



Issues of Human Interface design

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Question???

[Oscar Pistorius puts his Cheetah Legs to the test](#) – 1:15

[Oscar Pistorius – The Blade Runner](#) – 3:06



The biggest problem with human interface design is:
HUMANS



A prosthesis must fit intimately enough to comfortably support the limb during high loading, not bother the soft tissues and bone and transfer motion from the human to the device with extreme efficiency.







where does the pressure
go?????

While robotics starts with a task to be completed or a problem to be solved.

We start with the person, their goals and their limitations.









Given that everyone is different, are there some generalizations that can be made???



and.... how do we insure the long term success for the people we are supposed to help?

“Moments of Truth” in Interface Human Design

- ✿ What is a “Moment of Truth”?
- ✿ Independent but significant and often overlapping considerations for any device (or experience) that will interface with a person.
- ✿ Failure at any one could destroy the long term success

Five C's

- **Comfort**
- **Cosmesis**
- **funCtion**
- **Cost**
- **Cool**

Comfort

- What makes something ^{UN-}comfortable?

Comfort

- Transference of pressure
- No “noxious” stimuli (noise, vibration etc)
- Heat
- Nuisance factor
- Weight
- Sensitivity of skin or nerve





Colony 8/19



Comfort is illusive

- What may be “comfortable” one minute may not be the next.....

Cosmesis

- What is cosmetic?



Cosmesis

- How do we perceive ourselves?
- How do changes to our body affect our perception of cosmesis?







funCtion

- Is it a device that reliably does what it is intended to do?



funCtion

- Is there a device that can do everything?







bionic







cool

We have a problem with technology

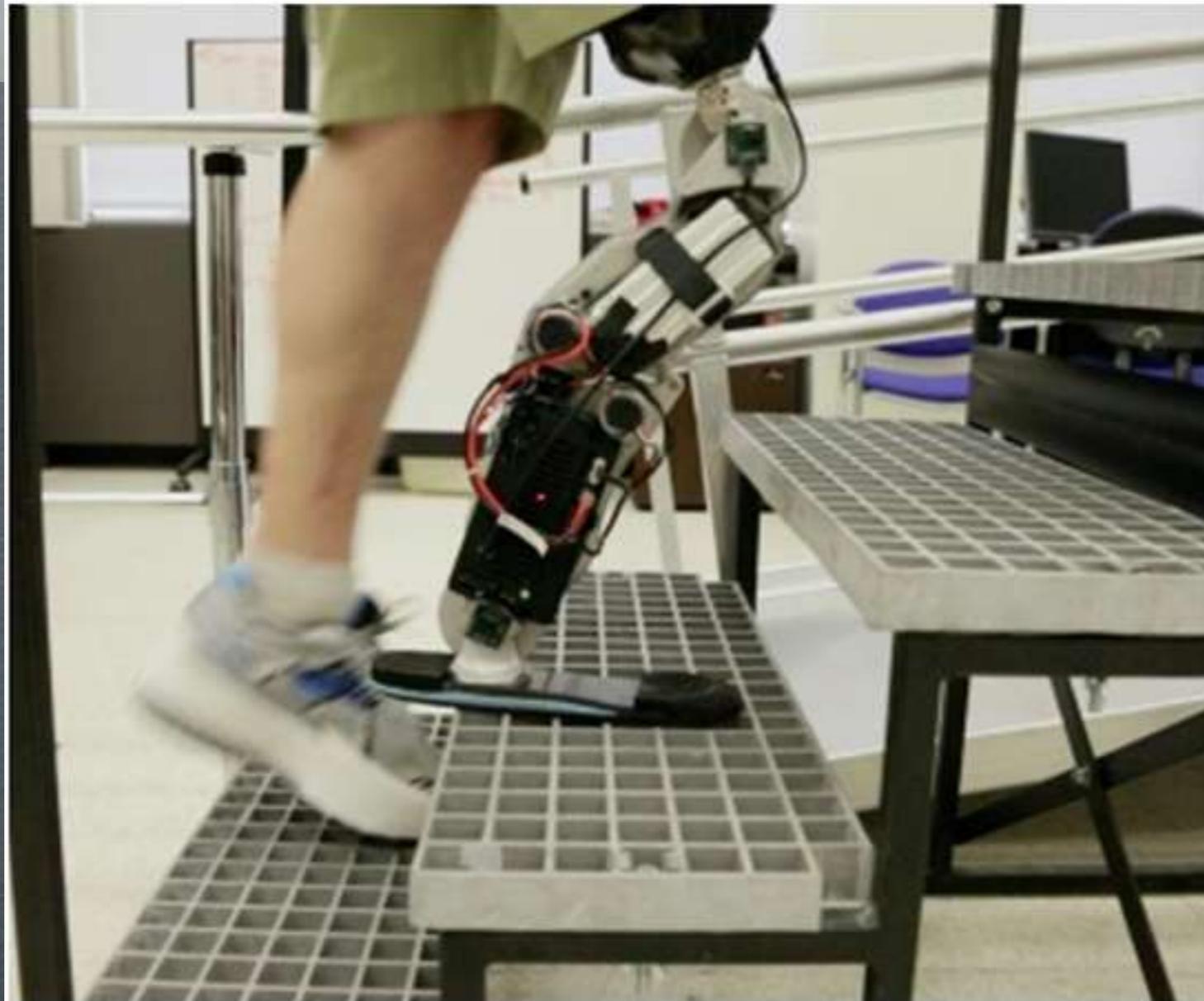
- We always want something new, often without formal training and **WITHOUT QUANTIFIABLE BENEFIT** and on some occasions, causing harm.

