Testing male, female combat strength

Research into performance of men and women will guide Marine Corps' integration plans

By Gretel C. Kovach /staff/gretel-c-kovach/ 1:23 p.m. March 6, 2015

CAMP LEJEUNE, N.C. — Exactly how strong does an infantryman, or woman, need to be? The Marine Corps is finding out.

University of Pittsburgh scientists who moved into a brick building at the Marine Corps Base Camp Lejeune in North Carolina last year are studying the physiology of men and women in ground combat occupations.

At the Warrior Human Performance Research Center, staff members armed with calipers, sensors and resistance machines spent months taking baseline measurements of the 350 volunteers in an experimental task force. The Marines, including 100 women, are assigned to mixed-gender units of infantry, artillery and mechanized vehicles.

Under orders from the Pentagon, each of the armed services as well as special operations command must decide whether to integrate women into all occupations and units by the first of the year, or lobby for an exception to the new gender-neutral policy. As the deadline approaches, the question of whether women can excel in physically demanding ground-combat jobs has been central to public debate and military research.

To help the commandant reach a decision, the Marine Corps enlisted the Pittsburgh researchers to track a broad range of factors including strength, flexibility, stamina, balance, and nutrition. That data will be correlated with injury rates and performance during a three-month combat assessment at Twentynine Palms to produce a profile of desired outcomes.

"The big question is what makes a successful combat Marine, that is what our information is going to provide, physiologically speaking," said Katelyn Allison, a health fitness specialist and principal investigator of the study.

A stream of Marines cycled through the Camp Lejeune research center before the task force deployed last month for California.

In one room they sat inside an egg-shaped "Bod Pod" that measured body fat. In another full of wall-mounted cameras, they jumped over obstacles with reflective sensors taped to their bodies while a computer tracked their form and the impact absorbed by their joints.

To demonstrate endurance, the Marines ran until exhaustion on a treadmill. One morning, a 27-year-old man hoping to join Marine special operations forces jogged on an incline.
The sergeant stared at a photo of the flag-raising at Iwo Jima taped to the wall in front of him, running until his skin reddened all the way to his calves and sweat dripped off the face mask monitoring his aerobic capacity. Every few minutes, a research assistant squeezed a drop of blood from his finger to measure lactate.

On the other side of the treadmill, an athletic trainer watched screen readouts of his heart rate and the exchange of carbon dioxide and oxygen.

"Looking good, keep it up! Lots more fuel in the tank," Renee Hendershot said over the soft thump of footfalls and whirring of the treadmill.

At the stationary bike nearby, researchers measured anaerobic output and wind gate needed for sprinting. As Lance Cpl. Anthony Jordan, 24, of San Pedro, pedaled, two research associates hollered “Drive, drive, drive! You got this. Finish strong!”

Jordan let out a long gasp. The wheels rattled to a stop, and he limped away.

SCREENING

The data will reveal whether task force Marines are giving it their all during the Twentynine Palms combat assessment, and it will help the Corps establish gender-neutral entry and performance standards for physically demanding jobs.

All Marines undergo basic fitness tests twice a year, with results adjusted for gender and age. “They are an overall measure of a Marine’s physical health and fitness, not an indicator of success in a physically demanding job,” said Capt. Maureen Krebs, Marine Corps Force Integration Plan public affairs officer.

In 2012, the service created a battery of six combat proxy tests in an attempt to answer the question “Are Females Ready for the Fight?” according to results presented at the 3rd International Congress on Soldiers’ Physical Performance, which was hosted in Boston in August by the United States Army Research Institute of Environmental Medicine.

About 400 male Marines and nearly the same number of female Marines were tested on pull-ups, two weight-lifting exercises, a 120-mm tank loading drill, a 155-mm artillery round carry and a 7-foot wall-climb while wearing a fighting load of about 30 pounds.

For the 35 Marines deemed best performers, 92 percent were males and 8 percent were females, proving that some women “are physically capable of meeting the demands of closed combat occupations,” according to results of the study presented by Karen Kelly, a San Diego-based research physiologist.

The Corps decided the proxy tests were not an adequate predictor of success in ground combat jobs, which led to the establishment of the experimental ground combat task force.

Among the other services, the Army has been conducting strength tests for male and female soldiers similar to the Marine combat proxy tests. The Air Force had integrated women into all jobs outside of special operations after air combat opened to women in the mid ‘90s. The Navy recently followed suit and started assigning women to the last submarine and riverine craft communities formerly reserved for men.

In preparation to allow the first women to attempt Army Ranger school for research purposes, the Army announced in February that five women had passed the first-ever gender-integrated Ranger Training Assessment Course, a two-week pre-qualification for the special operations training.

Historically, more than half of soldiers who pass the assessment will successfully complete the Ranger course, the Army said.

Other special operations forces, including the Coronado-based command overseeing the training of all Navy SEALs, have said they have no plans to allow women into their schoolhouse on an experimental basis while related jobs remain closed to them.

Naval Special Warfare Command already has a rigorous and time-tested physical screening test for entry and a highly competitive pool of applicants performing well above minimum standards, according to the commander, Rear Adm. Brian Losey.

For example, the minimum number of pull-ups required during screening to enter SEAL training is 6, but 25 is optimum.

“We’ve been doing frogman for 50 years. The standards are high, they are validated and they are uncompromising. So we know what it takes to make a frogman,” Losey said last month during a breakfast talk to the San Diego Military Advisory Council.

Women have been serving with naval special operations teams in direct combat support for more than two decades, he noted. Now as the command considers the question of women SEALs and combatant craft crewmen, in his opinion performance is all that matters — not race, sexual orientation or gender.

