



# Behavioral analysis of the Czechoslovakian Wolfdog using the C-BARQ questionnaire

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**Abstract:** The Czechoslovakian Wolfdog (CWD) is a recently established hybrid breed with limited behavioral data available. Using the validated Italian version of the C-BARQ questionnaire, this study assessed 204 CWDs (103 males, 101 females; 74% intact, 26% neutered/spayed). Results indicate high trainability (mean 2.86/5) and very low owner-directed aggression (0.28/4). However, sex and reproductive status influenced several traits. Males were more possessive of objects ( $p = 0.0065$ ), excitable when visitors arrived ( $p = 0.011$ ), and prone to attachment behaviors, such as following the owner ( $p = 0.045$ ) or reacting to owner affection toward others ( $p = 0.0006$ ). Neutered males displayed significantly higher stranger-directed aggression ( $p = 0.0019$ ), while dog-directed aggression averaged 2.05/4, mainly expressed by males toward unfamiliar males ( $p < 0.0001$ ). Fear-related behaviors were generally low across groups. Overall, the CWD emerges as a trainable, adaptable breed, though management should consider sex- and status-related differences, particularly in male aggression and attachment.

**Key Words:** behavior, Czechoslovakian Wolfdog, C-barq questionnaire, sex difference, castration

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## Introduction

The Czechoslovakian Wolfdog is a relatively recent breed, officially recognized by the Fédération Cynologique Internationale (FCI) in 1999. Its establishment began in 1955 in former Czechoslovakia under the direction of Colonel Jan Hartl and Dr. Heiri Machat. The breeding program involved controlled crosses between working-line German Shepherds (*Canis lupus familiaris*) and Carpathian grey wolves (*Canis lupus lupus*), with the objective of combining desirable behavioral traits of the German Shepherd (trainability, social cohesion, and cooperative temperament) with morphological and physiological characteristics of the wolf (strength, endurance, and robustness). The breed was initially employed for military purposes, particularly border patrol, and subsequently in search and rescue operations. In Italy, the population experienced a marked expansion during the 2010s, peaking in 2016 with more than 1,400 new registrations in the Italian Kennel Club (ENCI). Since then, numbers have progressively declined, reaching approximately 500 registrations in 2024 (Caniglia et al., 2008).

Given the recent establishment of this breed, limited information is currently available regarding its behavior in the domestic context and potential sex-related differences. It is well established that sex hormones influence behavior in both males and females. In females, reproductive behavior is regulated by cyclic hormonal fluctuations, which first induce estrous behaviors and subsequently, after parturition, maternal care (Lezama-García 2019). These hormonal dynamics are also responsible for the frequent occurrence of pseudopregnancy in bitches (Root 2018). In males, testosterone plays a central role and is strongly associated with behaviors such as inter-male aggression and urine marking (Hart & Eckstein, 1997).

The first studies on the effect of sex hormones on behavior are due to the pioneering research of Scott and Fuller in the 1960s (Scott & Fuller, 1965), followed by the research of Hopkins (Hopkins et al., 1976) and then Brochelt (Brochelt, 1983).

Early investigations into this topic showed several important shortcomings. One of the most evident was the absence of control groups of intact dogs, which prevented clear attribution of behavioral changes to neutering rather than to external influences such as household modifications or new activities like training. Many works were retrospective in design, depending on historical records and owners' recollections, both of which increase the likelihood of bias and inaccuracies (Wright J.C. & Nesselrothe M.S, 1987). Moreover, unwanted behaviors were not always differentiated from those linked to medical issues, so similar actions could be reported without recognizing their distinct origins. The samples themselves were

often skewed, with a higher representation of dogs already displaying aggression—as in Borchelt's 1983 study—or selected for particular outcomes. Small numbers of subjects further limited the strength of the conclusions, while factors such as breed, age, and timing of castration were frequently ignored. Finally, inconsistencies in the classification of behaviors, such as treating aggression as a single undifferentiated category rather than considering underlying motivations like fear or pain, reduced the reliability and comparability of results across studies (Arroube & Pereora, 2025)

