Handler-Dog interface: The Effects of Handlers' Controllability on the Performance of K9 in an Explosive Detection Task

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Introduction

Similar to the horse named 'clever Hans'(Pfungst 1911), the trust of dogs on human cues has been shown to prevail over both olfactory and visual indications for the location of food (Szetei et al. 2003), thus emphasizing the crucial role of the handler on the dog's performance.

The handler-dog interaction is subjected to the handler's skills and bonding. It has been long observed that the ideal system appears to be the use of single dog – single handler team, as it has been shown that changing handlers invariably resulted in lower percentage of correct detection (Nolan & Gravitte 1977).

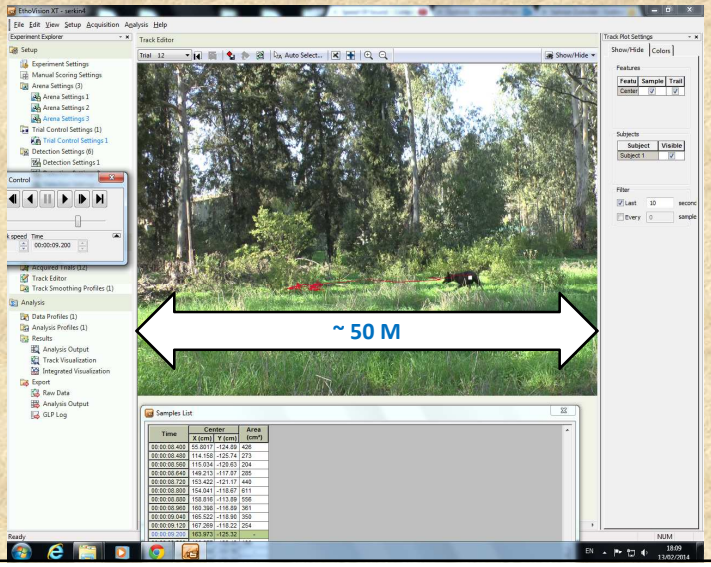
Outline

- **On/Off leash ?**
- Handler-Dog interface:
  The effects of the handler on the pup behavior.
- Handler-Dog interface:
  The effects of handler's stress on the performance in an explosive detection task.

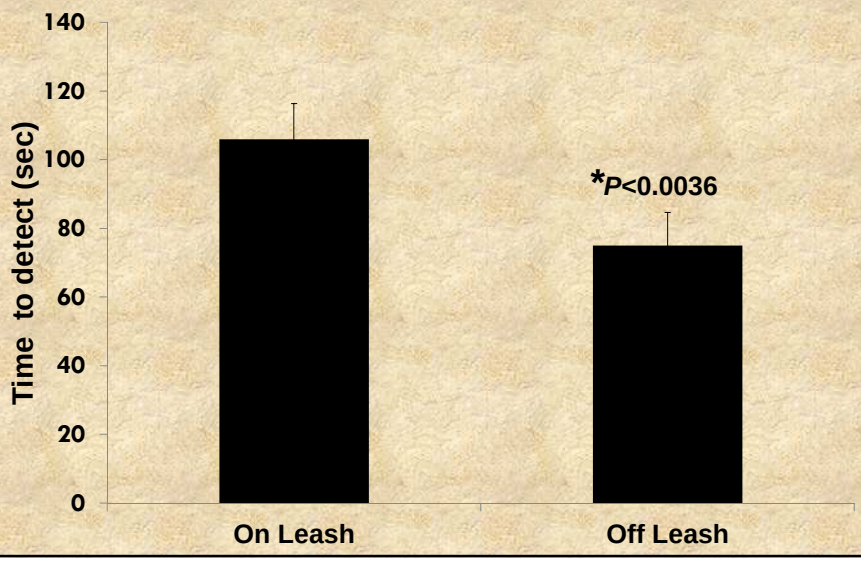
Methods

Nine Belgian shepherd K9 (12-18 months age) participated in the study (the IDF air force unit).

