

LESSONS IN RESILIENCE

In war zones and refugee camps, researchers are putting resilience interventions to the test

By Emily Underwood

In 2015, in the name of science, more than 800 teenage boys and girls in northern Jordan each allowed 100 strands of hair to be snipped from the crowns of their heads. Roughly half the teens were Syrian refugees, the other half Jordanians living in the area. The hair, molecular biologist Rana Dajani explained to the youngsters, would act as a biological diary. Chemicals embedded inside would document the teens' stress levels before and after a program designed to increase psychological resilience.

It was a unique experiment. And it was one that suited Dajani, who's based at The Hashemite University in Az-Zarqa, Jordan. Dajani looks askance at many humanitarian interventions imported from elsewhere. "I'm always skeptical of any program coming in from the outside, which says they can heal or help," she says. Half-Syrian herself—Dajani's mother is from Aleppo, her father from Palestine—she was also eager to study the physiological effects of conflict. So when medical anthropologist Catherine Panter-Brick, whom Dajani had met at Yale University in 2012, approached her about putting the resilience-boosting program to the test, she seized the opportunity.

Run by the nongovernmental organization (NGO) Mercy Corps, headquartered in Portland, Oregon, and Edinburgh, the Youth Take Initiative—or, in Arabic, Nubader program—would teach stress management and rela-

tionship skills to at-risk 11- to 18-year-olds. Nubader falls into a booming category called psychosocial support; the interventions are as diverse as play therapy, parenting courses, and mindfulness training, and they've flourished across more than a



Smoke rises from a November 2017 airstrike in Damascus carried out by the Syrian government. Since the conflict began, millions have fled the country.

dozen countries. Many aim to enhance the resilience of children affected by war and other disasters.

Finding ways to support these children has never been more urgent. Hundreds of millions of young people live in countries riven by armed conflict. Roughly 15% to 20% may develop posttraumatic stress disorder (PTSD) and other mental illnesses. Psychosocial programs, usually staffed by laypeople with various levels of training, are feasible in war zones and refugee camps in a way that specialized psychological care often is not. The question is: Do they work?

That's where the hair collection came in. Panter-Brick and Dajani hired professional hairdressers, who collected the strands while offering the teens stylish hairdos. The samples were then shipped to a lab at the University of Western Ontario in London, Canada. While the Canadian scientists ground up the strands and measured levels of the stress hormone cortisol, research assistants interviewed the teens about past traumas and current stress.

On average, the Syrian cohort reported six traumatic experiences, most commonly witnessing bombardments and having their homes forcibly searched or demolished. As Dajani listened to their harrowing stories, she wondered whether Nubader's setup, just 16 sessions of psychological coaching, had the power to deliver on the nonprofit's ambitious goal: boosting resilience by alleviat-

ing stress, strengthening relationships, and "healing the scars of conflict."

THE STUDY OF PSYCHOLOGICAL RESILIENCE has its roots in the 1970s. That's when Norman Garmezy, a developmental psychologist at the University of Minnesota in Minneapolis, began studying schoolchildren who thrived despite severe hardship, such as neighborhood violence or parents with mental illness. After Garmezy retired, his students picked up where he left off, pinpointing factors that helped these children cope. Some were environmental, such as a

A young Syrian refugee (right) who fled to Jordan listens to a teacher (left) as part of a Mercy Corps youth program.



strong bond with a parent. Others bloomed from within, such as a sense of agency or control over one's fate. One of Garmezy's students, developmental psychologist Ann Masten, coined a term for the constellation of variables that together help a child transcend bad circumstances: ordinary magic.

What began with Garmezy and the resilient children in urban Minneapolis raised an obvious question: Can resilience be taught to others who might not come by it as easily? Or, put differently, can ordinary magic be brewed for just about anyone?

Before answering that question, social scientists and psychologists had to consider what, exactly, resilience is. They have yet to agree. Some believe resilience means restoring mental health after a traumatic event. Others consider it a conscious determination to persevere under difficult circumstances. Still others describe it as a child's ability to benefit from external resources, such as a car-

ing adult. To complicate matters, humanitarian groups use the term resilience to describe any or all of these positive outcomes.

"It's quite a squishy concept," says Jon Kurtz, Mercy Corps's director for research and learning in Washington, D.C. By collaborating with Dajani and Panter-Brick, Mercy Corps hoped to get a firmer grasp on how to support and measure resilience in the Syrian and Jordanian teenagers, he says.

Despite the cacophony of definitions, most studies of resilience interventions in children ask one of two questions: Does a program promote existing mental health by helping children cope with war and displacement? Or does it prevent mental health complications for which children are now at higher risk?