The use of questionnaires in canine behavioral research has evolved considerably. Early studies often relied on open-ended owner reports and follow-up phone interviews, an approach prone to subjective interpretation and inconsistencies in questioning across researchers. In contrast, more recent work has employed standardized and rigorously developed instruments, providing more reliable and comparable data. Before the 2000s, no validated tools were available to systematically assess canine behavior. From that period onward, structured questionnaires were introduced to evaluate behavior in relation to factors such as reproductive status. Among the most widely recognized is the Canine Behavioral Assessment and Research Questionnaire (C-BARQ).

The C-BARQ gathers behavioral information indirectly through reports provided by owners, handlers, or caregivers, under the assumption that individuals most familiar with a dog are best suited to accurately describe its typical behavior [14]. It currently consists of 100 items that assess a dog's usual responses to a broad range of everyday situations and recent stimuli. Responses are recorded using two ordinal rating scales: a five-point scale (0–4) reflecting the severity or intensity of specific behaviors (e.g., aggression, fear), and a seven-point scale (0–6) indicating the frequency of behaviors (e.g., barking, howling). This dual-scale format enables a more precise evaluation of both the occurrence and magnitude of behavioral traits.

The objective of the present study was to characterize the baseline behavioral profile of the Czechoslovakian Wolfdog in a family setting and to examine potential differences associated with sex and reproductive status.

## Materials and methods

For this study, the validated Italian version of the C-BARQ, as described by Broseghini et al. (2023), was employed, with some modifications consisting of the addition of three questions (two in Section 1 and one in Section 6) and the removal of Section 7. The questionnaire was distributed online via social media platforms and breed club pages and further circulated among Czechoslovakian Wolfdog breeders and owners through word of mouth. An introductory section was included to collect demographic information (name, breed, date of birth, sex, and, where applicable, date of castration/neutering).

The C-BARQ uses two response formats depending on the behavior assessed. Items in sections 1, 4, 6, and 7 measure the frequency of specific behaviors on a six-point ordinal scale (0 = not applicable, 1 = never, 2 = rarely, 3 = sometimes, 4 = often, 5 = always), providing an index of behavioral consistency over time. Items in sections 2, 3, and 5 assess the intensity or severity of behaviors, regardless of frequency, using a five-point scale (0 = none, 1 = mild, 2 = moderate, 3 = intense, 4 = severe). Higher scores generally reflect more problematic behaviors, with the exception of trainability, where higher scores denote a desirable trait.

The original 100 C-BARQ items were grouped into 13 behavioral subscales. Statistical analyses were performed using GraphPad Prism 9 (GraphPad Software, San Diego, CA, USA). After verifying normal data distribution, a one-way ANOVA was applied to compare behavioral scores across the four coat-color groups, followed by Tukey's post hoc test for multiple comparisons. For each item, both the overall mean score and the mean score by coat-color group were calculated. Internal consistency of the questionnaire was evaluated using Cronbach's alpha.

## Results

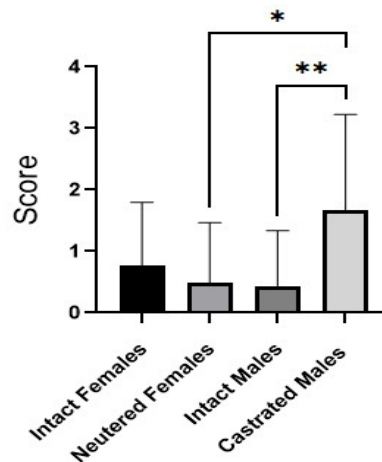
A total of 204 questionnaires were collected for the study. Of the dogs represented, 103 (50.5%) were male and 101 (49.5%) were female. Regarding reproductive status, 151 (74.0%) were intact and 53 (26.0%)

were neutered or spayed. Specifically, the sample included 60 intact females, 41 spayed females, 91 intact males, and 12 neutered males.