Computerized analysis of the detection task performance



On- versus Off- leash



On- versus Off- leash

Parameter	False + (%)	Environmental Condition		
		Temp (C°)	Wind (m/sec)	Humidity (%)
On Leash	15	15	0.22	42
Off Leash	14	14	0.27	42

Dogs work better without a leash.

Does the handler bungle?

Outline

- On/Off leash ?
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Methods

1. Ten Belgian shepherd pups (age: 3-5 months) and their handlers have participated in the study.

2. Procedure:

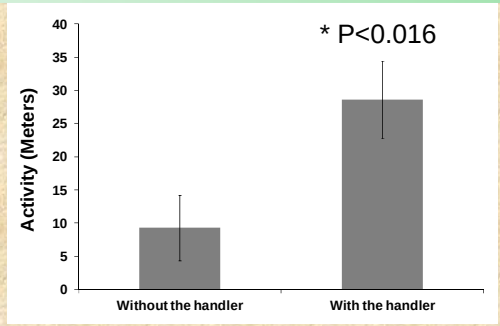
A. Handler's startle response measurement.

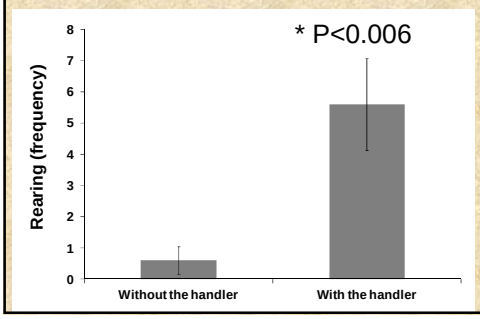
B. Five minutes of behavior recording in the home-cage:

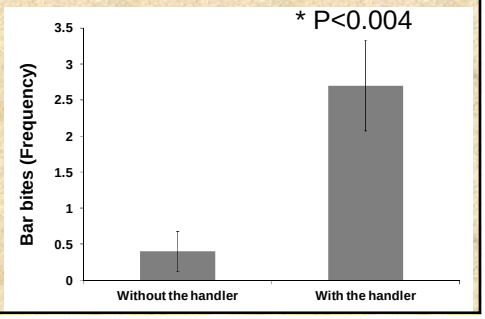
- **without the presence of the handler.**
- **with a passive presence of the handler.**

