WHY? HOW? WHAT?

In a nutshell
WHY?
We need a decision making tool:

1. Public Safety
   1. Prevent adoption of unsafe animals

2. Understand the individual
   1. Improve welfare now and later
   2. Provide enrichment and treatment
   3. Find the ideal forever home

3. Match-make
   1. Help adopters find the best match

4. Protect our resources
   1. Make outcome decisions
1. Every animal is different
2. Behavior is adaptive and will change over time
3. Most animals will show a medical or behavioral issue in their live time
4. Relinquishment data:
   1. 28.8% - 40% due to behavior
   2. 9.8% aggression to people – 53% not the relinquishment reason
   3. 11.9% of dogs had bitten a person

Kwan and Bain 2013
Cannas et al 2018
Example: SAFER™ = Safety Assessment for Evaluating Rehoming

The SAFER™ Test process:

The **Stare Test** gives clues regarding the dominance and submission of an animal.

The **Sensitivity Test** assesses social skills, sensitivity levels and level of fear.

The **Tag Test** determines dominance aggression and fear aggression.

The **Pinch Test** determines sensitivity, dominance and lack of bite inhibition.

The **Food Aggression Test** determines food aggression.

**Dog-to-Dog Aggression Test** determines sociability with other dogs.
TYPES OF TESTS

- Battery tests
- Questionnaires or Surveys
- Interviews
- Observations
WHAT?
WHAT ARE WE TESTING?

**Temperament:**
- Innate nature
- Stability over time

**Character:**
- Learned responses
- Changes with environment and experiences

**Personality:**
- Combination of Temperament and Character
- Based in genotype and environment

Mills, Encyclopedia 2010
Behavior response…

- Of a specific dog
- To a specific stimulus
- At a specific time
- In a specific (stressful) environment
SO WHAT ARE WE TESTING?

- Innate way of responding (Temperament?)
- Learned behaviors (Character?)
- Or overall way of responding (Personality?)

And what does it mean?
Extrapolation:

Assume any data can be used as a predictor of how that animal will respond to various stimuli, during different times, in different environments for the rest of its life.
WHAT WE FEAR IN ANY TEST

Specificity: true negative rate (healthy)
- False positive results → Dogs are being euthanized needlessly

Sensitivity: true positive rate (sick)
- False negative results → Dogs are adopted that pose a risk
# Confusion Matrix

<table>
<thead>
<tr>
<th>True condition</th>
<th>False positive, Type I error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Condition positive</td>
<td></td>
</tr>
<tr>
<td>Condition negative</td>
<td></td>
</tr>
<tr>
<td><strong>Prevalence</strong></td>
<td>$\frac{\sum \text{Condition positive}}{\sum \text{Total population}}$</td>
</tr>
<tr>
<td><strong>Accuracy (ACC)</strong></td>
<td>$\frac{\sum \text{True positive} + \sum \text{True negative}}{\sum \text{Total population}}$</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Predicted condition</th>
<th>True positive, Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>Condition positive</td>
<td></td>
</tr>
<tr>
<td>Condition negative</td>
<td></td>
</tr>
<tr>
<td><strong>Positive predictive value (PPV), Precision</strong></td>
<td>$\frac{\sum \text{True positive}}{\sum \text{Predicted condition positive}}$</td>
</tr>
<tr>
<td><strong>False discovery rate (FDR)</strong></td>
<td>$\frac{\sum \text{False positive}}{\sum \text{Predicted condition positive}}$</td>
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</tbody>
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<table>
<thead>
<tr>
<th>Predicted condition</th>
<th>False negative, Type II error</th>
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</thead>
<tbody>
<tr>
<td>Condition positive</td>
<td></td>
</tr>
<tr>
<td>Condition negative</td>
<td></td>
</tr>
<tr>
<td><strong>False omission rate (FOR)</strong></td>
<td>$\frac{\sum \text{False negative}}{\sum \text{Predicted condition negative}}$</td>
</tr>
<tr>
<td><strong>Negative predictive value (NPV)</strong></td>
<td>$\frac{\sum \text{True negative} + \sum \text{False negative}}{\sum \text{Predicted condition negative}}$</td>
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<tr>
<td><strong>Positive likelihood ratio (LR+)</strong></td>
<td>$\frac{\text{TPR}}{\text{FPR}}$</td>
</tr>
<tr>
<td><strong>Diagonal odds ratio (DOR)</strong></td>
<td>$\frac{\text{LR+}}{\text{LR-}}$</td>
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<table>
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<tr>
<th>Predicted condition</th>
<th>False negative, Miss rate</th>
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<tr>
<td>Condition positive</td>
<td></td>
</tr>
<tr>
<td>Condition negative</td>
<td></td>
</tr>
<tr>
<td><strong>False negative rate (FNR), Miss rate</strong></td>
<td>$\frac{\sum \text{False negative}}{\sum \text{Condition positive}}$</td>
</tr>
<tr>
<td><strong>Specificity (SPC), Selectivity, True negative rate (TNR)</strong></td>
<td>$\frac{\sum \text{True negative}}{\sum \text{Condition negative}}$</td>
</tr>
<tr>
<td><strong>Negative likelihood ratio (LR-)</strong></td>
<td>$\frac{\text{FNR}}{\text{TNR}}$</td>
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**$F_1$ score** | $\frac{2 \times \text{Recall} \times \text{Precision}}{\text{Recall} + \text{Precision}}$
A USEFUL TEST PROVIDES

1. Validity:
   Is test accurate?

2. Reliability:
   Is test precise?
   Consistent?

3. Standardization:
   The only variable is the animal itself

4. Feasibility:
   Minimal resources needed
No tests have been published in a peer reviewed journal that have passed all of the qualifications (yet)

Diederich, Giffroy AABS 2006
Segurson BSAVA 2009
“In the case of a positive test, it is much more likely that the test has failed the dogs, rather than the dogs failing the test.”
(Patronek et Bradley; 2016)
NOW WHAT?

We still need to make daily decisions:

This is how we do it:
✓ We use all the information we can get – full disclosure
✓ We adhere to our adoption criteria
✓ We use the 5 Freedoms model to assess welfare
✓ Provide post adoption support
I AM LOOKING FORWARD TO THE DISCUSSION

ANIMALS + HUMANS
150 YEARS
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