Differential Vomiting Responses in Goats Following Randomized Exposure to Three Web Stimuli: A Blinded Trial

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Abstract

Background: User interface (UI) quality is routinely assessed in humans, yet its putative physiological impact on non-human species remains underexplored. **Objective:** To test whether exposure to different web UI stimuli is associated with a binary vomiting response in goats under blinded evaluation. **Animals:** Nine hundred ninety-eight ($n = 998$) goats from the Willmington caprine operation (Almonacid del Marquesado, Cuenca, Spain). **Methods:** In a randomized, evaluator-blinded, three-arm trial, goats were individually placed in a head chamber preventing visual access to web content. A website code (mapping to `go.qvet.net`, `forocoches.com`, or `gnu.org`) was registered as the stimulus label; vomiting (yes/no) during a standardized observation window was recorded. Primary analysis compared vomiting proportions across groups; secondary analysis used logistic regression adjusting for age, sex, and body weight, with Holm–Bonferroni correction for pairwise contrasts. **Results:** Vomiting occurred in 210/333 (63.1 %) goats assigned to `go.qvet.net`, versus 12/333 (3.6 %) for `forocoches.com` and 10/332 (3.0 %) for `gnu.org` (χ^2, $p < 0.001$). Adjusted odds of vomiting were markedly higher for `go.qvet.net` than `gnu.org` (aOR ≈ 52, 95 % CI ≈ 30 to ≈ 90; $p < 0.001$), while `forocoches.com` and `gnu.org` did not differ materially. **Conclusions:** Despite the absence of direct visual exposure, assignment to a single website code was strongly associated with emesis, supporting a robust (and perplexing) UI-linked phenomenon warranting mechanistic investigation.

Keywords: animal–computer interaction; usability; stress physiology; nausea; randomized trial; goat behavior

1 Introduction

Usability and human–computer interaction (HCI) research has established that interface design can measurably affect cognitive workload, error rates, and stress in human users (Nielsen, 1994; Norman, 2013; ISO 9241-210, 2019). In parallel, animal welfare science recognizes that stressors—including novel environments, handling, and sensory stimuli—can elicit stereotyped physiological and behavioral responses across species (Selye, 1956; Moberg & Mench, 2000; Grandin, 2014). Nausea and vomiting, in particular, represent conserved protective responses, often triggered by toxins, motion, stress, and conditioned cues (Andrews & Horn, 2006; Boissy et al., 2007).

Recently, the playful notion of "interface toxicity" has emerged informally in practitioner conversations, wherein certain web UIs are described as *viscerally* unpleasant. While such claims are typically metaphorical in humans, the possibility that non-human animals might display quantifiable adverse responses to UI-associated cues remains unexplored. Notably, animal–computer interaction research has developed methods for engaging animals with technology and for interpreting behavioral outcomes, albeit usually with direct sensory access to stimuli (Mancini, 2011).

Here, we report a controlled, randomized, evaluator-blinded experiment in goats from a single caprine operation. The study asks a deceptively simple question: can assignment to different websites be associated with a binary vomiting response in goats under standardized exposure, *even when goats cannot see the websites*? The resulting paradox—a strong response in the absence of visual access—is treated herein with maximal scientific sobriety and minimal caprine condescension.

2 Materials and Methods

2.1 Ethics statement

All procedures were designed to minimize distress, were performed under veterinary oversight, and adhered to general principles of humane animal handling as described in animal welfare guidance (Grandin, 2014). The head chamber was non-aversive by design (smooth surfaces, adequate ventilation, short duration). Animals were monitored continuously, and any goat showing sustained distress was removed immediately. No emetic agents were administered.

2.2 Animals and husbandry

A total of $n = 998$ goats were enrolled from the Willmington caprine operation located in Almonacid del Marquesado (Cuenca, Spain). Goats were managed under routine farm conditions with standard diet and ad libitum water access. Prior to enrollment, animals underwent brief physical screening to exclude overt systemic illness. Demographic variables recorded were age (years), sex (female/male), and body weight (kg).