} **Counterbalanced**

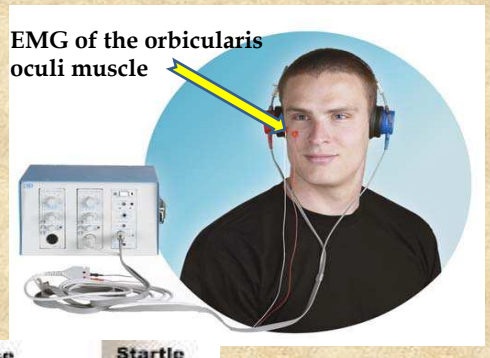
Pups' behaviour

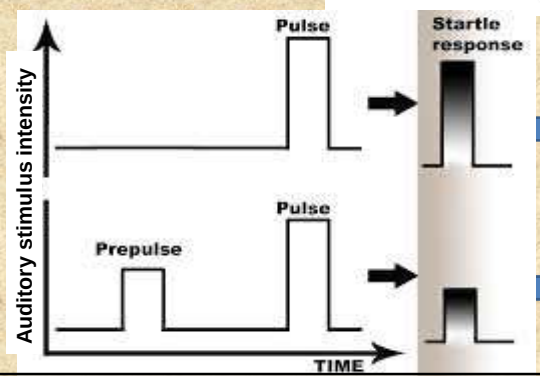






SR-HLAB startle response system

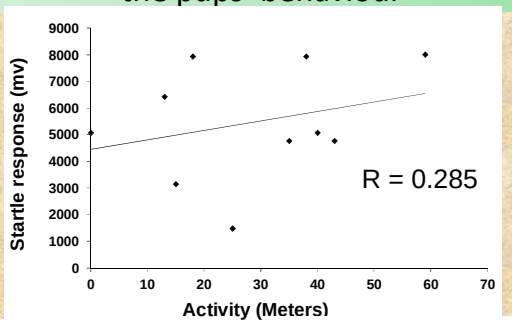


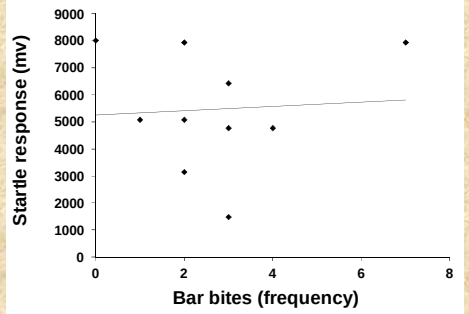


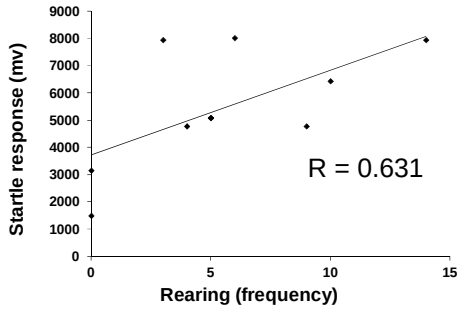
Anxiety/stress

Partial sustained attention

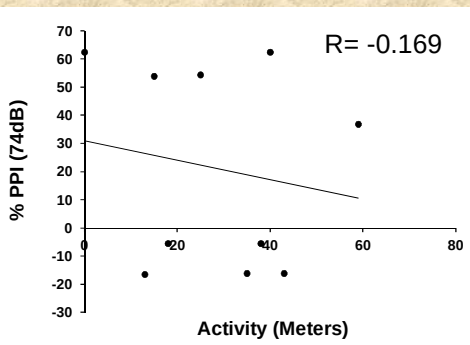
Correlations between the handlers' anxiety/stress level and the pups' behaviour

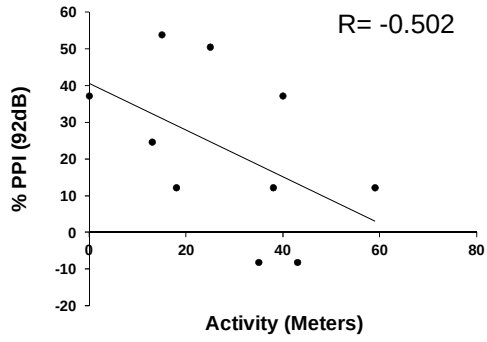




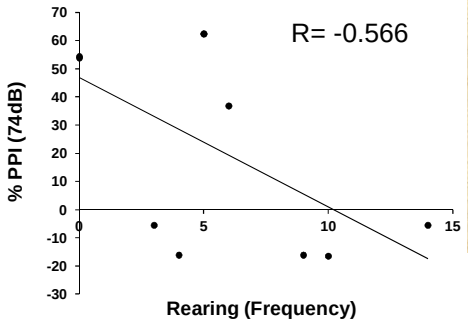


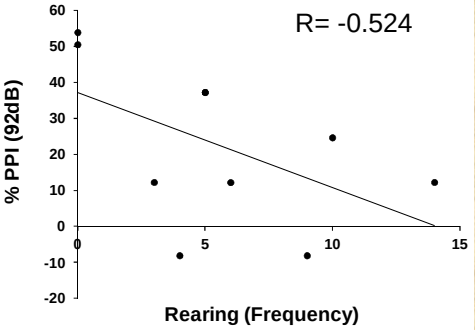
Correlations between the handlers' attention and the pups' activity



