Issues of Human Interface design

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SECTION ONE:

The older I get the less I know.


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Stokes

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Better than human?

Section 2:

Designing for Humans

How do you design a shoe?

Five C’s

- Comfort
- Cosmesis
- funCtion
- Cost
- Cool

Better than Human?

Why are we so hell-bent on making people with amputations better than human,
if we can't make able bodied people better than human??

Are elite runners getting faster or is a special pair of Nike shoes giving them an edge?


niko

Comfort

- Transference of pressure
- No “noxious” stimuli (noise, vibration etc)
- Heat
- Nuisance factor
  - easy to put on and take off
  - not too bulky
- Weight
- Sensitivity of skin or nerve

Comfort

- What makes something comfortable?
  - UN-
- Fluid dynamics, what happens when you add pressure to tissue?

Comfort is elusive

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

funCtion

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

funCtion

- Is there a device that can do everything?


FIRE
DEPARTMENT

Cosmesis

- What is cosmetic?

Cosmesis

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

Cost

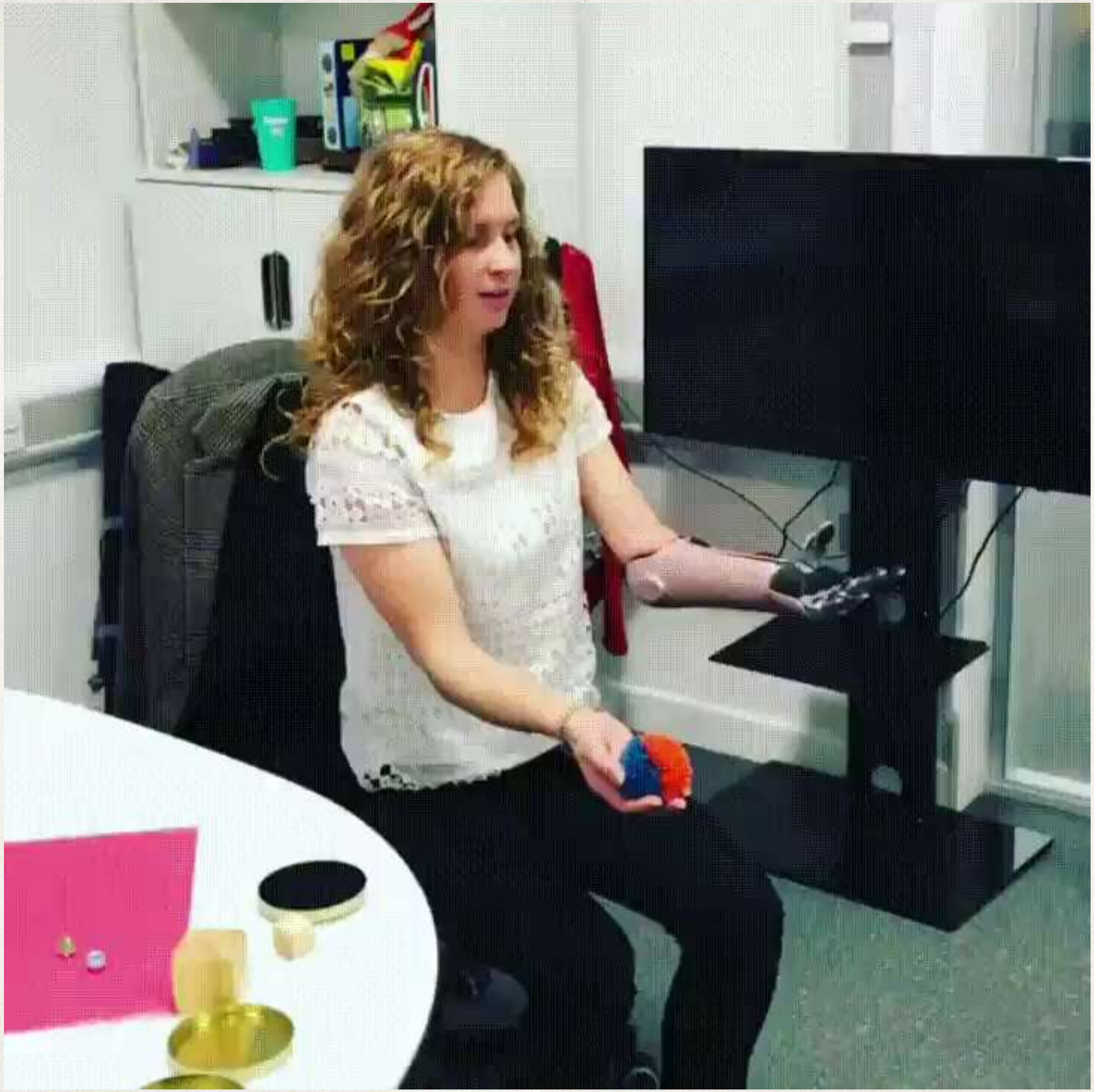
- What is it worth to the consumer and…
- If it costs way more, does it provide a proportional improvement in comfort, function, cosmesis or cool?

