Hyperactivity in a Weimaraner dog

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Abstract: A 9-month-old intact male Weimaraner dog was referred because of pica, as an aggravating factor for a food intolerance problem. The detailed history and the behavioral examination revealed not only pica but also impulse-control problems, increased excitability, destructiveness, attention deficits and inability to relax. Hyperkinesis was discarded considering normal vital signs and the non-clear paradoxical effect during the central nervous system (CNS) stimulant test. The presumptive diagnosis was hyperactivity. Treatment initially included avoiding conflict situations and never reinforcing nor punishing the dog if these occurred, as well as reinforcing calm states, increasing both play and exercise and starting with obedience training sessions. The dog really improved at home but not outside, which led the owners to drastically shorten walks. This situation, in turn, made the dogs' behavior worse, as he showed redirected aggression toward the owners when they tried to move him away from any new social and non-social stimuli during the walk. The improvement of the dog was finally achieved through management measures and behavioral therapy combined with fluoxetine (1.5 mg/kg, PO, q 24h), castration and the control of medical problems. The negative role of confinement of hyperactive dogs as a consequence of their excessive behavior, other contributing factors to canine hyperactivity, as well as the effect of medical conditions on behavioral problems are discussed.

Key Words: behavior problems; dog; hyperactivity; hyperkinesis; pica.

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Presentation

A 9-month-old intact male Weimaraner dog, weighing 27 kg, was referred to a behavioural medicine consultation because of pica. The dog had been previously diagnosed as having food intolerance and pica was considered an aggravating factor for this medical condition. Owners additionally related permanent restlessness and lack of control.

History and presenting signs

The dog had been purchased from a non-professional breeder at 5 weeks of age. Prior to acquisition, the dog remained with his dam and littermates. The owners, a young couple, reported both medical and behavioral problems from a very early age.

The dog was referred by a specialist in internal medicine because of pica. He showed chronic diarrhea from adoption but this problem had been successfully controlled at the moment of consultation with the use of a muzzle during the walks and a hypoallergenic diet, which suggested a problem of food intolerance. However, diarrhea occasionally still occurred whenever the dog consumed any non-hypoallergenic food or non-nutritional material as a consequence of pica.

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With regard to behavioral problems, owners reported permanent restlessness and lack of control both at home and outside, although the dog practiced daily exercise. Temporarily, they attended some agility training sessions with the aim of getting the dog tired, but no effect on his level of activity was observed. At home, the dog was described as being incapable of relaxing, following the owners all the time. The dog used to seek attention by nibbling at his owners' clothes and, in the last weeks, also by mounting them. In addition, the dog showed destructiveness (and ingestion) of any object within reach. Eventually, he showed tail chasing, flank sucking and limb licking. Outdoors, the owners recognized to be overwhelmed by the problem, as the dog sharply pounced upon people, nibbling or biting their clothes, and pulling on his leash. During these situations, the dog did not bark nor growl at people but showed a straight body position with erect ears and tail and sometimes piloerection. All these behaviors directed toward people worsened when the dog was on leash. He also barked at other dogs when he was on leash but played with them when unleashed. Apart from this, the dog showed signs of pica by eating sticks, grass, papers or any small objects he found during the walk. The owners had observed that the more signs of pica he showed during the walks, the more severe the diarrhea was the next day, but also that severe diarrhea aggravated his behavioral excesses. At the moment of consultation, and as consequence of the previously described problems, walks had become really short, lasting only a few minutes (ten minutes) and making the dogs' behavior worse probably as a result of the limited time for exercise and play.

The owners had tried a number of strategies to correct the dogs' behavior at home, including verbal punishment, to which the dog reacted by growling, and enclosing the dog in his crate, where he seemed to calm down. They also unsuccessfully tried to prevent mounting by making the dog get down to the floor, counterconditioning with a sit command and ignoring the dog. During the daily walks, different tools were also used in order to stop the pulling on leash habit, including a head collar, which only worked during the first days, and a non-pull harness, which promoted frustration in the dog. Finally, a muzzle was used during the walk to avoid pica, although sometimes the dog was capable of eating non-nutritional material even while wearing it.