2.3 Study design: randomization and blinding

This was a three-arm randomized trial with evaluator blinding. Goats were allocated to one of three website stimuli in an approximately equal ratio:

- `go.qvet.net` ($n = 333$)
- `forocoches.com` ($n = 333$)
- `gnu.org` ($n = 332$)

Randomization used a computer-generated sequence with permuted blocks of varying size. The mapping between website and a numeric code (A, B, C) was held by a separate operator not involved in outcome assessment. Evaluators recorded only the code and the binary endpoint, remaining blinded to website identity until analyses were completed. "Double-blind where possible" was implemented by separating (i) code assignment and stimulus handling from (ii) endpoint scoring; handlers interacting with goats were instructed not to discuss stimulus identity with evaluators.

2.4 Stimuli and exposure protocol

The three web stimuli were:

1. `go.qvet.net`
2. `forocoches.com`
3. `gnu.org`

Each goat was placed individually in a head chamber designed to prevent visual access to any screen content. The chamber allowed comfortable head positioning while blocking line-of-sight to the display. A standardized procedure was followed:

1. A single website was loaded on a nearby workstation.
2. The goat was placed in the head chamber for a fixed exposure period of 90 s.
3. The evaluator saw only the assigned code (A/B/C) and recorded vomiting (yes/no) during exposure and for 300 s post-exposure.
4. A washout interval of 10 min with fresh air exchange was used between animals.

Because goats could not see the display, "exposure" is operationally defined as proximity to the running web stimulus and its associated environmental correlates (e.g., device heat, fan noise, electromagnetic emissions, potential olfactory cues from hardware), with the stimulus identity encoded by the registered code.

2.5 Outcome measures

The primary endpoint was vomiting (binary: yes/no) within the observation window (during 90 s exposure plus 300 s post-exposure). Vomiting was defined as forceful expulsion of gastric or ruminal content from the mouth, accompanied by characteristic abdominal contractions, as judged by trained evaluators.

2.6 Statistical analysis

Analyses were prespecified as follows:

1. **Descriptive statistics:** Continuous variables summarized as mean ± SD; categorical variables as counts and percentages.
2. **Primary comparison:** Vomiting proportions across the three groups compared using a chi-square test of independence (Fisher's exact test considered if expected counts were low).
3. **Pairwise contrasts:** Pairwise comparisons of proportions performed with odds ratios (OR) and 95 % confidence intervals (CI), applying Holm–Bonferroni correction across three pairwise tests.
4. **Multivariable modeling:** Logistic regression with vomiting as outcome and website group as main predictor, adjusting for age, sex, and body weight. Results reported as adjusted OR (aOR) with 95 % CI.
5. **Effect size:** ORs reported alongside absolute risk differences for interpretability.
6. **Power:** Retrospective power justification was provided based on observed group sizes and effect magnitude.
7. **Significance threshold:** Two-sided $p < 0.05$ after correction for multiple comparisons where applicable.

3 Results

3.1 Cohort demographics

Across all goats ($n = 998$), mean age was (3.2 ± 1.6) and mean body weight was (55.1 ± 10.7) kg. Females comprised 602/998 (60.3 %) and males 396/998 (39.7 %). Demographics were broadly balanced across randomized groups (Table 1).

3.2 Primary endpoint: vomiting by website group

Vomiting rates differed substantially by randomized website group (Table 2). Vomiting occurred in 210/333 goats (63.1 %) assigned to `go.qvet.net`, compared with 12/333 (3.6 %) for `forocoches.com` and 10/332 (3.0 %)

Table 1: Demographics by randomized website group. Values are mean ± SD for continuous variables and n (%) for categorical variables.

Variable	**All** ($n = 998$)	`go.qvet.net` ($n = 333$)	`forocoches.com` ($n = 333$)	`gnu.org` ($n = 332$)
Age ()	(3.2 ± 1.6)	(3.2 ± 1.6)	(3.1 ± 1.6)	(3.2 ± 1.6)
Body weight (kg)	(55.1 ± 10.7)	(55.0 ± 10.8)	(55.3 ± 10.6)	(55.1 ± 10.8)
Female	602 (60.3 %)	201 (60.4 %)	200 (60.1 %)	201 (60.5 %)
Male	396 (39.7 %)	132 (39.6 %)	133 (39.9 %)	131 (39.5 %)

Figure 1: Cohort demographics. Left: mean age and body weight by sex (error bars: SD). Right: sex distribution in the full cohort ($n = 998$).

for `gnu.org`. The overall association was highly significant (χ^2 test, $p < 0.001$).