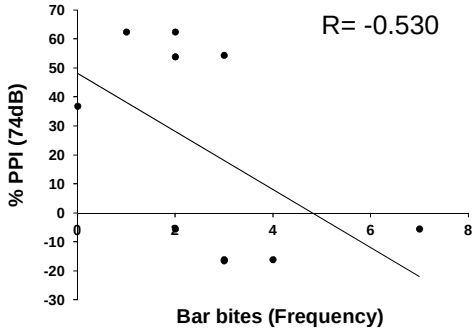


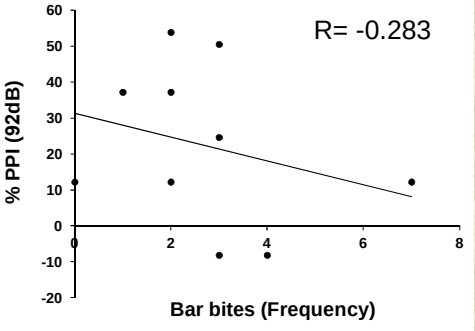
Correlations between the handlers' attention and the pups' rearing behaviour



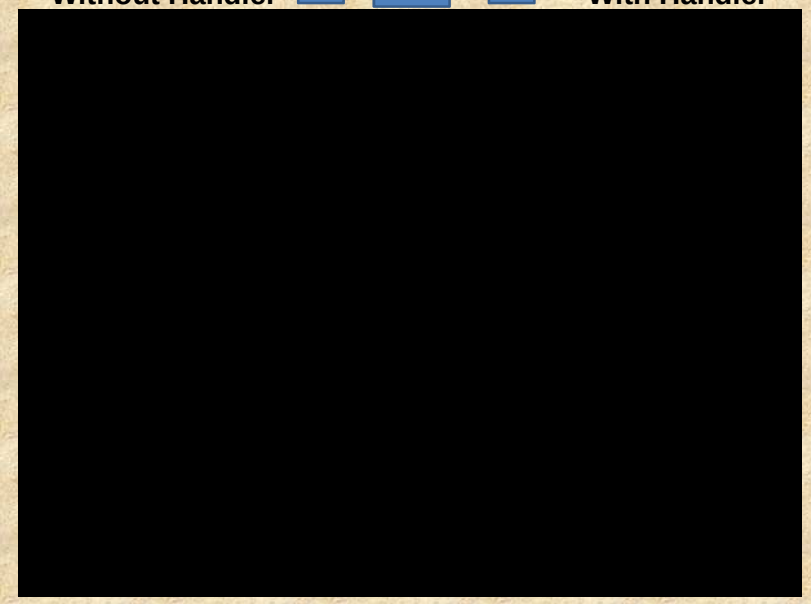


Correlation between the handlers' attention and the pups' bar bites



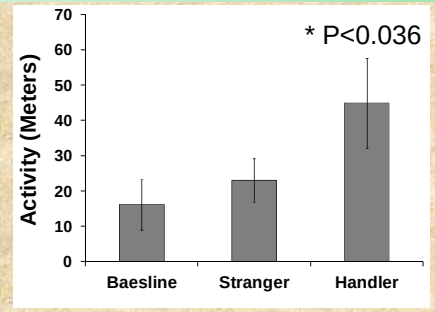


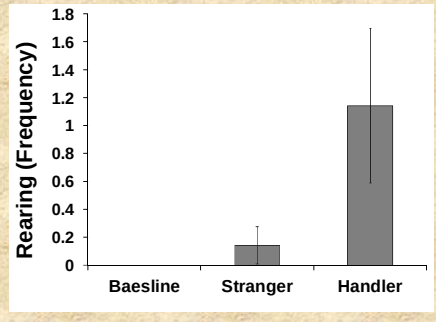
Without Handler With Handler

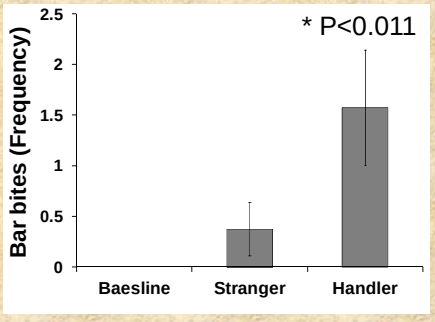


Does a stranger affect the pups' behaviour differently compared with the handler?