Physical and laboratory evaluation

A number of tests had been previously performed by the referring internist to rule out medical causes for pica, including a coprologic analysis, abdominal ultrasonography, gastrointestinal endoscopy and biopsy, and canine immunoreactive trypsine, B vitamin and folic acid analyses. The results of all these tests were normal. Results of cell blood count and biochemical analysis were also within the reference limits. Food intolerance was finally diagnosed as the cause of the diarrhea, and pica was considered as an aggravating factor. In the beginning, before a diet management was introduced, a possible malabsorption syndrome due to diarrhea may had prompted the pica problem.

At the moment of the behavioral consultation, physical and neurological examinations were carried out, with no remarkable findings (100 bpm, 38.7ºC) except for the constant panting of the dog. Thyroid hormones were not analyzed considering the age of the dog and the absence of clinical hypothyroidism related signs.

During the visit, the dog constantly jumped on clinicians, rubbed his muzzle against his owner's legs and barked at some of the students. He even chewed and broke the clinician's flat shoe in a matter of seconds, in spite of wearing the muzzle.

Diagnosis

Despite the early age of the dog, a diagnosis of hyperactivity was carried out considering the signs of pica, impulse-control problems, increased excitability, destructiveness, attention deficits and in-

ability to relax (Hart & Hart, 1985; Overall, 1997 and 2013; Lindsay, 2001; Landsberg et al., 2003 and 2013; Horwitz & Neilson, 2007). Hyperactive dogs are especially sensitive and reactive to novelty or the presence of unfamiliar people or animals, often displaying a pronounced inability to habituate to such stimulation, which could explain this dog's reactions to strangers (Lindsay, 2001). Stereotypic behaviors were also diagnosed, as the dog eventually showed tail chasing, flank sucking and limb licking. These behaviors were sometimes performed short after the interruption of undesirable behaviors by the owners and, therefore, could have been considered as displacement activities.

According to the French approach in canine behavior problems, this diagnosis is referred to as hypersensitivity-hyperactivity syndrome, a disorder appearing during the puppyhood or adolescence, in which a no sequential organization can be found in behavior and the appeasement phase that follows the achievement of the consummatory act is rarely shown. Furthermore, this syndrome describes dogs showing an extremely low reactive sensory threshold, that respond to very weak visual, tactile or auditory stimulation, and present severe difficulties to balance their emotional state. In particular, this dog would meet the criteria for a hypersensitivity-hyperactivity syndrome in a stage 1, as no global decrease of the sleeping time was observed. In addition, the absence of dietary satiety disappeared when a hypoallergenic diet was initiated and the diarrhea was under control (Pageat in Landsberg et al., 2013).

The dog in the present report fulfills several of the predisposing factors for hyperactivity. Thus, he belongs to a hunting breed, Weimaraners, which are predisposed to overactivity (Beaver, 1999). In addition, he was separated from his dam and littermates when he was 5 weeks old, an early age for weaning and adoption in dogs (Westgarth et al., 2012), and this may have influenced the way he behaved with people during the walks (by jumping on) and with his owners (by constantly demanding attention). Furthermore, involuntary reinforcement by the owners could also be another contributing factor in the development of hyperactivity in this case, since they used to pay attention to the dog when he showed undesirable behaviors.

Increased vigilance and scanning, autonomic hyperactivity, increased motor activity, destructiveness, excitability, panting and pacing may be also signs of generalized anxiety (Overall, 1997; Lindsay, 2001). However, anxious dogs usually exhibit hesitant or avoidance behaviour, or trembling (Overall, 1997; Horwitz & Neilson, 2007), which did not match with the present dogs' behavior, as suggested by his attitude toward people and the related body language. Attention seeking behavior was not considered as a separate diagnosis but as a symptom, as the ignorance of these behaviors by the owners did not stop nor diminish them. Hyper-reactivity was also ruled out as this dog showed his excessive behavior whether an external stimulus was present or not and as no low-energy phases were observed (Overall, 2013). Finally, a hyperattachment problem was not considered in the diagnosis since his behavioral (hyper) manifestations did not get worse when the dog was left alone at home. Thus, even the dog used to follow the owners at home, this was considered an attention seeking behaviour and not a real need for permanent physical contact.