What does a prosthesis cost AND what do we get paid?

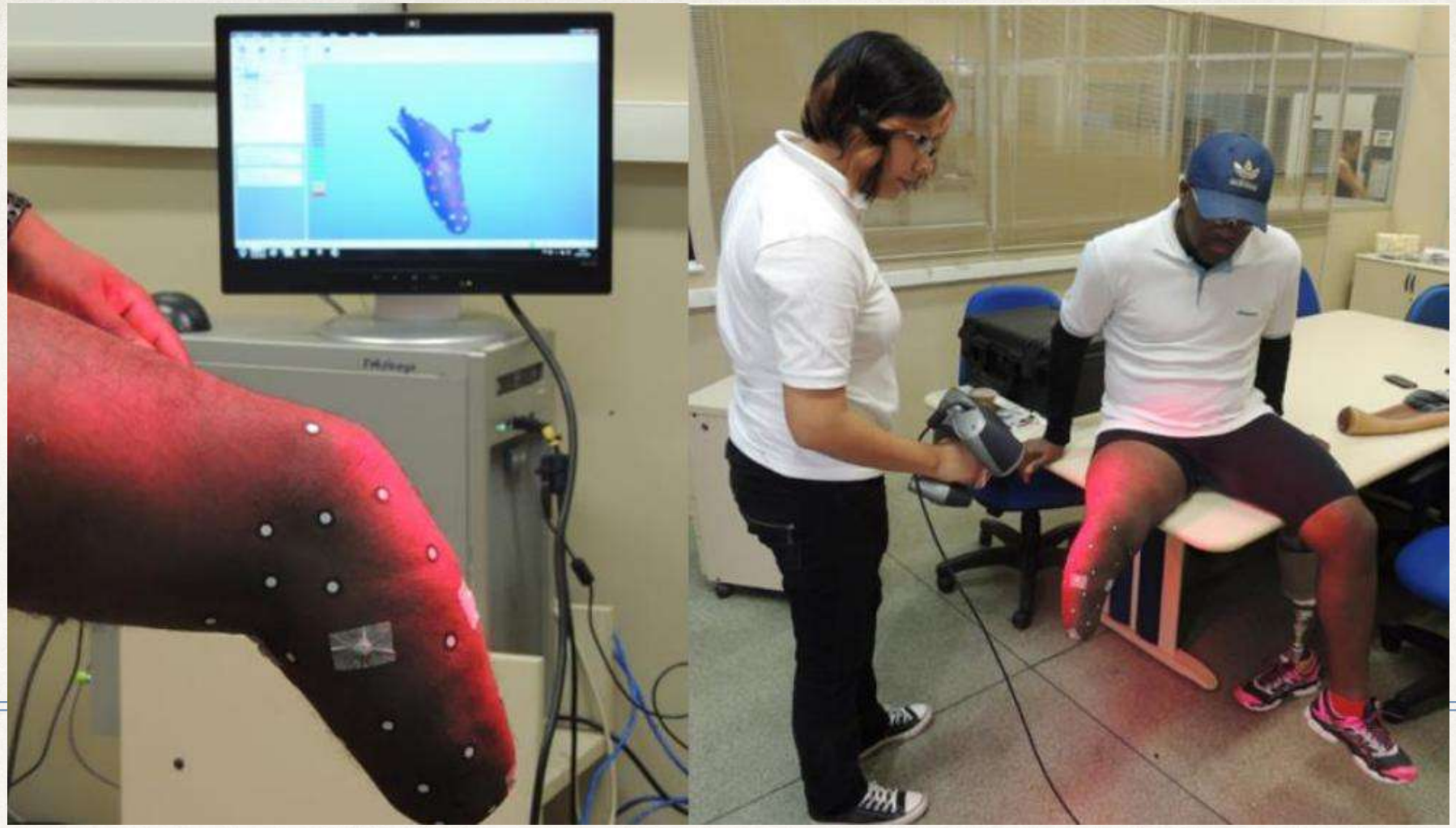
cool

“Cuz I deserve it”

bionic



Play video



I give you permission to be skeptical with your optimism

How do “things” interact with humans?

glasses

	Regular glasses	Self Adjusting
Comfort	√	
Function	√	√
Cosmesis	√	
Cost	√	
Cool		√

SECTION THREE:

- There are people everywhere that use sticks to eat, perhaps we should 3-D print them forks.

