**TOPIC SUMMARY:**

Separation anxiety (SA) in canines is characterized as the distress caused by the separation of the affected individual from the owner or the perceived separation. This distress often manifests in loud vocalizations, excessive panting, defecation, and other destructive behaviours such as object destruction.

The study of SA has evolved over time. SA was historically studied via descriptive methodology using observational studies or clinical records and looked at conference abstracts (Ogata, 2016). Current research commonly uses observational studies as well as questionaries filled out by the owners of affected individual. More recently, video, hormone and genetic analysis have been utilized in studying SA.

However, with the study of SA comes the problem of indirect evidence. This is due to the nature of SA being an issue *only* when the owner is away. Meaning, the owner is unable to directly observe what happens in their lack of presence. Often the owner is made aware of this issue by neighbours. If a dog doesn’t demonstrate noticeable signs such as howling or destruction and instead exhibits behaviours such as panting, the owner(s) may not notice. This is primarily a problem affecting questionnaire studies. In fact, a study by Palestrini et al., 2010 asserts that the proportion of dogs with SA is higher than estimated due to this fact. The exact extent is unknown.

SA is an incredibly multifactorial problem and has many etiological factors. One review conducted by Appleby & Pluijmakers., 2003 analyzed the contribution maintaining homeostasis has in SA. An object becomes a key point of attachment and plays a role in maintaining homeostasis. Given a situation where the object of dependency is missing, the dog will engage in various behaviours to re-establish its homeostatic base (i.e., howling or defecation). When analysing various non-environmental factors, studies found male dogs are at a higher presenting population as well as mix breed dogs (Storengen et al., 2014). There is discrepancy in saying male dogs are at a higher presenting population as some studies attest that males are over-represented in sample sizes when it comes to behaviour cases (Takeuchi et al., 2001). The elevated presentation of mixed breed dogs may be due to the increased likelihood of being adopted from shelters or having previous owners. Certain pure breed dogs also present at a higher population suggesting there may be a genetic link in SA. The breeds in question vary across studies. This potential genetic link is something that warrants for future investigation (Storengen et al., 2014). Environmental factors that could influence SA include sex of the owner. Storengen et al., 2014 found that more dogs with SA belonged to single female households. Other notable findings include an association with fear and noise phobia (Tiira et al., 2016) and hyperattachment not being a necessary factor in SA (Parthasarathy & Crowell-Davis, 2006).

Few studies have explored physiological and genetic factors. Of those that have, Pirrone et al., 2019 and Moesta et al., 2020 have investigated biomarkers of SA and evidenced salivary vasopressin and serum BDNF, respectively, as potential candidates. Serum BDNF (brain-derived neurotrophic factor) is a growth factor involved in neurogenesis and neuron maintenance, it is analyzed via blood samples and is found to be lower in dogs with SA. It was noted that most of the dogs in this study also had other diagnosis’ (i.e., noise aversion) that could have affected the results. Salivary vasopressin is a hormone that is part of the stress response system and is measured through saliva samples. The levels of this hormone were found to be elevated in dogs with SA immediately after separation from the owner. The results, similarly, to the study by on BDNF could also be influenced by the added stress from being in a novel environment. On a genetic level, Zapata et al., 2016 found loci specific variations at IGF1, HMGA2 (variants correlated with small body size) and chromosome X to also associate with SA.

While the evolutionary history behind SA is unknown, a review by Appleby & Pluijmakers, 2003 introduces the idea that canine breeding through history, favours more affectionate dogs. It is this preference that also created a greater likelihood of developing separation anxiety. This statement requires further research for validity (Appleby & Pluijmakers, 2003).

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