The results for each of the 13 behavioral subscales are presented in Table 1

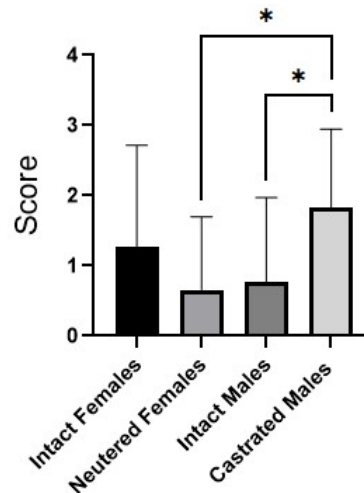
		Males	Females	Intact males	Castrated males	Intact females	Neutered females	General mean
1	Trainability Frequency scale (0-5)	2.89±0.44	2.83 ±0.46	2.90± 0.43	2.84±0.49	2.85±0.47	2.81±0.45	2.86±0.45
2	Strange Direct Aggression Intensity scale (0-4)	1.21±0.98	1.10±0.96	1.20 ±0.99	1.29±0.97	1.04±0.93	1.18±1.00	1.18±0.97
3	Owner-directed aggression Intensity scale (0-4)	0.33±0.51	0.25±0.38	0.35 ±0.53	0.19±0.31	0.30±0.43	0.18±0.27	0.28±0.42
4	Dog-directed aggression Intensity scale (0-4)	2.18±0.92	1.84±1.01	2.16 ±0.84	2.31±1.40	1.73±1.11	2.01±0.82	2.05±1.00
5	Dog rivalry Intensity scale (0-4)	0.67±0.85	0.84±0.93	0.68 ±0.87	0.55±0.57	0.77±0.87	0.95±1.04	0.76±0.88
6	Stranger-directed Fear Intensity scale (0-4)	0.69±0.99	0.85±0.97	0.60 ±0.93	1.50±1.10	1.00±1.01	0.62±0.89	0.86±0.99
7	Nonsocial fear Intensity scale (0-4)	1.03±0.81	0.93±0.69	0.99±0.81	1.36±0.74	0.93±0.69	0.93±0.71	1.02±0.73
8	Dog-directed Fear Intensity scale (0-4)	0.67±1.10	0.62±0.71	0.60±1.03	1.25±1.44	0.64±0.77	0.59±0.63	0.71±0.94
9	Separation- Related Behaviors Frequency scale (0-5)	1.26±0.89	1.08±0.86	1.28±0.89	1.17±0.90	1.05±0.87	1.13±0.86	1.17±0.88
10	Excitability Intensity scale (0-4)	2.29±0.86	2.09±0.87	2.25±0.87	2.53±0.78	2.06±0.96	2.15±0.72	2.23±0.84
11	Attachment/ Attention-seeking Frequency scale (0-5)	3.19±0.99	2.78 ±1.00	3.19±0.95	3.20±1.31	2.92±0.99	2.56±0.99	3.01±1.08
12	Chasing Frequency scale (0-5)	1.63±1.06	1.48±1.00	1.69±1.05	1.21±1.10	1.36±1.10	1.66±0.81	1.53±1.02
13	Touch Sensitivity Intensity scale (0-4)	0.60±0.60	0.54±0.59	0.57±0.60	0.81±0.50	0.53±0.64	0.56±0.50	0.59±0.57

The responses indicate that the breed is generally characterized by a high level of trainability and low levels of owner-directed aggression. However, males showed greater possessiveness over objects compared to females ( $p = 0.0065$ ). With regard to stranger-directed aggression, a significant effect of reproductive status was observed when dogs were approached directly by an unfamiliar child while on a leash, as illustrated in Figure 1.