“It was an irrational and emotional discussion about the integration of homosexuals. We’ve crossed that rubicon. ... Integration occurs over time. We are now at the crossing where the question is being asked of women.
“Again, I think it’s about standards and candidates. Pure and simple,” Losey said.

PRIOR RESEARCH

Much was already known about the physical capabilities of women before the services embarked on the latest round of research. On average, women are smaller, weaker, and slower than men, numerous studies have shown. This puts them at a disadvantage as combat loads have steadily increased. The average rucksack carried by troops in Iraq and Afghanistan was more than 60 pounds, twice as heavy as during the Vietnam War.

In 1994 as opportunities for women in air and naval combat expanded, Congress provided $40 million for biomedical research on military women. A landmark series of more than 130 studies in ensuing years was organized by the Defense Women’s Health Research Program at the U.S. Army Medical Research and Materiel Command. The gender-specific research affirmed that women have twice the overall injury rates as men and, among basic training recruits, roughly five times the risk of stress fractures.

On the other hand, “several important assumptions about female physiology and occupational risks were found to be astoundingly wrong,” according to a 2005 overview of the research published by Karl Friedl in the Journal of Women’s Health. Among them:

- Moderate exercise by young women did not produce changes that would lead to reproductive dysfunction, as long as they ate enough food.
- Exercise did not increase risk of amenorrhea and consequent bone mineral loss.
- Hormonal changes through the menstrual cycle were less important to acute health risks and performance than previously predicted. Women were found to tolerate G-forces in the cockpit as safely as men if their equipment was designed for normal strength and size ranges.
- Ovarian hormones did not help women perform better during rapid ascents to high altitude.

A ten-year review of Marine boot camp training at Parris Island, S.C., found that men were at much higher risk of hospitalization for exertional heat illness than women.

One of the most ambitious studies compared different weight-lifting programs for women. Researchers with Pennsylvania State University who looked into the “gender gap” in physical performance found that women who underwent six months of training focusing on explosive power and strength exercises combined with endurance conditioning could dramatically improve performance on combat tasks.

After the resistance training, researchers were surprised to find that women performed as well as the control group of untrained men on a two-mile run with 70 pounds of weight as well as repetitive boxlifting, according to the study published in 2001 in the Official Journal of the American College of Sports Medicine.

Looking at pure power and strength, men and women have stark physiological differences, “particularly of the upper body. But with military occupation performance, that is a combination of strength and endurance and the gender differences are less,” said Lt. Col. Bradley Nindl, scientific advisor with the Army Institute of Public Health and one of the study authors.

What’s more, increasing interest by women in weight-lifting and intense fitness programs like CrossFit and Insanity is pushing the parameters of peak performance. For example, the reigning female champion of the CrossFit Games maxed out at 80 pull-ups last year. The Fittest Man on Earth titleholder could only do 75 pull-ups, but he deadlifted nearly twice as much weight as her.

“Things have changed. When you see what those women can do, it’s crazy,” said Rep. Duncan D. Hunter, R-Alpine, a former Marine artillery officer who served in Iraq and Afghanistan. “Those women who do the CrossFit Games are more intense in that way than a lot of guys in the military.”

That translates into combat aggression, Hunter said: “those women are driven, motivated. They will pick stuff up and throw it and lift it and kill you.”

TASK FORCE

Col. Matthew St. Clair, commanding officer of the gender-integrated Marine task force, said he was most concerned going into the research about physical capabilities.

“Our tasks are very physically demanding. The loads that we carry are very heavy. And we carry them often,” said St. Clair, an infantry officer and 49-year-old former marathon runner.

“I thought there would be a lot of injuries, physical injuries related to the tasks that we are performing. Those injuries have been much lower than I thought.”

In the first four months of training, the task force of roughly 600 staff and volunteers reported 183 injuries. About 30 were severe enough to limit duties. Most involved prior injury and chronic pain.
During that time, the infantry company dropped eight women for medical reasons — all for hip or severe foot or leg injuries — and one woman for personal reasons. Men showed an inverse pattern, with 12 pulled for personal reasons, and one for medical, commanders said.

Back strain and other musculoskeletal injuries, not gunshots and bomb blasts, were the leading cause of medical evacuations from Iraq and Afghanistan during the recent wars. The majority of the injuries, 56 percent, stemmed from physical training, according to a study published in 2013 in The Army Medical Department Journal.

Better technique, stretching, strengthening, and avoidance of overuse can prevent most training injuries if minor strains are addressed early, medical experts say.

For example, “ankle sprains, if you don’t rehab it you are going to be more apt to sprain it again. ... Catching it early would prevent the chronic pain,” as well as lifelong problems, said Lt. Cmdr. Stephanie Elenbaum, the task force medical officer.

Sgt. Emily Gavidia, 25, of Fairfax County, Va., repeatedly injured her ankle as a high school basketball player. During boot camp training in 2008 she ignored the pain and ended up with a hairline stress fracture.

“If you roll your ankle does that mean your ankle is going to be stronger later?” she asked Yosuke Kido, as the research associate pressed a device to her ankle to measure resistance.

“Not necessarily,” Kido said.

Corinne Ruttiger, a certified athletic trainer, said “they never want to admit there’s anything wrong.”

The Marine on her exam table that day was a classic example. Sgt. Luis Martinez, 29, of Newark, N.J., ached with hip pain for weeks. The infantry squad leader sucked it up, he said, until his platoon sergeant spotted his limp and ordered him to medical.

Martinez buried his face in his arm and moaned while Ruttiger stretched his leg into the air. “Just relax. Still pain in there?” she asked, massaging his flank. “This is the stuff you’re supposed to be doing so you don’t get in this position again.”

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