On the other hand, medical conditions such as metabolic disturbances, endocrine diseases, neurological conditions or pharmacological interventions, can produce physiological signs coinciding with those observed in hyperactive individuals (Overall, 1997 and 2013). However, these medical problems had been discarded in this dog during the physical and laboratory evaluation, as previously mentioned.

Despite vital signs were within the normal limits, a CNS stimulant test was performed in order to rule out a real hyperkinesis (Hart & Hart, 1985; Overall, 1997; Lindsay, 2001; Landsberg et al., 2003; Horwitz & Neilson, 2007). For the test, the dog was orally administered a starting dose of 0.2 mg/kg of methylphenidate and kept under intrahospital vigilance for 2 hours (Voith, 1980; Landsberg et al., 2003), monitoring both physiological (heart rate and respiratory frequency) and behavioral parameters. Later, at home, owners were instructed to increase the dosage in 0.1 mg/kg every day and to communicate daily with the clinicians about the evolution of signs. Significant behavioral changes were not observed during the test, although the owners reported that shortly after

methylphenidate administration, the dog went to rest to his crate. However, when the dog was administered a 0.8 mg/kg PO, q 12 h, dose of methylphenidate, the owners detected hair loss, anorexia and sensation of hyperthermia (hot ears), and interrupted the drug administration by themselves. Despite those results, the test was not conclusive, as it was interrupted before a higher dose could be administered. True hyperkinetic dogs are expected to show a paradoxical response after methylphenidate administration, and this was not clearly observed in this dog, at least at the administered doses. In addition, the dog showed vital signs within the normal values. All these data prompted the clinicians to discard real hyperkinesis.

Treatment

Management measures

The owners were instructed to avoid conflict situations, by walking the dog at the least crowded/busy hours and places, and to never reinforce nor punish the dog if these situations were to occur. They were also instructed to reinforce calm states by giving hypoallergenic treats in these situations (e.g., when the dog was lying on his bed), to ignore repetitive behaviors, and to increase both play and exercise, in order to give the dog stimulation according to his breed and age. On top of these measures, owners were recommended to maintain the use of a muzzle during walks to avoid pica.

Behavioral therapy

Behavioral therapy sessions were carried out in the Veterinary Hospital at the University of Zaragoza (HVUZ) facilities, allowing for direct observation and monitoring changes in the dogs' behavior during sessions. Firstly, obedience training was started in order to teach the dog desirable behaviors and to develop self-control, while improving the relationship and communication between the dog and his owners. During these sessions, apart from obedience commands (i.e., "sit", "lie down", "come here" and "stay"), which were rewarded when the dog performed them in a calm way, other relaxing and communication-promoting exercises were explained. For instance, the dog was taught to look at his owners' eyes to get their attention or to obtain a treat, and he was ignored if other behaviors were used, including repetitive behaviors.

Once the dog had achieved the obedience exercises, it was planned to implement a desensitization program combined with counterconditioning to unknown people and different stimuli in order to manage the behavior of the dog when not at home.

Follow-up

During the first indoor session, the dog was observed to have obvious difficulties relaxing and concentrating during exercises whenever minimal distractions occurred, or when continuous food reward was not provided. Despite these difficulties, an improvement was observed during the first month, and the owners were instructed to practice these exercises both at home and outside. Two months later, they felt the dog had improved at home, but severe difficulties persisted when practicing exercises outdoors, where the dog continued displaying the same behavior. Moreover, the dog had started to show aggression toward other males. At this point, considering previous evidence of positive effects of serotonergic drugs on the management of hyperactivity in dogs, especially when loss of impulse control is present, as well as in Attention Deficit Hyperactivity Disorder (ADHD) children, treatment with fluoxetine was initiated, at a dose of 30 mg (1 mg/kg, PO, q 24 h) (Overall, 1997; Lindsay, 2001; Mentzel, 2009; Carter, 2011; Landsberg et al., 2013; Chantiluke et al., 2015). The dose was introduced progressively in order to minimize side effects (Mills & Sherman Simpson

in Horwitz et al., 2006; Manteca, 2002). Along with pharmacological intervention, castration was carried out in order to avoid the effects of sexual hormones in sexually dimorphic behaviors, including intrasexual aggression and mounting (Horwitz & Neilson, 2007), both of them showed by this dog. Chemical castration was not chosen considering the risk of heightening aggression after desloreline acetate administration due to an initial testosterone increase (Ponglowhapan, 2011).

