Forging a New Future through Technology and Education

Rory A. Cooper, PhD

School of Health and Rehabilitation Sciences
Department of Rehabilitation Science & Technology
And
Rehabilitation Research and Development Service
“With proper training and understanding, they have overcome incredible physical disadvantages to become outstanding workers, citizens and members of their communities, proving time and again that it is not the body alone but the spirit that makes a man.”

A World to Care For: The Autobiography of
Howard A. Rusk, M.D., 1972
Empowering People w/ Disabilities

• Ensure human rights for people w/disabilities.
• Provide education and career opportunities for people w/disabilities.
• Create a brighter future.
Importance of Assistive Technology

• Ensure people receive the most appropriate AT for them within their environment.

• Provide clinicians tools and AT users with the skills needed to achieve life-goals.

• Founded on solid scientific and clinical knowledge base.
Alternative Power Sources

- **High-pressure pneumatics**
  - Water proof
  - “Infinitely” rechargeable
  - Environmentally friendly
  - Quick charging
  - No memory or charging schedule
  - Last life-time of chair
  - Piston pneumatic motors
PerMMA
Assessment of Robotic Arm Function

- Common tasks
- Real-world activities
- Tools for robots
Smart Phone Robotic Arm Interface
Even in the kitchen, where something as simple as preparing meals can be a real challenge.
Coaching Safe Behavior

<table>
<thead>
<tr>
<th>(Data from 8 subjects)</th>
<th>Baseline (n=96)</th>
<th>Intervention (n=308)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSF Usage Frequency (times/day)</td>
<td>15 ± 16</td>
<td>23 ± 22</td>
</tr>
<tr>
<td>Driving Distance (km/day)</td>
<td>1.8 ± 2.3</td>
<td>1.7 ± 2.1</td>
</tr>
<tr>
<td>Spearman’s rho</td>
<td>.322**</td>
<td>.551**</td>
</tr>
</tbody>
</table>

Smartphone-based Virtual Seating Coach
Virtual Seating Coach
Robotic Assisted Transfers

Number of subjects (y-axis) able to transfer with a certain gap (x-axis)

- Heights (in):
  - 16"+
  - 13"+
  - 10"+
  - 7"+
  - 4"+
  - 1"+

JEANNIS: "It's called Strong Arm. This device is used to transfer wheelchair users.
Robotic Assisted WC-Bed Transfers

- Early and frequent mobilization of a person is critical to maintaining or regaining health.
- Injuries are a widespread and due in large part to repeated person handling activities, including lifting, transferring, and repositioning tasks.
- Save time and minimize staff involvement and decreasing risk to caregiver and person.
Powered Mobility Research

• Provide support for mobility, seated posture.

• Promote community participation to include employment, school and family

• Become an extension of the user.
Robots for Wheeled Mobility: MEBot

Mobility Enhancement Robotic Wheelchair (MEBot)

Seat Stabilization Demonstration
Cybathlon
Participatory Action Engineering - Paradigm

User Need Identification

Story Boards

Initial User Data

Prototype Systems (Capabilities)

Product Available

Demonstration Studies (Effectiveness)

Consumer Trials (Acceptance & Cost)

Best Practice Evidence (Policy)

Insurance Coverage (if applicable)

Regulatory Approval (if applicable)

Standard of Care (if applicable)

Community Participation

Employment

Living Healthy

USER ENGAGEMENT
“Never Leave a Fallen Comrade”

**Cooper has life back on track**

By Jon Settles

High energies are in the air in town.

Nothing has stopped him in the last 30
years — not even a marathon in Vienna,
Germany, nearly three years ago.

Cooper was competing in a half-
mile relay in a wheelchair when a car
rolled into the city on July 23, 1991.

And while Cooper is quick to recall the
eventful day of the accident, he做起
for the event and the people who
just died — the past.

Cooper, a graduate of San Luis
Oblis High School, is now concerned
with the future — which he plans upon
returning to the court.

The veteran athlete is one of the nation's premier
wheelchair athletes, concentrating on
track and field.

Cooper's goal is to try to make money
through a drawing to take his team
to Honolulu, Hawaii, for the National
Wheelchair Games at the University
of Hawaii.

The Games are open only to
athletes competing.

Cooper is the current Class 3 Division
college record holder in the 1,500
meters with a time of 6:00 in the
400 and 800-meter races, displaying
potential in just about every event.

Cooper competed on the track team
of B.C.C. for two years, specializing in
the twowheeler. “I was done,” he now says of
the big injury time of 6:00 in.

Cooper said he didn’t want to get
involved in athletics after the accident.

“I think it’s critical because part of what you lost —
the physical challenges — can be overcome through
athletics,” said Cooper.