Pups' behaviour







Summary and conclusions (1)

- All behavioural measures (i.e. activity, rearing and bar bites) have increased with the presence of the handler.
- The positive correlations between the handlers' startle response and the pups' behaviour, presumably reflects mutual arousal or alternatively, an effect of the handlers' mental state on the pups' behaviour.

Summary and conclusions (2)

- Complementary to the handlers' stress, the negative correlations between the handlers' attention and the pups' behaviour support the possibility that the handlers' mental state affects the pups' behaviour.
- Finally, considering the presence of a stranger, the behavioural measures of the pups were closer to the baseline level than to the level during the presence of the handler. This control condition, further our postulation that the mental state of the handler (specifically) affects the pups' behaviour.

Outline

- On/Off leash ?
- Handler-Dog interface:
  The effects of the handler on the pup behavior.
- **Handler-Dog interface:**
  The effects of handler's stress on the performance in an explosive detection task.

The handler-dog interaction is significantly important for the canine performance. The handler error may mislead the dog into false identification, and the probability to commit such an error is altered often by the handlers' stressful state.

we have focused on stress characteristics and the handler-dog interface effects on the canine detection performance.

Human-animal interface: the effects of handler's stress on the performance of canines in an explosive detection task
Zubedat Salman., Aga-Mizrachi Shlomit., Cymerblit-Sabba Adi., Shwartz Jonathan., Leon Fikko., Rozen Shlomo., Varkovitzky Itay., Eshed Yuval., Grinstein Dan. and Avital Avi. (2014).158: 75–69

Methods

Fig1

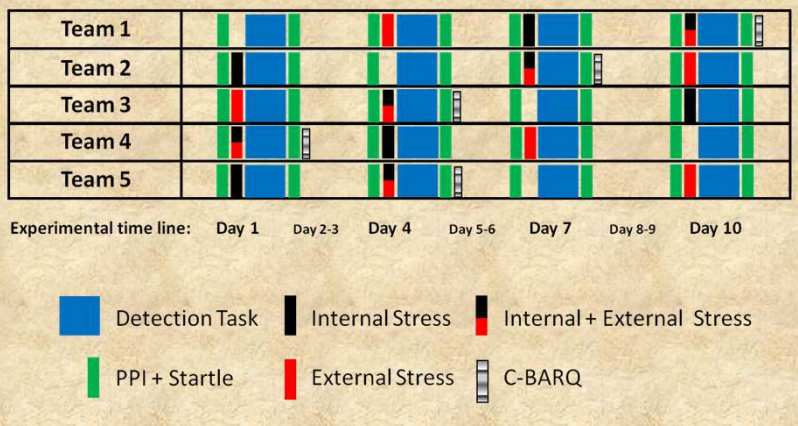


Figure 1: Schematic description of the experimental procedure.
Experimental time line with a description of experimental conditions (Days 1, 4, 7 and 10), the various tests conducted, and the order of conditions counterbalanced between teams.