Two months later, the owners felt the dog had really improved at home, as he was relaxed for larger periods than before, slept more deeply, and mounting rarely occurred. During the daily walks, they also reported an improvement, as the dog was generally in a much calmer state, and intrasexual aggression had diminished. However, whenever a new stimulus appeared during the walk, he started again pulling on the leash, pouncing upon people, trying to pick up objects from the floor, or chase pigeons. In addition, redirected aggression toward the owners started to appear when they tried to move the dog from those stimuli, and as a consequence, the duration of the walks was shortened, which made the dogs' behavior got worse. Before starting with systematic desensitization sessions, an increase in the fluoxetine dose up to 1.5 mg/kg, PO, q 24 h was administered, since higher doses than those normally used for canine aggression (i.e. 1 mg/kg, PO, q 24 h) have been reported for hyperactive dogs (Lindsay, 2001; Mentzel, 2009; Pageat in Landsberg et al., 2013).

At that time, under the recommendation of an unknown external dog trainer and without the authors´ approval, the owners started to use a pinch collar. The owners felt more control over the dog with this collar and started walking the dog for longer periods. However, the dog began to whine and lick his limbs and flank when corrected with the collar, which could be considered as stress or anxiety signs (Overall, 1997; Lindsay, 2001; Horwitz & Neilson, 2007). After explaining to the owners our disagreement with the pinch collar and all the disadvantages it supposed for the dog, they were asked to remove it. Exercises of progressive approaching (desensitization) to unfamiliar people were practiced during outside training sessions (without the collar). From then on, a notable improvement of the dog's behavior outside was apperceived.

After summer holidays, the owners reported they had abruptly interrupted fluoxetine by themselves since they observed the dog was progressively more calm. Tail chasing and licking of limbs and flank had been considerably reduced, becoming only sporadic.

Summary and discussion

Hyperactivity is a common complaint that describes over-reactivity, excitability and/or overactivity (Horwitz & Neilson, 2007). Overactive behavior could be defined as a high level of energy associated with an increase of the motor activity and of the social, exploratory and play behaviors, and it must be differentiated from hyperactivity, where more symptoms are observed. Hyperactive dogs also show an excessive degree of restlessness, inability to learn, poor habituation and difficulty to adjusting to new surroundings (Beaver, 1999). Hyperactivity has been suggested to be overdiagnosed, as most dogs that clients believe are hyperactive are either overactive or underexercised (Overall, 1997). Thus, the diagnosis is sometimes conditioned by the owners' expectative of a normal puppy's behavior. However, in the present case, a real hyperactive dog was attended, with obvious symptoms of pica, impulse-control problems, increased excitability, destructiveness, attention deficits and inability to relax (Hart & Hart, 1985; Overall, 1997; Lindsay, 2001; Landsberg et al., 2003; Horwitz & Neilson, 2007). At the first visit, the dog was only 9 months old. At the same time the treatment was getting established, the dog was growing up. The effect of the age in hyperactive dogs has been described before, as some authors affirm that this syndrome is mostly observed in young animals (Horwitz & Neilson, 2007; Landsberg et al., 2013). Despite this fact, it is difficult to assume that the improvement of the dogs' behavior only relied in his growth, but with a combination of pharmacological, behavioural therapy and management measures.

