

# Orthoses and Exoprostheses for Companion Animals



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## KEYWORDS

- Prosthetic device • Orthosis • Orthotics • Exoprostheses • Socket prosthesis
- Prosthetic design • Prosthetic fitting • Prosthetic training

## KEY POINTS

- Orthoses are external devices that are placed around complete limbs to protect or support them.
- Exoprostheses are likely to be successful when the limb has a functional elbow or stifle joint and a portion of the antebrachium or crus. The longer the stump, the easier it is to fit an exoprosthesis.
- The fabrication and fit of orthotic or prosthetic devices for companion animals must be precise for the device to be stable when worn.
- Axial, angular, and rotational (torsional) stability are key to successful use of an orthosis or exoprosthesis.
- Training companion animals to use an external device is akin to managing limb disuse. It requires patience and attention to details.

Exoprostheses (also named *socket prostheses* or *prosthetics*) are devices that are secured to incomplete limbs to enable locomotion. By comparison, orthoses (also named *orthotics*) are devices externally applied to support or protect an injured body part. Orthoses also can be used to control, guide, protect, limit motion of, or immobilize an extremity, joint, or body segment. Exoprostheses and orthoses are a growing aspect of the physical rehabilitation of companion animals.<sup>1</sup> In veterinary medicine, orthoses may be used to restrict movement in a given direction, such as limiting shoulder abduction with medial shoulder instability, or hip abduction after a ventral hip luxation. They may assist in a movement, such as a carpal or tarsal brace

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with nerve injury to the radial or peroneal nerve, respectively. Orthoses also may serve a protective function, such as a tarsal brace after fracture or dislocation, and surgical repair when regional tissues (eg, ligaments, joint capsule, periarticular tendons) are not strong enough to provide the needed support during the healing phase.

## ORTHOSES

Orthoses are externally applied devices used to support or protect an injured body part. Orthotics also can be used to control, guide, limit, and/or immobilize an extremity, joint, or body segment. In veterinary medicine, orthoses may be used to restrict movement in a given direction, such as limiting shoulder abduction with medial shoulder instability or after a hip luxation. They may assist in a movement, such as a carpal or tarsal brace with nerve injury to the radial or peroneal nerve, respectively. Orthotics also may serve a protective function, such as a tarsal brace after fracture/dislocation, and surgical repair when the tissues (eg, ligaments) are not strong enough to provide the needed support during the healing phase. Orthoses work by applying forces in specific locations on the body, while preventing tissue damage.

Orthotic devices can be rigid, semirigid, or flexible. Rigid orthoses can be fabricated from custom molds or can be prefabricated in several sizes, such as commercial hock splints. Custom orthoses are made from casts of the patient's limb or are fabricated directly on the patient using a moldable thermoplastic polymer (Fig. 1). Heat moldable polymers come in numerous varieties depending on the clinical need, and also can be designed for use with aquatic therapy. Knowledge of the principles of orthotic fabrication is necessary to correctly design the device, as well as a good knowledge of the anatomy and pathology. Flexible orthoses are typically made with breathable neoprene. Nylon straps can be added with hook and loop fasteners (Velcro) to strategically reinforce or limit motion in specific areas (Fig. 2), such as limiting carpal hyperextension by reinforcing the palmar aspect of the carpus. Orthoses can be hinged to stabilize or limit the motion of joints (Fig. 3). Hinged orthoses are custom made because they need to fit precisely. Orthotic prescription should take into account skin integrity and cleanliness, hair coat, and other concurrent diseases or medications that may potentially affect skin strength and thickness, such as Cushing disease or chronic prednisone treatment. Attention must be given to adequate ventilation and ease of cleaning the appliance, especially for long-term use. Orthoses should also be assessed for their effect on function. For example, a brace may work well in standing but may impede a motion, such as sitting or laying down. When fitting a dog with an orthosis, it is essential to assess the orthosis during functional tasks. Most orthoses have a limited life span and require refurbishment or replacement for long-term use (months to years). In some instances, an orthosis is chosen over surgical correction. However, the owner must be educated about the advantages and disadvantages of each approach. Orthoses should not be considered as a replacement for surgery, as there is no current evidence to support efficacy of orthoses in comparison with conditions traditionally managed by surgery in dogs.

### ***Shoulder Orthoses***

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The most common shoulder orthoses are used for preventing shoulder abduction either as a primary treatment or to provide postoperative support to dogs with medial shoulder instability secondary to rupture of the medial glenohumeral ligament.<sup>2</sup> Common sources for this type of orthosis include DogLeggs Shoulder Stabilization System (Reston, VA, USA) and Phoenix Design Solutions (Ashburn, VA, USA). The shoulder stabilization orthosis is made from breathable neoprene that can be worn continuously

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