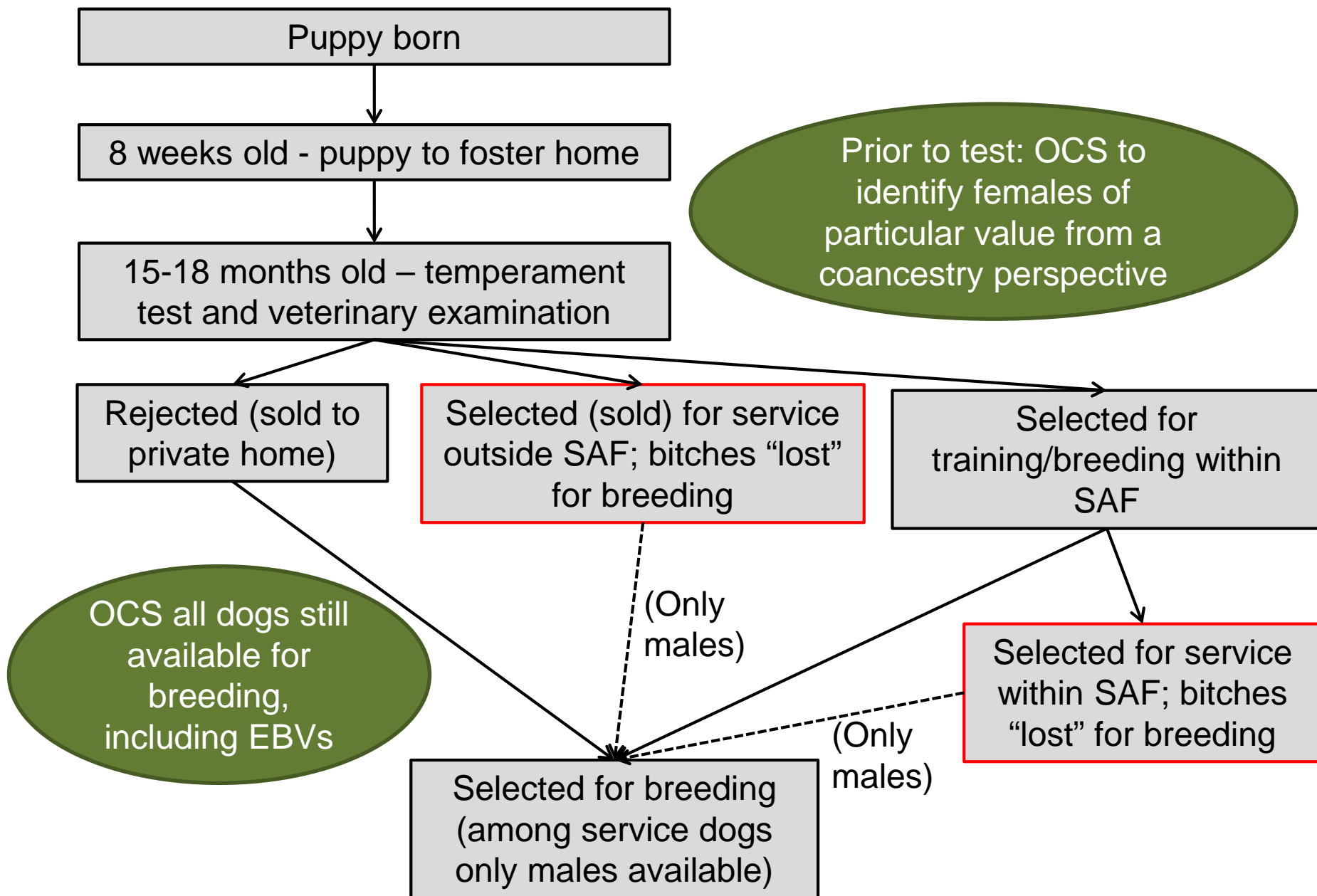
Challenges…example 2:

Some dogs "consume" lots of foster homes

Number of host families	Number of dogs
1	1046
2	326
3	94
4-5	34

(Mean = 1,41 families/dog)

Challenge = Dogs who consume many foster homes to a higher degree pass the temperament test

Engagement and Confidence related to number of host families consumed