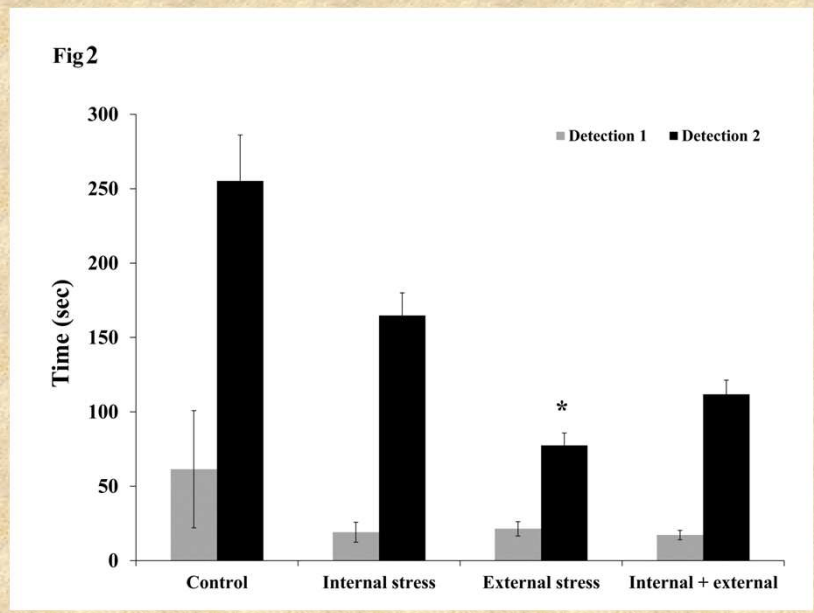


Figure 2: Handlers stress improves canine performance.
Stress improved detection time compared with the control condition. Specifically, the exposure of the handlers to 'external stress' led to the shortest detection time (*P<0.01).

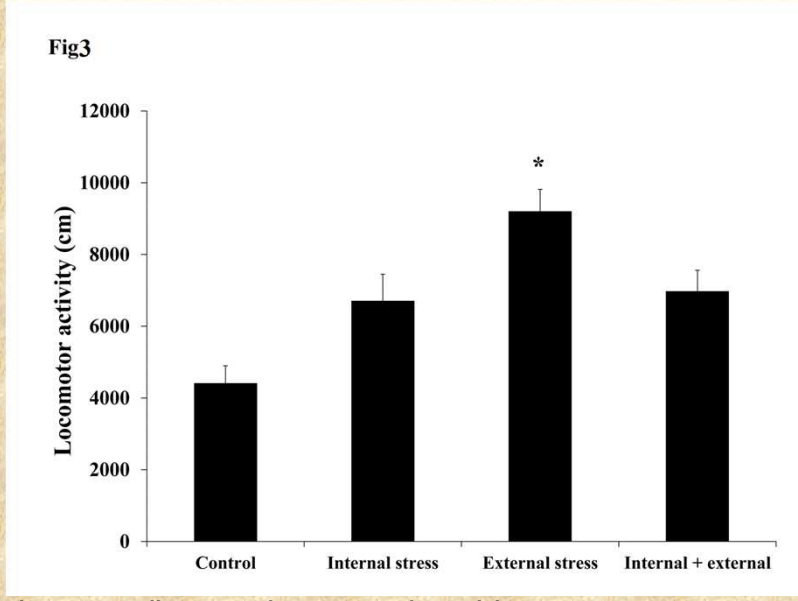
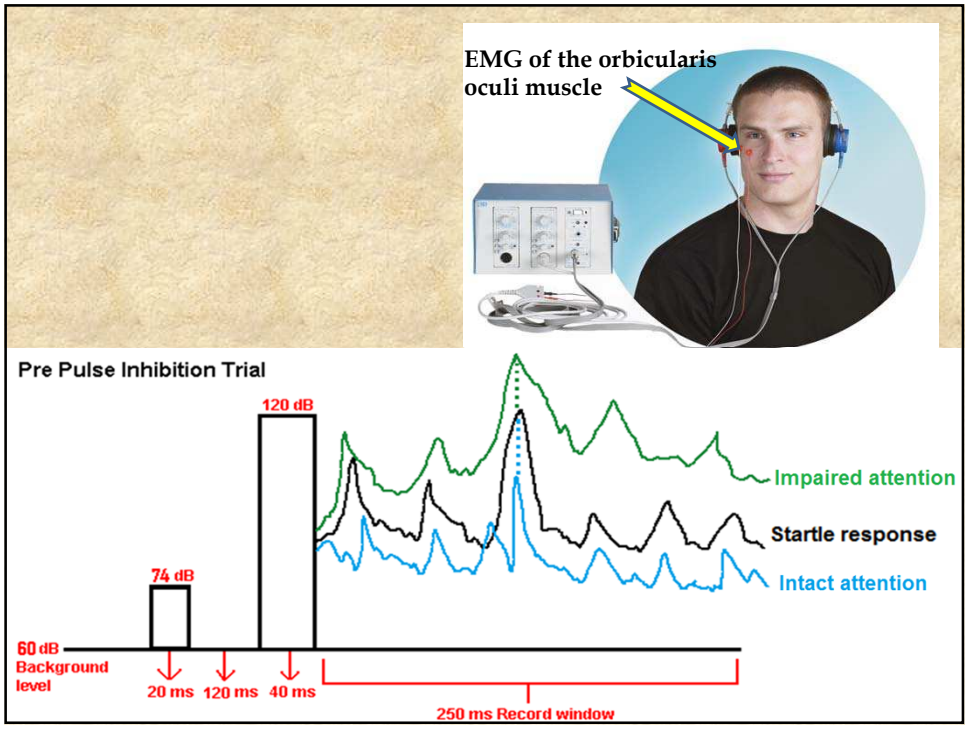