The possible causes or contributing factors to canine hyperactivity include genetic predisposi-

tion, social and sensory deprivation, unintentional reinforcement and physiological abnormalities (Landsberg et al., 2003; Horwitz & Neilson, 2007). Hyperactivity problems are widely distributed among canine breeds but are especially prevalent among hunting and working breeds, as Weimaraners are, since they are dogs selectively bred for enhanced environmental alertness, vigilance and high activity levels (Hart & Hart, 1985; Overall, 1997; Lindsay, 2001; Landsberg et al., 2003; Horwitz & Neilson, 2007). As hunting dogs, they have an excessive amount of energy that requires a good outlet, and lack of exercise can be one of the contributing factors. An early weaning can also be considered as a predisposing factor, since social contact deprivation during early development could cause the puppy to make various compensatory and excessive efforts to make up for this lack (Lindsay, 2001). This dog was separated from his mother and siblings when he was 5 weeks old, and previous studies have suggested that dogs may possess a biological need for some relatively fixed amount of daily sensory stimulation, motor activity and social contact. If these requirements are not met (and when litters are together it is more probable to have them), then various compensatory and excessive efforts may be emitted by dogs to secure them (Lindsay, 2001).

It is important to mention that only a few hyperactive dogs are truly hyperkinetic. The pathophysiology of hyperkinesis is not fully understood. Hyperkinesis is a very rare condition which includes the symptoms of a hyperactive dog but with altered physiological signs, namely elevated baseline heart rate, respiratory rate, and temperature when at "rest" with lower than expected increases when exercised (Voith, 1980). This condition is characterized by paradoxically answering to CNS stimulants (Overall, 1997; Beaver, 1999; Lindsay, 2001; Landsberg et al, 2003; Horwitz & Neilson, 2007) and by abnormalities in the dopaminergic, noradrenergic, or serotoninergic systems (Horwitz & Neilson, 2007). Similarly, children with ADHD typically show a low dopamine release as well as a low dopamine receptor density in several brain regions, which is in perfect agreement with the mechanism of action of the medications used to treat ADHD (Sharma & Couture, 2014). Furthermore, serotonergic system has been shown to play a key regulatory role in dopamine release. In particular, serotonin and dopamine interact in the prefrontal cortex, resulting in the fine tuning of neuronal responses and better cognition, particularly in tasks that require the maintenance of stimulus-response representations, as well as in the control of impulsiveness. Thus, selective serotonin reuptake inhibitors appears to moderate the efficacy of stimulant medication in ADHD children (Chantiluke et al., 2014).

Excessively active dogs presenting signs of impulse-control problems and other relevant symptoms (e.g., attention deficits, inability to calm down, aggressiveness, and impaired learning abilities) should be evaluated for hyperactivity and possible hyperkinesis syndrome (Lindsay, 2001). In the present case, the interruption of the CNS-stimulant-response test before a higher dose could be administered did not allow for a clear response to CNS-stimulants and, therefore, the test results were not conclusive. The absence of clear paradoxical effects together with the normality of the vital signs prompted the clinicians to rule out the hyperkinesis in this dog. However, much higher doses of methylphenidate could be required to observe clear paradoxical effects, as it has been recently reported (Piturru, 2014). Beyond the clinical effects of methylphenidate, a recent study revealed the inability of the CNS-stimulant test as a tool for the diagnosis of hyperkinesis in dogs (Stiles, 2011). In this study, Beagle dogs did not display any significant changes in body temperature, motor activity, and certain specific behaviours such as "lip-licking", "panting", and "yawning" within 90 minutes of receiving an oral dose of 0.2 mg/kg of dextroamphetamine. The heart rate of those studied Beagle dogs was significantly reduced with treatment as is seen in a paradoxical response indicating that a low dose oral dextroamphetamine challenge test may in fact identify more than only truly hyperkinetic dogs. On the other hand, a negative test for hyperkinesis cannot be taken as an indication that the dog is physiologically normal, since several neurotransmitters appear to be involved in this disorder (Luescher, 1993). In fact, fluoxetine partially improved the dogs' symptoms of restlessness, excessive activity, attention seeking behaviour by mounting the owners, destructiveness and permanent alert, especially at home, which may indicate that, as previ-

ous studies suggest, serotonergic system is involved in hyperactivity control in animals as well as in children with ADHD (Lindsay, 2001; Luescher, 1993; Chantiluke et al., 2014).This may suggest an altered serotonergic neurotransmission in this dog, but it cannot be discarded that fluoxetine may have also led to clinical improvement through a better regulation of dopamine release.