SECTION THREE:

- Just because we CAN, doesn’t mean we SHOULD


LANCERS

How is a prosthesis made?

As we have gotten significantly better and faster at building products, the challenge has shifted. The challenge today isn't building products, but uncovering what to build.

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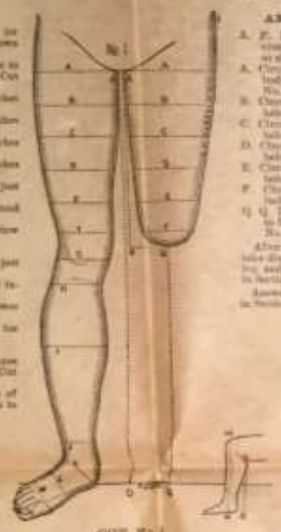
Section I. Directions for Taking Measurements and Diagrams of Single Leg Amputations (Right or Left)

ONE LEG AMPUTATED IN OR ABOVE THE KNEE

Distances and circumferences to be taken with a tape measure in the way indicated by illustrations in Section II. The figures to be placed on this cut.

SOUND LEG

A. O. Distance from body (or crotch) to floor, taken as shown in Cut No. 4.
A. Circumference of thigh close to body, taken as shown in Cut No. 5.
B. Circumference of thigh 3 inches below body.
C. Circumference of thigh 4 inches below body.
D. Circumference of thigh 6 inches below body.
E. Circumference of thigh 8 inches below body.
F. Circumference of thigh just above knee cap.
G. Circumference of knee around center of knee cap.
H. Circumference of leg just below knee cap.
I. Circumference of calf.
J. Circumference of ankle just above joint.
K. Circumference of heel and instep.
L. Circumference of foot at lower instep.
M. Circumference of foot at the joints.
N. Length of foot.
W. W. Distance from top of knee to floor, taken as shown in Cut No. 6.
X. X. Distance from under side of knee to floor, taken as shown in Cut No. 7.



CUT No. 1

AMPUTATED LEG

A. P. Distance from body (or crotch) to end of stump, taken as shown in Cut No. 6.
A. Circumference of stump close to body, taken as shown in Cut No. 8.
B. Circumference of stump 3 inches below body.
C. Circumference of stump 4 inches below body.
D. Circumference of stump 6 inches below body.
E. Circumference of stump 8 inches below body.
F. Circumference of stump 10 inches below body.
Q. Q. Distance from end of stump to floor, taken as shown in Cut No. 10.

After taking these measurements, take diagrams and profiles of sound leg and amputated leg, as shown in Section III.

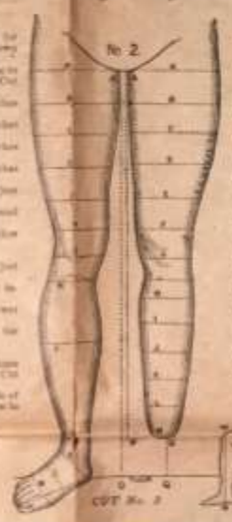
Answer all the questions asked in Section VI.

ONE LEG AMPUTATED BELOW THE KNEE, OR FOOT AMPUTATED AT THE ANKLE, OR INSTEP

Distances and circumferences to be taken with a tape measure in the way indicated by illustrations in Section II. The figures to be placed on this cut.

SOUND LEG

A. O. Distance from body (or crotch) to floor, taken as shown in Cut No. 4.
A. Circumference of thigh close to body, taken as shown in Cut No. 5.
B. Circumference of thigh 3 inches below body.
C. Circumference of thigh 4 inches below body.
D. Circumference at thigh 6 inches below body.
E. Circumference of thigh 8 inches below body.
F. Circumference of thigh just above knee cap.
G. Circumference of knee around center of knee cap.
H. Circumference of leg just below knee cap.
I. Circumference of calf.
J. Circumference of ankle just above joint.
K. Circumference of heel and instep.
L. Circumference of foot at lower instep.
M. Circumference of foot at the joints.
N. Length of foot.
W. W. Distance from top of knee to floor, taken as shown in Cut No. 6.
X. X. Distance from under side of knee to floor, taken as shown in Cut No. 7.