According to Stryker, the wide variety of component lengths and sizes were intended to provide surgeons more options to achieve a better fit in their patients. The neck is made of cobalt chromium and the stem is made of Stryker's proprietary titanium alloy blend designed to resist corrosion and fretting.

Just two months before the recall, Stryker issued an Urgent Field Safety Notice that warned doctors and hospitals that these two implants had an increased rate of Adverse Local Tissue Reactions (ALTRs). ALTRs are complications arising from inflammation in the tissues surrounding the implant because of metal debris released when they components rub together. These ALTRs usually end in painful and complex revision surgeries. Because stems are imbedded in the femur, they are more difficult to remove and can increase the rate of femur fracture.

The metal liner, which created a metal-on-metal junction when it was used, was marketed as durable and wear-resistant. However, in the recall, Smith & Nephew said the metal liner had not performed as well as the company had expected.

DePuy's ASR acetabular implant was replaced or removed 29 percent of the time after just six years. This was compared with an overall 9.5 percent failure rate for all-metal hip implants. In January 2013, the jury in the first ASR trial heard evidence that, at the time of the recall, DePuy knew that within five years, 40 percent of its ASR implants would fail.





COST

27 degrees of
freedom arm
controlled by re-
innervated muscle
groups



Sullivan, the first recipient of the bionic arm, tests its remarkable abilities

The perfect
device is one
that balances
all of the above
for that
individual





Using the “c’s”

There is a 6th 'C'

- CHANGE
 - Psychological change
 - Physical change
 - Yearly
 - Monthly
 - Daily
 - Hourly

What goes in
to provision of
a prosthesis??

