A Method of Prototype Evaluation for Assistive Mobility in Animals: Intervention for a Congenitally Malformed Dog – A Case Study

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Outline

- Case Presentation
- Current Technologies / Research
- Design Goals & Method
- Results
- Future Application
- Questions
Tiny Tim

- Male Chihuahua
- DOB August 20 2006
- Congenital L wrist disartic, R transhumeral
Tiny Tim

- R Shoulder: Fixed 30 deg extension
- L Shoulder: Normal ROM +20 deg hyper extension
- L elbow: 50 deg flexion contracture with 5 deg of additional flexion
Tiny Tim

- Want to be able to take on walks
- Concerned about chin hitting ground
- Concerned about possible scoliosis
Current Mobility Devices

$430+ (HandicappedPets.com)

$400+ (K9carts.com)

$370+ (eddieswheels.com)
Bipedal Animals

Slijper – Goat (1942)

Dogs can adapt to 3 legs
3 legged stance can lead to scoliosis
3 legged dogs have been fit with prosthetic devices
No detailed reports on the method of designing a device or training an animal to use the device
Methods & Goals

Overall Goal: **Increased Mobility**

Design Problem #1: **Create Usable Device(s)**
- Owner can don/doff device(s)
- Dog must tolerate device(s)
  - No “complaint” for 10 min’s of wear
  - No redness lasting >10 min’s after doffing device
- Dog must be able to ambulate 5 feet*
**Overall Goal:** Increased Mobility

**Design Problem #2:** Verify Increased Mobility
- Create a repeatable measure of mobility
  - Adaptation of the Timed Up & Go test
- Measure mobility with and without the device(s) on different surfaces and compare
  - Carpet, hardwood, grass, asphalt

**Additional Goal:** Prevent Chin from Hitting the Ground
- Verified by visual assessment in the Timed Up & Go test
Design Problem #1: Create Usable Device(s)

- Owner can don/doff device(s)
  - instant
- Dog must tolerate device(s)
  - 3 prototypes for assisted standing
  - Additional Home training was instituted
Home Training Protocol

- All sessions: withhold food before, feed during, praise during
- Start @ 10 min wear
  - Assist if needed
  - Check for redness
  - Increase 10 min’s every day or as frequent as possible not to exceed 1 hour
- STOP if excessive redness
- STOP if major objection (not tolerable)
Design Problem #1: Create Usable Device(s)

- Owner can don/doff device(s)
- **Dog must tolerate device(s)**
  - 3 prototypes for assisted standing
  - 3 prototypes for unassisted standing
- **Dog must ambulate 5 feet**
  - not able to achieve with 6th prototype
  - Additional Home training → excessive red marks
Design Problem #1:
Create Usable Device(s)

- Dog must ambulate five feet
- 2 prototypes using a wheeled system
Design Problem #2: Verify Increased Mobility

- Adapted Timed Up & Go
- Failed Trial if:
  - Dog refuses to finish
  - Dog is unable to finish
  - Dog requires assistance
Timed Up & Go Data

Unaided
- 18s
- 17.5s
- 26s*
- 9.5s
- 9s

Aided
- 42s
- 6.5s
- 8s

Outside Times (asphalt)

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Unaffected

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Applications / Future

- Decision Tree for future prototypes
- Timed Up & Go test for animals

- Use to develop future prototypes
  - Wire frame
  - Larger wheels
  - Easier to steer
References for Presentation

- Fairley M. Golden Retriever Is a ‘Liberator’ for Disabled: A chain of events and some kind people saved a tiny disabled puppy’s life, and now she is “giving back” in a big way. The O&P Edge December 2006, pp11.
- Farley M. Horses and Dogs Find a Friend at Equine Prosthetics. The O&P Edge. 2004 April.
References for Presentation

- Fullen M. O&P Aids Animals. The O&P Edge. 2005 April.
- Fairley M. Golden Retriever Is a ‘Liberator’ for Disabled: A chain of events and some kind people saved a tiny disabled puppy’s life, and now she is “giving back” in a big way. The O&P Edge December 2006, pp11.
- Information on Faith the biped dog provided by http://www.gizmag.com/go/5715/.
- Cart systems information, pictures and pricing provided by HandicappedPets.com, K9carts.com, and eddieswheels.com
- Pictures for dog rang of motion provided by http://cal.vet.upenn.edu/saortho/appb.htm#shoulder
Initial Evaluation

Impression Taking →

Modification / Fabrication

Fitting

Tolerable Standing (10 Min's)

Tolerable Ambulating (5 Feet)

not tolerable → Adjustments

tolerable

Tolerable Ambulating (5 Feet)

Home Training Protocol #1

Timed Up & Go

Home Training Protocol #2

Slower than unaided time

Delivery

Follow-Up

Timed Up & Go

Success

Improved mobility

No mobility improvement