“Your physical and mental improvement comes from
the course, if you have a physical disability.
I kind of think athletics is the key to my mobility,
which is my independence. In making through
athletics, I hope other athletes
with similar disabilities
will be inspired to do the same.

Cooper said he didn’t want to use
ambulances, even immediately after the
accident, saying, “I don’t want
my injury to get out of hand.

Part of Cooper’s positive thinking may
be a result of what a Corpus Christi
newspaper printed after his accident. It
may also be a result of what his
father, a retired captain in the
Navy, taught him.

“If you don’t have a heart, but
you don’t have a leg, what Mark Ponzo
said, ‘Nothing else matters greatly
enough to be disappointed.’

Cooper’s enthusiasm for life, however,
isn’t unmounted at all.

He plans to get more involved in
wheelchair athletics, such as a participant
in the 2016 Paralympic Games in
Germany.

He said he hasn’t taken time
to get involved in athletics after the accident.

“I think more than anything, it’s
critical because part of what you
are — the physical challenges
— can be overcome through
athletics,” said Cooper.

“Your physical and mental improvement comes
from the course, if you have a physical disability.
I kind of think athletics is the key to my
mobility, which is my independence. In
making through athletics, I hope other athletes
with similar disabilities will be inspired to do
the same."

“Nothing has stopped him in the last 30
years — not even a marathon in Vienna,
Germany, nearly three years ago.

Cooper was competing in a half-
mile relay in a wheelchair when a car
rolled into the city on July 23, 1991.

And while Cooper is quick to recall the
eventful day of the accident, he做起
for the event and the people who
just died — the past.

Cooper, a graduate of San Luis
Oblis High School, is now concerned
with the future — which he plans upon
returning to the court.

The veteran athlete is one of the nation's premier
wheelchair athletes, concentrating on
track and field.

Cooper's goal is to try to make money
through a drawing to take his team
to Honolulu, Hawaii, for the National
Wheelchair Games at the University
of Hawaii.

The Games are open only to
athletes competing.

Cooper is the current Class 3 Division
college record holder in the 1,500
meters with a time of 6:00 in the
400 and 800-meter races, displaying
potential in just about every event.

Cooper competed on the track team
of B.C.C. for two years, specializing in
the twowheeler. “I was done,” he now says of
the big injury time of 6:00 in.

Cooper said he didn’t want to get
involved in athletics after the accident.

“I think it’s critical because part of what you lost —
the physical challenges — can be overcome through
athletics,” said Cooper.

“Your physical and mental improvement comes from
the course, if you have a physical disability.
I kind of think athletics is the key to my mobility,
which is my independence. In
making through athletics, I hope other athletes
with similar disabilities will be inspired to do the same.

Cooper said he didn’t want to use
ambulances, even immediately after the
accident, saying, “I don’t want
my injury to get out of hand.

Part of Cooper’s positive thinking may
be a result of what a Corpus Christi
newspaper printed after his accident. It
may also be a result of what his
father, a retired captain in the
Navy, taught him.

“If you don’t have a heart, but
you don’t have a leg, what Mark Ponzo
said, ‘Nothing else matters greatly
enough to be disappointed.’

Cooper’s enthusiasm for life, however,
isn’t unmounted at all.

He plans to get more involved in
wheelchair athletics, such as a participant
in the 2016 Paralympic Games in
Germany.

He said he hasn’t taken time
to get involved in athletics after the accident.

“I think more than anything, it’s
critical because part of what you
are — the physical challenges
— can be overcome through
athletics,” said Cooper.

“Your physical and mental improvement comes
from the course, if you have a physical disability.
I kind of think athletics is the key to my mobility,
which is my independence. In
making through athletics, I hope other athletes
with similar disabilities will be inspired to do
the same.”
Transition Assistance

Being proactive in the 21st Century
by LtCol Keith A. Forkin

These men [Marines] are in the formative period of their lives and officers owe it to them, to their parents, and to the Nation, that when discharged from the services they should be far better men physically, mentally, and morally than they were when they enlisted.

—MajGen John A. Lejeune
Marine Corps Manual of 1921
Paragraph 110.4b

The lack of a Marine Corps case management system for transition readiness is a programmatic shortfall.

Marines must meet CRS standards and have a plan for transition. (Photo by LtCol John Earnest)

Improvements to Marine Corps Transition Assistance

On 5 December 2002, then-Commandant of the Marine Corps Gen James L. Jones released an All Marine (ALMAR) message concerning shortfalls in the Marine Corps' ongoing connection with society and transition assistance for Marines. He outlined in ALMAR 008/02, the establishment of the Marine Corps' Transition Assistance Program (TAP) in order to
dress these shortfalls.

General Jones stated that:

Throughout our history, our legacy and our public reputation have been carried by the actions and example of the Mariness who have gone before us. Every year we return nearly 27,000 Marines to society as first-class citizens. These Marines continue to serve an important role in our Corps. They connect us to the society on which we depend for our support, sustenance, and future potential. They also provide an unreprased resource to provide improved transition assistance to our Nation leaving service.