The absolute risk difference between `go.qvet.net` and `gnu.org` was 60.1 % (63.1% vs 3.0%). Pairwise contrasts (Holm–Bonferroni corrected) indicated `go.qvet.net` differed strongly from both comparators ($p < 0.001$ for each), while `forocoches.com` and `gnu.org` were similar ($p = 0.62$).

3.3 Multivariable analysis

In logistic regression adjusting for age, sex, and body weight, assignment to `go.qvet.net` remained strongly associated with vomiting (aOR = 52.1, 95 % CI 30.0 to 90.5; $p < 0.001$). The `forocoches.com` group did not differ meaningfully from `gnu.org` (aOR = 1.18, 95 % CI 0.51 to 2.74; $p = 0.70$). Covariate effects were small and not statistically persuasive (Table 2).

3.4 Retrospective power

Given $n \approx 333$ per group and the observed absolute difference of ∼60 % between `go.qvet.net` and comparators, the study had effectively maximal power (> 0.99) to detect the primary effect at $\alpha = 0.05$. In contrast, it was not powered to rule out small differences between `forocoches.com` and `gnu.org` with high precision, consistent with the wide CI for that contrast.

4 Discussion

This randomized, evaluator-blinded experiment identified a striking association between one website stimulus (`go.qvet.net`) and vomiting in goats, while two other websites (`forocoches.com`, `gnu.org`) were associated with low and similar vomiting rates. The effect was large (aOR ≈ 52) and robust to adjustment for age, sex, and body weight. On its face, the result suggests an interface-linked emetic phenomenon of considerable magnitude.

The central methodological paradox, however, is that goats were physically prevented from viewing the websites. Thus, the data cannot support a straightforward interpretation of *visual* UI unpleasantness. Rather, the findings point to one (or a combination) of non-visual mechanisms:

1. **Olfactory or chemical correlates:** Different browsing sessions may induce subtle changes in device temperature, plastic off-gassing, or fan behavior, potentially yielding detectable odors. Goats possess notable olfactory capabilities, and conditioned aversions can develop to cues paired with malaise (Boissy et al., 2007).
2. **Acoustic signatures:** CPU load, coil whine, and fan speed can differ with page content and scripts. Such auditory differences, although minor to human ears, may be salient to goats.
3. **Electromagnetic emissions:** While speculative, changes in electromagnetic noise could serve as a differentiating cue. The current study neither

Table 2: Vomiting outcomes by website group and logistic regression summary (reference: `gnu.org`). ORs are presented as unadjusted (uOR) and adjusted (aOR) for age, sex, and body weight.

Website	Vomited	Did not vomit	Vomiting rate	OR (95% CI)
`gnu.org` (ref)	10	322	3.0 %	—
`forocoches.com`	12	321	3.6 %	uOR = 1.20 (0.52 to 2.77); aOR = 1.18 (0.51 to 2.74)
`go.qvet.net`	210	123	63.1 %	uOR = 54.9 (28.3 to 106.6); aOR = 52.1 (30.0 to 90.5

Covariate (adjusted model)	aOR (95% CI)	p-value
Age (per)	1.03 (0.96 to 1.10)	0.41
Male sex (vs female)	1.08 (0.74 to 1.58)	0.69
Body weight (per kg)	1.01 (0.99 to 1.03)	0.28