In order to introduce a new method for studying behavior problems related to attention skills and the levels of activity/impulsivity in pet dogs, a 13-item rating scale questionnaire has been developed for dog owners to measure attention deficit and activity-impulsivity in their dogs as well as its validity and reliability (Vas et al., 2007). The inclusion of most of its questions in our behavioral questionnaire and the limitations of the test (it does not test for different raters other than the owners) were the main reasons why it was not performed in this case.

Recent studies have reported no adverse effects in dogs following the oral administration of 1-3 mg/kg of methylphenidate in healthy Beagles, apart from mild hyperkinesia (Lavy, 2011). Nevertheless, alopecia, anorexia and pyrexia are described as frequent side effects of methylphenidate in humans. Similarly, hair loss, anorexia and perception of hyperthermia in this dog could also have been considered as side effects, despite the owners were unable to be specific about the delay between side effects and methylphenidate administration.

Apart from difficulties in diagnosis, the management of dogs showing hyperactivity is complex. Thus, hyperactive dogs are often exposed to routine isolation due to their behavioral excesses, which points to another set of contributing factors underlying hyperactivity: inadequate social attention, insufficient or irregular exercise, and excessive confinement. Active dogs subjected to daily confinement tend to become increasingly hyperactive and solicitous of attention. The situation is a vicious circle, with excessive behavior resulting in further rejection and isolation, thereby generating more attention-seeking behavior and hyperactivity (Lindsay, 2001). The case reported here may be representative of such a vicious circle. The increase of physical exercise and the desensitization sessions would be the real cause of the dog's positive evolution and the reason why he got a stable situation even once fluoxetine was removed.

Finally, it is important to mention the relationship between medical and no medical causes in the development of hyperactivity in dogs. For instance, food allergies have been previously related to excess activity in dogs (Beaver, 1999). In this case, the coexistence of a behavioral problem (hyperactivity with pica) and a medical condition (food intolerance) reveals the importance of managing both carefully with the objective of having a result. As both conditions can affect each other, the solution of the problem will be held by considering a mixed therapeutic approach.

In sum, the present case emphasizes the importance of managing behavioral conditions in a multifocal approach, considering each case as a whole, taking into account medical, environmental and individual factors. The authors consider that this case report provides clinicians with clinically relevant information on the evaluation, diagnosis, treatment and management of canine hyperactivity.

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Iperattività in un cane di razza Weimaraner

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Sintesi

Un cane di razza Weimaraner, maschio intero, di 9 mesi di età è giunto alla consulenza comportamentale in seguito a manifestazioni di pica, fenomeno aggravante un problema di intolleranza alimentare.

L'anamnesi e la consulenza comportamentale hanno messo in evidenza come l'animale non presentasse solo la pica ma anche problemi legati al controllo degli impulsi, aumentata eccitabilità, distruttività, deficit dell'attenzione ed incapacità di rilassarsi.

L'ipercinesi è stata scartata in quanto i segni vitali erano normali e gli effetti paradossi durante il test di stimolazione del sistema nervoso centrale non furono chiari.

La diagnosi presunta fu di iperattività. Il trattamento consigliato, inizialmente prevedeva di evitare situazioni di conflitto e di non rinforzare né punire il cane se queste si verificavano; si consigliava di rinforzare gli stati di calma, aumentando sia i periodi di gioco sia quelli di esercizio e di iniziare un corso di educazione di base.

Il comportamento del cane migliorò notevolmente in casa ma non all'aperto e questo costrinse i proprietari ad accorciare le passeggiate.

Questa situazione provocò, di conseguenza, un peggioramento nel comportamento del cane poiché l'animale iniziò a presentare una forma di aggressione rediretta nei confronti dei proprietari quando questi cercavano di allontanarlo da qualsiasi stimolo sociale o meno che incontravano durante la passeggiata.

Il miglioramento definitivo del comportamento del cane fu ottenuto con le misure di gestione ed una terapia comportamentale combinata con fluoxetina (1,5 mg/Kg s.i.d.), la castrazione ed il controllo dei problemi organici.