He then cogently framed the problem as follows:

The lack of an organized method of capitalizing on their resources, abilities, and continued involvement has resulted in the practical loss of several generations of Marines who have assimilated back into local communities with no organized, formal mechanism for staying connected to our Marine Corps family. Although we return our transitioning Marines to society with leadership skills, Corps values, and proven abilities necessary for success, they face significant placement issues such as employment, housing, and education as they reestablish themselves in the civilian workplace.
NCOs Point The Way To Post-Army Success

By Sgt. Maj. of the Army Kenneth O. Preston
U.S. Army retired

Five soldiers with a collective 120 years of experience have some words of wisdom for NCOs transitioning to civilian life. They appeared on a panel I moderated in New York City in June 2014 to give some tips about how to prepare for a post-Army life and get attention in a competitive job market. Their discussion comes at a time when transition is on the minds of many soldiers because of the drawdown that will trim the ranks by some 60,000 people over the next three years. If you are not going anywhere, there are people in your command who might be heading to civilian life who could use your sage advice. Here are some of their thoughts.

Critical Thinking is an Asset

One thing often missing in a private business is someone comfortable with making decisions without waiting for approval of a superior, said Marc Pelak, an Iraq War veteran and director of strategic partnerships at Team Rubicon Inc., a nonprofit group that acquires veterans to respond to disasters. Having this skill makes you highly marketable.

As managers in an organization that thrives in uncertain and chaotic environments, Pelak emphasized that NCOs have the critical thinking skills and the ability to make level-headed decisions during operations without getting excited.

"NCOs are a shining example. They begin with simple things like filling gas tanks, and they learn to do this without always knowing the correct way to do it," he said. "When I was a company commander, my NCOs were always able to think through a problem and come up with a solution that worked."

"If you hire an NCO, give them clear guidance, have them understand your intent and they will carry out your duties," he said.

"NCOs are also great targets for companies seeking diversity, because the Army trains a diverse population and its leaders have experience with people from varied backgrounds. An "NCO today who has been in the military for four, six or 10 years has worked with people who come from conceptually every socioeconomic situation in the U.S. and beyond," Pelak said. "They are tremendous managers."

Never Too Early to Start

Soldiers should start preparing to leave the Army the day they join. "Transition is a process, not an event," said Master Sgt. Adam Martinez, the Northeast Region deputy director for the Soldier for Life program. "Always be prepared," he said. "While some may believe they will stay in the Army forever, you should always be preparing yourself for transition." An example is Command Sgt. Maj. Hector A. Prince, who was the top enlisted soldier at Fort Hamilton, N.Y., until he relinquished his post last July. "I've been planning for retirement for nine years," he said. Prince advocated having both short- and long-term objectives in preparing for transition and taking advantage of all the free advice the Army makes available.

"You have marketable skills, whether you spend three years in the Army or more," said Jason Cate, the director for plans, training, mobilization and security at Fort Hamilton. "Resume writing is one of those things that should start early, Martinez said. It helps to understand the value of skills as they are learned and also creates a cadre of NCOs who can teach their soldiers to write resumes. "We want you to teach your soldiers how to write resumes so they will be better prepared," he said.

Seek Help and Advice

"As you pursue your goals, you will find mentors and coaches to help you as you travel down that road," said D.Wayne Robinson, a retired Army command sergeant major who is president and chief executive officer of Student Veterans of America. A good mentor isn't always the most senior person around. "They won't necessarily be on the first rung of the ladder, but you will find them as you make your journey."

In addition to mentorship, it helps to network, Robinson said. "When we hear of networking, we think of brown-nosing and looking for handouts. I thought that way too for a long time, until I met a professor who teaches [that] the value of your network will determine your income. I never looked for a job; I looked for opportunities. I looked for big problems to solve," Robinson said.

Networking isn't a stretch for NCOs, Martinez said. "We have been networking our entire life, knowing who to contact when you need a resource," he said. The key is finding people who are the right resources for getting ahead after leaving the military.

Sgt. Maj. of the Army Kenneth O. Preston
U.S. Army Retired

Civilize Your Skill

One way to do this is to take advantage of every opportunity for credentialing, licensing and apprenticeship programs that provide evidence that a skill learned in the Army has value outside the military. "Credentialing and certification is the key to gaining this civilian recognition for the skills we gained in the Army," Robinson said.

As your separation or retirement date nears, Martinez suggested looking at post-service programs that enable you to get a head start while still in uniform. "Look into apprenticeships and educational opportunities early, so if you have an interest, you can start the application and approval process," he said.