Figure 3: Handlers stress increases canine activity.
The exposure of handlers to stress increased the dogs' activity compared with the control condition. Specifically, the 'External stress' condition yielded the highest level (*P<0.001).



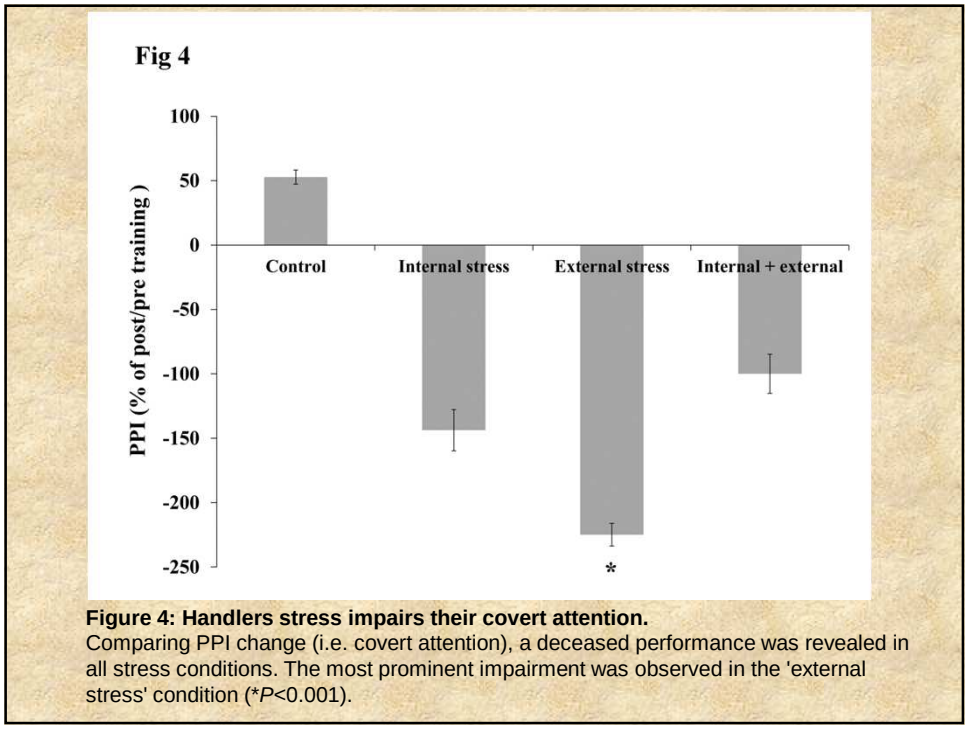


Figure 4: Handlers stress impairs their covert attention.
Comparing PPI change (i.e. covert attention), a deceased performance was revealed in all stress conditions. The most prominent impairment was observed in the 'external stress' condition (*P<0.001).