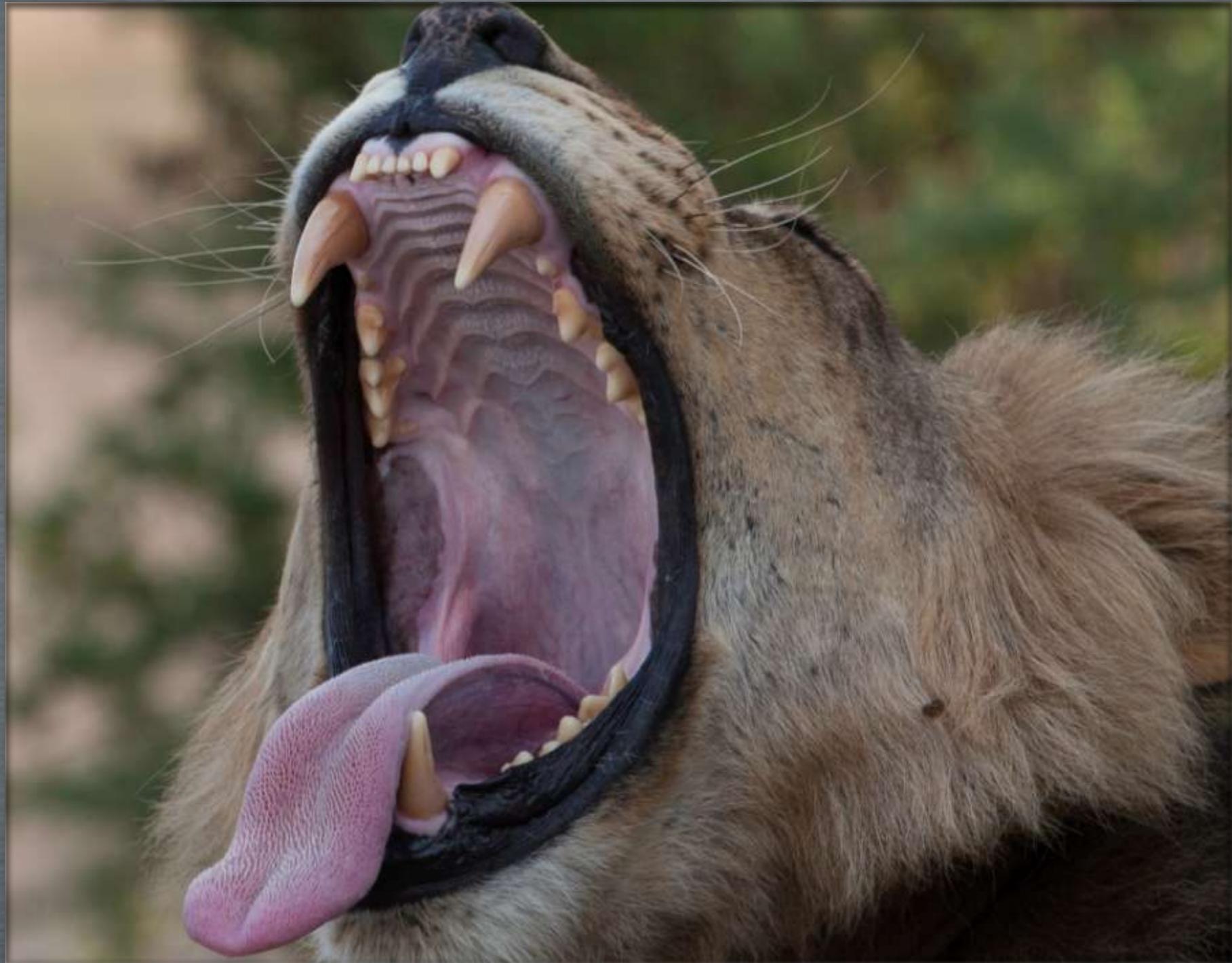
AKA: What does Gary
do when not hanging
out with us!



Take home

- Critically evaluate what we do and why.
- We must focus on solving problems, not just creating new devices or techniques that are equal to existing.
- Narrow your goals
- A prosthesis is not just a series of parts
- Just because you have a hammer, doesn't mean everything is a nail





Thank you

How many of the “C’s” does this meet??



Why is he standing like this?

What is the Cost of 3d printing?

- Cost of printer
- Cost of assembly
- Cost of materials**
- Cost of programmer
- Software
- Electricity**
- Cost of on-site provider **
 - (providing prosthesis, providing adjustments/repairs)
- Administration costs**
- Cost of travel
- Cost of shipping
- Cost of Repair to printer
- Repair/adjustment to prosthesis (cables, parts etc)**
- Facility costs**
- 5 c's??？**