CUT No. 2

AMPUTATED LEG

A. P. Distance from body (or crotch) to end of stump, taken as shown in Cut No. 11.
A. Circumference close to body, taken as shown in Cut No. 12.
B. Circumference 3 inches below body.
C. Circumference 4 inches below body.
D. Circumference 6 inches below body.
E. Circumference 8 inches below body.
F. Circumference just above knee cap.
G. Circumference of knee around center of knee cap.
H. Circumference of stump just below knee cap.
H. Circumference of stump 2 inches below knee cap.
I. Circumference of stump 4 inches below knee cap.
J. Circumference of stump 6 inches below knee cap.
K. Circumference of stump 8 inches below knee cap.
L. Circumference of stump 10 inches below knee cap.
M. Circumference of stump 12 inches below knee cap.
R. Q. Distance from under side of knee to end of stump, when knee is bent at right angles as shown in Cut No. 13.
S. Q. Distance from end of stump to floor, taken as shown in Cut No. 14.

After taking these measurements, take diagrams and profiles of sound leg and amputated leg, as shown in Section III. Answer all the questions asked in Section VI.

ONE LEG AMPUTATED BELOW THE KNEE, LEAVING A VERY SHORT OR CONTRACTED STUMP, REQUIRING THE USE OF A KNEE-BEARING LEG

Distances and circumferences to be taken with a tape measure in the way indicated by illustrations in Section II. The figures to be placed on this cut.

SOUND LEG

A. O. Distance from body (or crotch) to floor, as shown in Cut No. 4.
A. Circumference of thigh close to body, as shown in Cut No. 5.
B. Circumference of thigh 3 inches below body.
C. Circumference of thigh 4 inches below body.
D. Circumference of thigh 6 inches below body.
E. Circumference of thigh 8 inches below body.
F. Circumference of thigh just above knee cap.
G. Circumference of knee around center of knee cap.
H. Circumference of leg just below knee cap.
I. Circumference of calf.
J. Circumference of ankle just above joint.
K. Circumference of heel and instep.
L. Circumference of foot at lower instep.
M. Circumference of foot at the joints.
N. Length of foot.
W. W. Distance from top of knee to floor, taken as shown in Cut No. 6.
X. X. Distance from under side of knee to floor, taken as shown in Cut No. 7.

CUT No. 3

AMPUTATED LEG

A. P. Distance from body (or crotch) to knee when bent, taken as shown in Cut No. 22.
A. Circumference close to body, taken as shown in Cut No. 23.
B. Circumference 3 inches below body.
C. Circumference 4 inches below body.
D. Circumference 6 inches below body.
E. Circumference immediately above the knee cap.
S. S. Circumference of stump between patella below knee cap.
T. S. Projection of stump back of thigh, taken as shown in Cut No. 25.
U. Lateral diameter of knee joint from inside to outside, taken with calipers as shown in Cut No. 26.
Q. Q. Distance from heel knee to floor, taken as shown in Cut No. 27.

After taking these measurements, take diagrams and profiles of sound leg and amputated leg as shown in Section III.

Answer all the questions asked in Section VI.