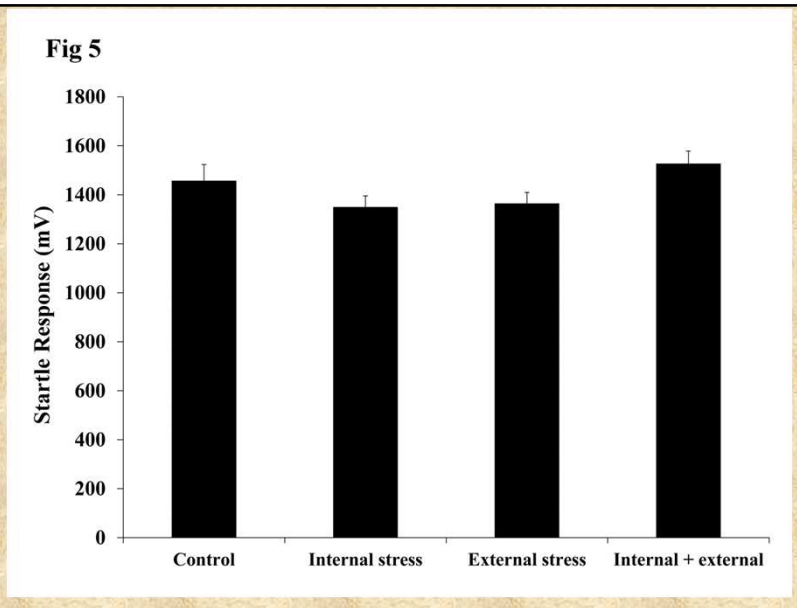


Figure 5: Handlers baseline anxiety level.
No basal startle response (anxiety level) difference was found across all groups. This test was performed prior to the exposure to stress at each day.

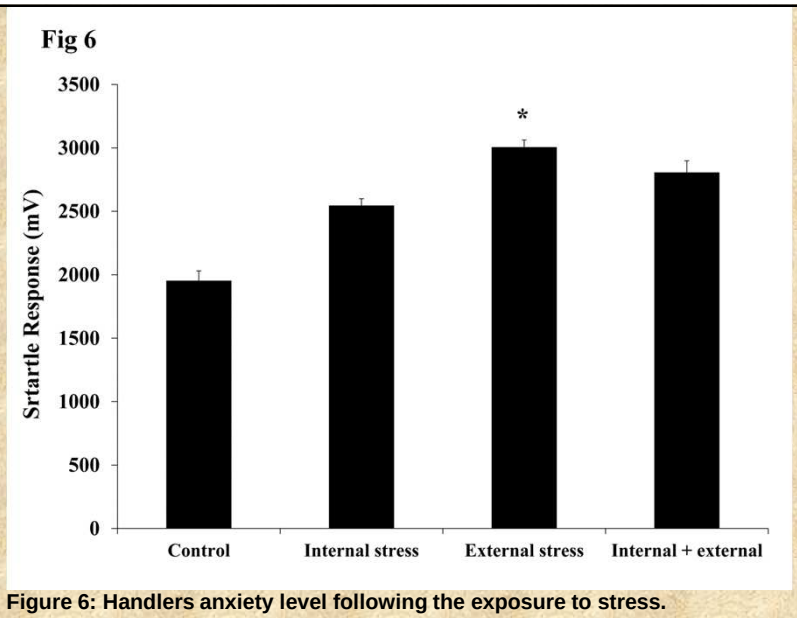


Figure 6: Handlers anxiety level following the exposure to stress.
Startle response was elevated following the exposure to the various stress conditions. However, a significant elevation of the startle response was observed following the exposure to external stress compared with the control and to internal stress groups (*P<0.001).

Conclusions

- We postulate that since the handlers' exposure to stress elevated anxiety level and impaired their attention, it may have led to less control over the dog. Consequently, it allowed the dogs to 'take control' and manifest their training outcomes.
- This alleged locus of control transfer may explain the improved performance of the dogs (supported by the 'off-leash' over 'on-leash') , and further emphasizes the importance of the handler-dog interface.
- Since it has been shown that the dog's behavior is further affected by the handler personality (Kotrschal et al. 2009), a specific handler-dog matching may be beneficial to form an optimal 'dog-handler interface', especially during stressful mission.

….back to K9

I **Off-leash** > On-leash

II **Pups K9**

Handler's stress ↑ ⇨ K9 behaviour ↑

Handler's attention ↓ ⇨ K9 behaviour ↑

III **Adult K9**

Handler's stress ↑ ⇨ K9 behaviour ↑

Handler's attention ↓ ⇨ K9 behaviour ↑

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33