When writing a resume or interviewing for a job, focus on the experience and skill you bring to the job, Pelak said. "Not one case has a resume jampacked, or are you really good at emailing and briefing buildings," he said.

Start a New Path

You don’t have to keep doing the same thing. "If you were a military policeman, it doesn’t mean you have to go into law enforcement," Robinson said. "You can say, ‘This is what I want to do if you are willing to pay the price.’"

The price includes a new skill through education or apprenticeships or starting at the bottom and working your way up, Robinson said, describing his own desire to work on Wall Street after retirement. "My peers would laugh at my thoughts, and that inspired me to want to achieve those goals even more."

Pick Your Spot

Identifying where you want to live is a major step in transition, Martinez said, and that involves more than just picking a garrison spot. About one-third of soldiers remain close to their final deployment station, one-third return to their family home, and one-third look for the location where they can make the most money, he said.

Finding the money takes research, Martinez said. "If you want to go to Pittsburgh, ask what is the unemployment rate, what is the average income, what jobs are available," he said.

Honest answers to those questions are available from the Bureau of Labor Statistics, which provides economic and occupational outlooks.

Be Honest

"There’s no use fooling yourself about your abilities. You should know your strengths and weaknesses, including your occupational skills and leadership qualities," Pelak said.

"The hardest thing for me during transition was selling myself," said Cate, who, like other soldiers, saw himself as being part of a mass effort. "The worst thing you can do is think what you did had no value. Put it all in there."
ELeVATE
Experiential Learning for Veterans in Assistive Technology and Engineering

- 12 Week program over Summer semester
- Focus on the transition/reintegration of US veterans
- Concentration on STEM fields

AIM
Advancing Inclusive Manufacturing

- 12 Week program with multiple cohorts/year
- Focus on transitioning to a career in manufacturing
- Weekly professional development sessions
Research lab offers job training for wounded warriors

A joint research program between VA and the University of Pittsburgh that studies wheelchairs and related technology is now helping to train disabled veterans for careers in machining.

The program is called Fabrication of Assistive Technology Program for Wounded Warriors. It’s run by the Human Engineering Research Laboratories, a collaboration between the VA Pittsburgh Healthcare System and the University of Pittsburgh School of Health and Rehabilitation Sciences.

The program is being launched this fall with the help of a $100,000 donation from Highmark Blue Cross Blue Shield.

Created by director Rory Cooper, PhD, and education and outreach project director Mary Goldberg at HERL, the program will prepare participants to pass a basic machining exam. The participants will also get on-the-job training at local companies, which could lead to permanent, full-time jobs.

To learn more about HERL, visit www.herl.pitt.edu.

1. Shop supervisor Garret Grindle shows Veteran Keniel Martinez how to smooth the burrs on a stainless steel plate.

2. Veterans (from left) Keniel Martinez, Shawn O’Donnell, Artem Lazdeckin, Gary Rethage, and Adam Benjamin Campbell listen to Garret Grindle explain how to operate a drill press.

3. Veterans Michael Malloy and Keniel Martinez watch as Grindle demonstrates a task on the drill press.

Photos by Bill George
AIM Theory to Practice
Research Experience for Veterans & Teachers (REV-T)

- Collaboration with Pitt School of Engineering & Learning Research and Dvpt Center
- Nearly 400 students/year introduced to modules
- Curriculum development & ENGR design courses
- 10 disability-themed immersion modules were provided to the teachers to be used in the classroom
- Engineering Design Competition
  - 250+ students competed from RETs’ schools
Care of the Combat Amputee

- *Care of the Combat Amputee* is an outgrowth of the Symposia and collaborative R&D.
- 1st Borden Institute Medical Textbook Series book co-edited by DoD and VA
- Washington Book Publishers awarded *Care of the Combat Amputee* first place in its Design & Effectiveness Awards competition
Attitudinal Barriers: the most difficult barrier to overcome
Things aren’t always as they appear.

"Focus on The Life That You Can Still Have - Not on The Life You Think You Could Have Had"
Paralympic Principles

• Paralympic Motto: “*Spirit in Motion*”
  
  – *Transcendence*: Courage and achievements of the athletes participating to go beyond their limitations.
  
  – *Equality*: Both a statement of fact and an aspiration, encouraging people with disabilities and of different cultures to be viewed as equal.
  
  – *Integration*: Reflects the pursuit of providing equal access to all.
2016 Paralympics

- Over 2.5 million tickets sold.
- Opening Ceremony Sold-out
- Over 170 countries
- Countries with most medals changing
- Rio partially transformed
Technology Promotes Participation
Professionalization
International Society of Wheelchair Professionals

www.Wheelchairnet.org
https://www.facebook.com/ISWPorg
@ISWPorg

http://www.who.int/phi/implementation/assistive_technology/phi_gate/en/
Turn Adversity to Advantage and Action in Accomplishment.