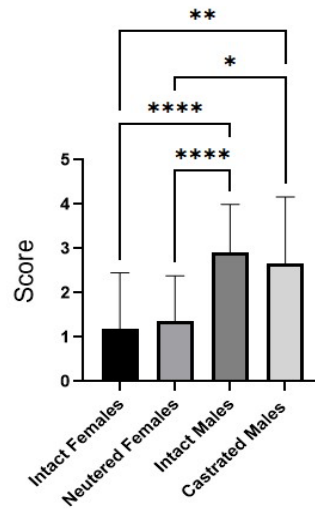
**Figure 1.** Responses to the item “Is the dog aggressive when approached directly by an unfamiliar child, outside the home?” A significant difference was detected using the Mann–Whitney test ( $p = 0.0019$ ). Post hoc analysis revealed significant differences between neutered males, intact males, and spayed females. (\* $p = 0.02$  \*\* $p = 0.006$ )

Furthermore, neutered males exhibited higher levels of aggression when approached by a stranger attempting to touch or pet them (Figure 2).



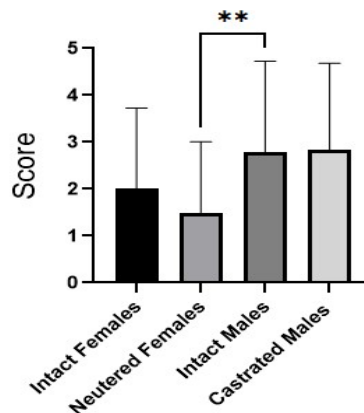
**Figure 2.** Responses to the item “Is the dog aggressive when a stranger attempts to touch or pet it?” A significant effect was detected with the Mann–Whitney test ( $p = 0.0015$ ). Post hoc analysis revealed differences between neutered males, intact males, and spayed females. (\* $p = 0.011$ )

With respect to interactions with other dogs, no significant rivalry was observed among cohabiting individuals. However, a slight increase in aggression was noted toward dogs of the same sex during on-leash walks. Differences related to reproductive status were also identified and are presented in Figure 3.



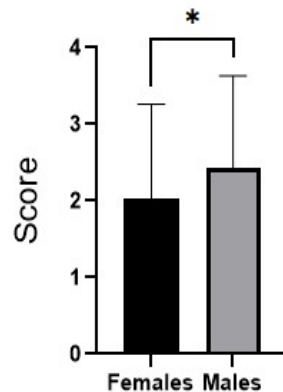
**Figure 3.** Responses to the item “Is the dog aggressive when approached directly by an unfamiliar male dog while walking on a leash?” A significant effect was detected with the Mann–Whitney test ( $p < 0.0001$ ). Post hoc analysis revealed differences between neutered males, intact males, and both spayed and intact females. (\* $p=0.025$ , \*\* $p= 0.005$ , \*\*\*\* $p= <0.0001$ )

Sex-related differences were also observed in separation-related behaviors. Males showed a greater tendency to howl compared to females ( $p = 0.0364$ ), exhibited stronger attachment to a specific family member ( $p = 0.049$ ), and were more likely to follow the owner or household members from room to room ( $p = 0.045$ ). In addition, males were more prone to whining or attempting to intervene when the owner or others displayed affection toward another person ( $p = 0.0006$ ), a behavior predominantly expressed by intact males (Figure 4).



**Figure 4.** Responses to the item “Does your dog become agitated (whines, jumps, tries to get in the way) when the owner or others show affection toward another person?” A significant effect was identified using the Mann–Whitney test ( $p = 0.0009$ ). Post hoc analysis revealed a difference between intact males and spayed females. (\*\* $p= 0.0027$ )

Males also exhibited higher levels of excitability when visitors arrived at the home ( $p = 0.011$ ), (Fig.5).



**Figure 5.** Responses to the question “Is the dog excited when do people come to the house?” A significant result was found using the Mann-Whitney test ( $P = 0.0109$ ). The test showed a significant difference between males and females. (\* $p=0.0109$ )

## Discussion

The findings of this research on the Czechoslovakian Wolfdog provide a clearer and more detailed profile of the breed. These dogs are highly trainable, which explains their use in both research and sporting activities. They also adapt well to family life, showing no signs of aggression toward their owners. Coexistence with other dogs in the same household appears to be generally positive, as scores in the rivalry category remain very low—well below 1 on a scale of 0 to 4. However, this result should be interpreted with caution, since it is not always clear how many Czechoslovakian Wolfdogs actually live with other dogs or interact with them regularly.

