personal heating and cooling for people with paraplegia
body temperature regulation

Body gets cold
Person starts to shiver
Body warms up

Body gets hot
Person starts to sweat
Body cools down
Body temperature regulation

Body gets cold

Person starts to shiver

Body warms up

Body gets hot

Person starts to sweat

Body cools down
body temperature regulation

Body gets cold
Person starts to shiver
Body warms up

Body gets hot
Person starts to sweat
Body cools down
Body temperature regulation interrupted by spinal cord injury

Body gets cold
Body stays cold

Body gets hot
Body stays hot
“On a fall day most people go outside without a jacket and they come back into a heated building and they get warm again. But when I do the same thing, I stay cold for the rest of the day and will shiver through all my classes.”

-Emily Obert, MIT’11
heating & cooling
ThermAssist

Heating & Cooling

Subtle
ThermAssist

Heating & Cooling

Subtle

Safe
ThermAssist

Heating & Cooling

Subtle

Safe

Unique
User Needs

Detachable
User Needs

- Detachable

- Convenient
ThermAssist

User Needs

- Detachable
- Convenient
- Versatile
heating
heating
heating

moisture-proof vinyl
heating

insulating & reflective padding
heating

resistive wire network
safe

Pulse-Width Modulation

Sensors

Thermal Fuses
controls

24.6° C
controls

25.2° C
controls

26.9° C
controls

23.9° C
auto
power

6 hours of continuous use

12 hours of cycled use

4-5 year lifespan
cooling
cooling

- cooling pad
- cooling system
- power pack
cooling
cooling

phase change material (PCM)

water reservoir
cooling
cooling
cooling

water reservoir

phase change material (PCM)
cooling
cooling

cooling pad

[Diagram of cooling pad]
cooling

cooling pad

water reservoir
cooling

cooling pad

water reservoir

PCM reservoir

solid
cooling

cooling pad

water reservoir

liquid

PCM reservoir
cooling

cooling pad

water reservoir

liquid

PCM reservoir
cooling

cooling pad

water reservoir

PCM reservoir

liquid
market

♀ 400,000 people with spinal cord injuries
market

400,000 people with spinal cord injuries

200,000 people with paraplegia
## Competition Table

<table>
<thead>
<tr>
<th>Feature</th>
<th>TechKewl</th>
<th>Ready Heat</th>
<th>Blanketro</th>
<th>ThermAssis</th>
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<tbody>
<tr>
<td>Heating</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
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<tr>
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</table>
pricing

$1,200 selling price
pricing

$1,200 selling price

$120 material cost
pricing

$1,200 selling price

$120 material cost

$360 total cost per unit
cash flow

Net Cumulative Cash Flow Projection

Cash Flow (Millions)

2012 2013 2014 2015 2016 2017 2018
Net Cumulative Cash Flow Projection

Cash Flow (Millions)

2012 2013 2014 2015 2016 2017 2018

$3M $2M $1M $0M

$0M $1M $2M $3M

FDA
cash flow

Net Cumulative Cash Flow Projection

Breakeven in Year 4
Cash Flow

Net Cumulative Cash Flow Projection

Cash Flow (Millions)

- $1M
  $0M
  $1M
  $2M
  $3M

2012 2013 2014 2015 2016 2017 2018
ThermAssist

Heating & Cooling

Subtle

Safe

Unique
thank you

§ Instructors & Mentors

Prof. David Wallace
Matt Duplessie
Warren Seering
Jane Kokernak
Eric Statz
Eliza Eddison
Jordan Nollman
Shaohui Foong

Ilan Moyer
Melody Kuna
Josh Ramos
Dick Fenner
Bill Cormier
Joe Cronin
Jim Dudley
Steve Haberek

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Diana Elledge
Jim Cesario
Dr. Jain

Emily Obert
Colleen Rock
Spinal Cord Injury Forum
Spaulding Rehabilitation Center

§ Life Savers

Barbara Hughey
Danielle Morimoto
Cathy Wu
Tyler Thompson
Alexandre Milouchev

Michael Glombicki
Sareena Avadhany
Gail Cormier
Johanna Chong
by the numbers

<table>
<thead>
<tr>
<th>Heating</th>
<th>Cooling</th>
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<tbody>
<tr>
<td>33 W</td>
<td>7.6 W</td>
</tr>
<tr>
<td>12 V</td>
<td>12 V</td>
</tr>
<tr>
<td>2.8 A</td>
<td>1 A</td>
</tr>
<tr>
<td>Fuse trips at 60°C</td>
<td>PCM melts at 15°C</td>
</tr>
<tr>
<td>Max pad T of 41°C</td>
<td>Max pad T of 41°C</td>
</tr>
<tr>
<td>.5 lbs</td>
<td>5.75 lbs</td>
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Power 3.5 lbs
average pad?

THIS PAD IS NOT TO BE USED BY OR ON AN INVALID, A SLEEPING OR UNCONSCIOUS PERSON, A PERSON WITH POOR BLOOD CIRCULATION, A PARALYZED PERSON OR A PERSON WITH DIABETES. DO NOT USE A HEATING PAD ON AREAS OF INSENSITIVE SKIN.