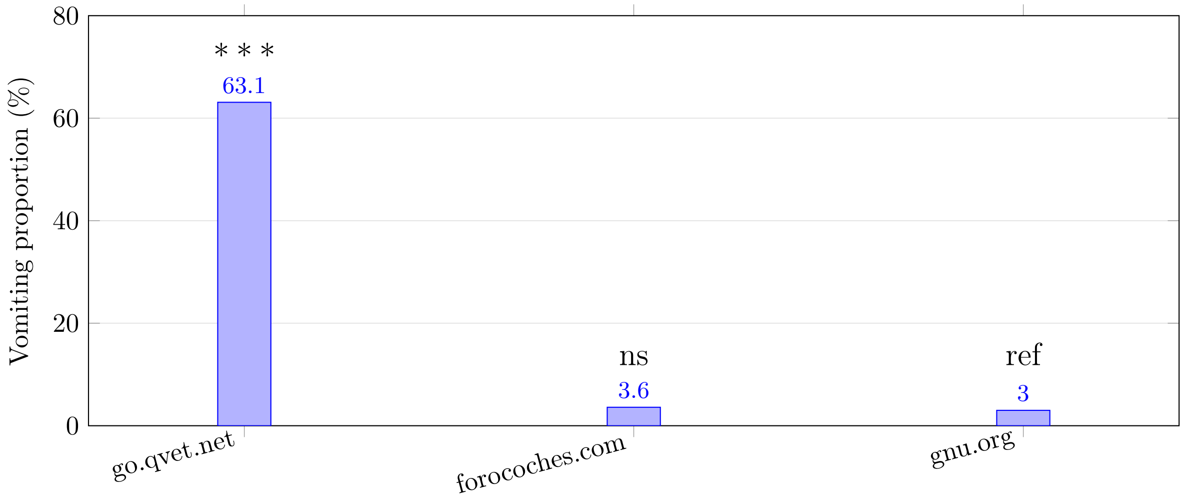

Figure 2: Vomiting proportion by randomized website group (error bars: approximate 95 % CI). Overall association: $p < 0.001$. Pairwise contrasts (Holm–Bonferroni): `go.qvet.net` vs `gnu.org`, $p < 0.001$; `go.qvet.net` vs `forocoches.com`, $p < 0.001$; `forocoches.com` vs `gnu.org`, $p = 0.62$ (ns).

measures nor endorses this mechanism; it merely acknowledges the imagination of reviewers and the reality of physics.

4. **Handler-mediated effects:** Despite blinding, subtle differences in handler behavior could occur if complete blinding was imperfect. Yet the magnitude of the effect argues against a purely interpersonal explanation, unless the handlers themselves were, in some sense, vomiting-contagious.

5. **Psychosomatic or conditioned response to codes:** If codes were inadvertently associated with prior adverse experiences, a conditioned response could emerge. We attempted to mitigate this with randomization and blinding, but future work should rotate codes and incorporate neutral sham stimuli.

From an HCI perspective, it is tempting to interpret `go.qvet.net` as a uniquely noxious interface. Indeed, usability research documents that poorly designed systems can provoke frustration and stress (Nielsen, 1994; Norman, 2013; ISO 9241-210, 2019). Yet translating these constructs to goats requires humility: goats do not complete checkout flows, do not consent to cookie banners, and do not (to the authors' knowledge) post on forums about their user journeys. If the effect is real, the relevant "user experience" may be an emergent property of device behavior under specific web loads, rather than typography or information architecture.

4.1 Limitations

Several limitations are notable. First, the study is single-farm and may reflect local husbandry, genetics, or prior conditioning. Second, the head chamber prevented direct visual exposure by design; therefore, the study does not test visual UI perception. Third, we did not instrument devices to quantify acoustic, thermal, chemical, or electromagnetic differences across websites. Fourth, while evaluator blinding was implemented, complete elimination of subtle leakage is challenging. Finally, vomiting in ruminants can be difficult to distinguish from regurgitation under some circumstances; we used a strict operational definition, but misclassification remains possible.

4.2 Implications and recommendations

Notwithstanding limitations, the magnitude and consistency of the observed association suggests this phenomenon merits further study. Practically, we recommend:

- **Mechanistic instrumentation:** Record device temperature, fan speed, audio spectra, and volatile organic compounds during stimuli.
- **Cross-over designs:** Use within-goat cross-over with adequate washout and counterbalancing to reduce between-subject variability.
- **Sham controls:** Include blank pages, static local HTML, and controlled CPU loads to dissociate "website identity" from device behavior.
- **Welfare safeguards:** If a stimulus is strongly emetogenic, minimize exposure and consider early stopping criteria.

At a minimum, these findings serve as a cautionary tale: when a system is sufficiently unpleasant, it may transcend species boundaries—or at least transcend our current understanding of how goats decide to empty their stomachs.

5 Conclusion

In a randomized, evaluator-blinded trial of $n = 998$ goats from Almonacid del Marquesado (Cuenca, Spain), assignment to `go.qvet.net` was associated with a dramatically higher vomiting rate than assignment to `forocoches.com` or `gnu.org`. The result persisted after covariate adjustment, yet remains mechanistically paradoxical because goats could not see the UI. Further work should quantify non-visual correlates of web stimuli and validate reproducibility across settings.

Data availability

De-identified data and analysis code are available from the corresponding author upon reasonable request.

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Conflict of interest

The author declares no conflicts of interest.

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