The picture changes when considering aggression toward unfamiliar dogs. With an average score of 2.05, the data suggest a moderate level of reactivity, most commonly expressed by males (both intact and neutered) toward other males. For this reason, owners should be mindful of such tendencies and take appropriate precautions during encounters with unknown dogs. A structured socialization and training program, begun at an early age, can play a crucial role in reducing this issue.

With regard to fear-related behaviors, the Czechoslovakian Wolfdogs in our sample showed a low tendency to be intimidated by either social or physical stimuli. Scores for fear of unfamiliar people or dogs were consistently low, as were those related to non-social fears: the breed generally shows little reactivity to novel objects, sudden noises, thunder, or fireworks. In contrast to findings reported in other studies (BIBLIO Mengoli), no significant differences emerged between sexes or reproductive status.

Although often described as an independent breed, the Czechoslovakian Wolfdog is capable of forming a strong emotional bond with its owner and may display signs of distress when separated. Behaviors linked to attention-seeking and physical contact with the owner are common, with an average score of 3.01 on a 5-point scale. The development of this attachment bond—even in early life (Mariti et al.; Carlone et al.)—is a crucial factor, providing the dog with the sense of security needed to thrive in a human environment. The importance of relational factors in modulating behavioral responses is also confirmed by recent studies on shelter dogs, in which oxytocin was found to be associated with a lower physiological response to stress during veterinary examinations (Gazzano et al., 2025). However, the intensity of this motivation can become problematic if not properly managed. Dogs that rely heavily on attachment are at greater risk of developing separation-related issues, including separation anxiety, which can be challenging to treat. For this reason, it is vital that prospective owners are informed of this predisposition—particularly marked in intact males—and that they seek guidance from qualified dog trainers and veterinary behaviorists to prevent the emergence of problematic behaviors and to safeguard the human–dog relationship.

## Conclusion

In conclusion, this study enhances our understanding of the behavioral characteristics of the Czechoslovakian Wolfdog, drawing attention to differences linked to sex and reproductive status. These insights provide valuable guidance for owners, trainers, and veterinarians, ultimately supporting the development of a more harmonious and fulfilling bond between humans and this unique breed.

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Analisi comportamentale del Cane Lupo Cecoslovacco mediante il questionario C-BARQ

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## Sintesi

Il Cane Lupo Cecoslovacco (CLC) è una razza ibrida di recente formazione, per la quale sono disponibili dati comportamentali limitati. Utilizzando la versione italiana validata del questionario C-BARQ, questo studio ha analizzato

204 soggetti (103 maschi, 101 femmine; 74% interi, 26% sterilizzati). I risultati mostrano un'elevata addestrabilità (media 2,86/5) e livelli molto bassi di aggressività diretta verso il proprietario (0,28/4). Tuttavia, sesso e stato riproduttivo influenzano diversi tratti. I maschi si sono mostrati più possessivi verso gli oggetti ( $p = 0,0065$ ), più eccitabili all'arrivo di visitatori ( $p = 0,011$ ) e più inclini a comportamenti di attaccamento, come seguire il proprietario ( $p = 0,045$ ) o reagire quando questo mostrava affetto verso altre persone ( $p = 0,0006$ ). I maschi castrati hanno evidenziato una maggiore aggressività verso gli estranei ( $p = 0,0019$ ), mentre l'aggressività verso altri cani ha raggiunto una media di 2,05/4, soprattutto tra maschi verso conspecifici maschi non familiari ( $p < 0,0001$ ). I comportamenti legati alla paura sono risultati generalmente bassi in tutti i gruppi. Nel complesso, il CLC appare una razza addestrabile e adattabile, sebbene la gestione debba considerare differenze legate a sesso e stato riproduttivo, in particolare per aggressività e attaccamento nei maschi.