Section II. Illustrations Showing the Manner of Measuring

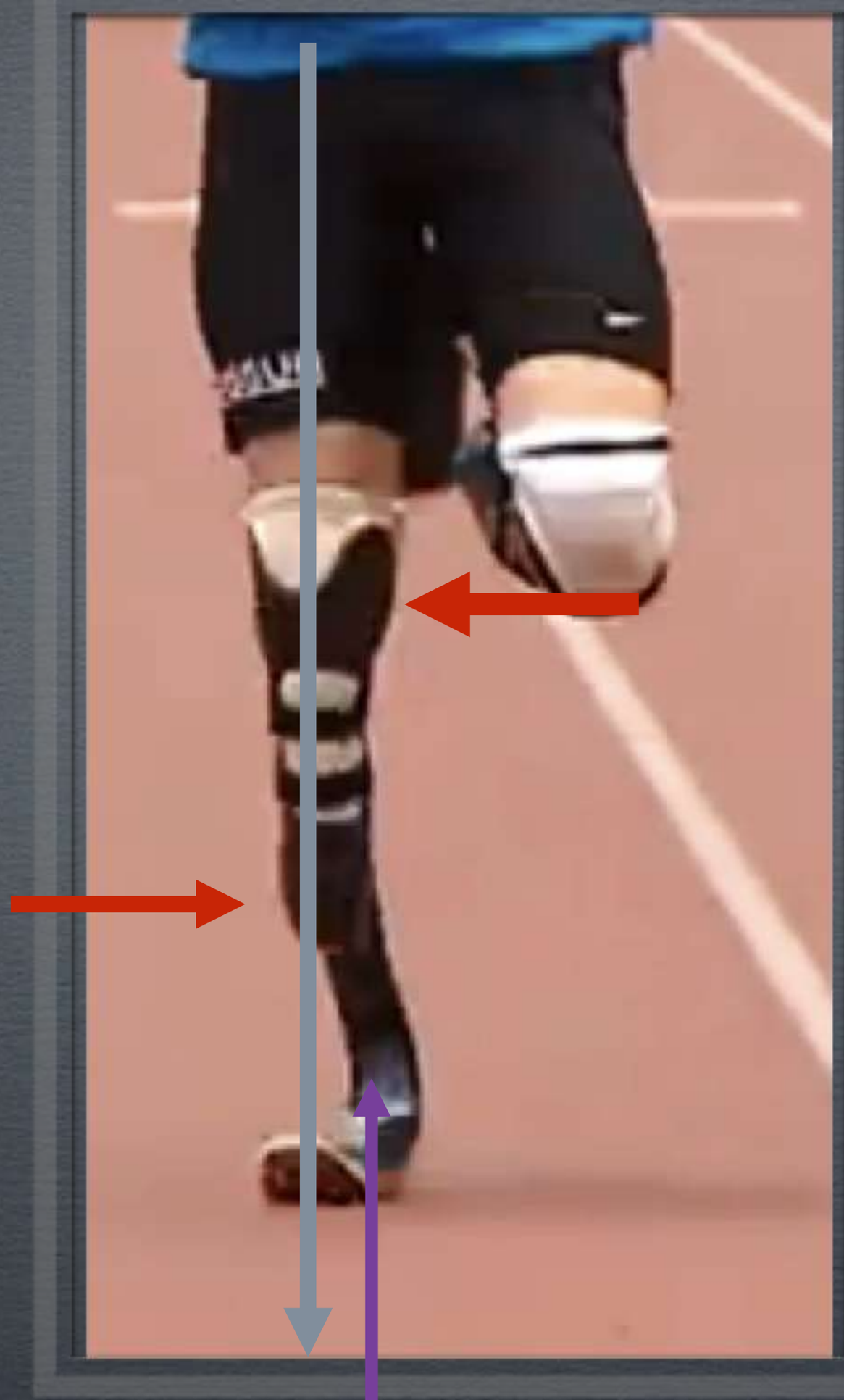

Cut No. 4 Cut No. 5 Cut No. 6 Cut No. 7 Cut No. 8 Cut No. 9 Cut No. 10 Cut No. 11 Cut No. 12 Cut No. 13 Cut No. 14 Cut No. 15 Cut No. 16 Cut No. 17

Section III. Directions for Taking Diagrams and Profiles of Single Leg Amputations




CABINET
PORTRAIT
PHOTOGRAPHED BY
OTTAWA

Total Contact / Total Surface Bearing



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.

SECTION FOUR:

I have to do what??

FDA, ISO, CE and other regulatory hurdles

The US FDA defines Class 1:

Not intended for use in supporting or sustaining life or of Substantial Importance in preventing impairment to human health, And they may not present a potential for unreasonable risk of illness or injury.

Class 1 devices

- Technical File
- Human studies
- Validation of safety and efficacy
- Human Factors Engineering

ISO- International Standards Organization

- ISO-10328
- 3m cycles
- Test to failure

CE Mark

- In order to go to “Market” in Europe
- Self Mark vs Serial number

You can’t start with the technology and try to figure out where you’re going to try to sell it.

Steve Jobs

HUMAN?


R
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Total Contact/ Total Surface Bearing

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SECTION FIVE:

- It is hard when the expectation of the patient is greater than the design can provide.


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