Outcomes are mixed for the few resilience programs that scientists have evaluated. In 2016, an article in *Current Psychiatry Reports* reviewed data on 24 mental health and psychosocial pro-

grams conducted in nine countries, including Bosnia, Uganda, and Nepal. The researchers found that although all interventions had some positive impact on mental health, less than half met their goals. Nearly a quarter had a negative impact on an endpoint the program aimed to improve, such as symptoms of depression or PTSD. Some programs worked in one country but failed in another: Teaching emotional regulation to former child soldiers in Sierra Leone improved their social relationships, for example, whereas a similar effort for Palestinian children increased symptoms of PTSD. In a study in Nepal, being affiliated with a political movement appeared to protect mental health among former child soldiers. Yet the opposite was true among children in Bosnia, says Wietse Tol, one author of the 2016 review and a mental health researcher at Johns Hopkins University in Baltimore, Maryland.

What accounts for these inconsistent outcomes? The factors that support mental health and resilience in one situation may be useless or even harmful in another, Tol says.

To pinpoint the ideal interventions for a community, researchers need to spend time there, suggests Michael Pluess, a psychologist at Queen Mary University of London. In recent focus groups with Syrian refugee mothers in Lebanon, for example, Pluess and his colleagues found that a popular ingredient in many psychosocial programs—a concept called “internal locus of control”—was problematic among people anchored by religion. An internal locus of control is the conviction that success comes thanks to one’s own efforts, such as hard work, rather than external factors. Although often seen as supporting mental health, the concept didn’t resonate with religious parents who believe that life unfolds according to God’s will, Pluess says.

Despite the mixed results of resilience programs, Tol is heartened by the learning curve he sees. “I think the research is showing that it is possible to teach resilience” to conflict-affected children, he says.

A MEDICAL ANTHROPOLOGIST at Yale, Panter-Brick has navigated that learning curve herself, traveling extensively to study resilience. She has visited Nepal and interviewed homeless children. In Afghanistan, she probed the mental health of young people in the wake of war. Panter-Brick argues that for children, resilience has three dimensions: individual strengths, relationships with family and peers, and community support.

Nubader mainly targets the first. The program nurtures an adolescent’s resources and

skills, although it also aims to build a support network for teens by training mentors and creating community councils to consider children’s ongoing needs. Between 2014 and 2016, more than 4000 young people with mental health struggles and poor access to social services participated in similar Mercy Corps-run programs across the Middle East.

The intensive program Panter-Brick and Dajani evaluated in Jordan lasted 2 months.

“It takes guts to let someone in to evaluate your program as thoroughly as we did.”

Catherine Panter-Brick, Yale University

In it, teenagers gathered at a youth center twice a week to participate in group activities of their choosing, including soccer, sewing, and computer repair. Those activities were meant to foster social bonds and build confidence and competence. Participants also learned how chronic stress can affect the brain—for example, by impairing impulse control. Coaches practiced relationship-building skills with the teenagers, such as expressing affection and empathy.

This neuroscience-based instruction, called the Profound Stress and Attunement model, was developed by former Mercy Corps youth program director Jane MacPhail. It’s loosely based on emerging neurobiology research suggesting that social relationships can buffer the negative effects of chronic stress and trauma.

From its own before-and-after program evaluations, Mercy Corps believed that

MacPhail’s program worked. But those evaluations lacked the scientific rigor of an independently run randomized trial, which would compare the intervention with another activity or with no intervention at all. So the NGO approached Panter-Brick and Dajani for an outside assessment. “It takes guts to let someone in to evaluate your program as thoroughly as we did,” Panter-Brick says.

Accomplishing that goal meant running Nubader and testing it simultaneously. Panter-Brick and Dajani invited 817 young people living in Jordan, who had already signed up for Nubader, to participate. They included both Syrian refugees and at-risk Jordanian teens. The youths were randomly assigned to the program or to a 2-month waitlist, which served as a control group.

Dajani and Panter-Brick quickly found that their desire for rigor and clear outcomes ran up against teenage inhibitions and logistical snags. Plans for an expansive collection of biological samples, including cheek swabs for DNA, dried blood spots to test immune function, and saliva for additional cortisol levels, had to be pared back. Many teens were too embarrassed to spit into the sample vials. Saliva was also hard to freeze and transport in Jordan’s summer heat because electricity was sporadic, Panter-Brick says.

Hair could be mailed cheaply in an envelope. Still, even gathering those samples “was very tough” at first because of the tense relationship between Jordanians and the Syrian refugees they were hosting, says Natasha Shawarib, the project manager for Mercy Corps in Amman. Some refugee families feared their child’s data would be handed off to the Jordanian government, and they

NATURE’S STRATEGIES

Resilience by regeneration

Humans should envy the axolotl (pictured, right). Our powers of regeneration are limited: Broken bones knit, wounds heal, and large parts of the liver can regenerate, but that’s about it. But the axolotl—a large salamander also called the Mexican walking fish because it looks like a 20-centimeter eel with stumpy legs—can replace an entire missing limb or even its tail, which means regrowing the spinal cord, backbone, and muscles. About 30 research teams are probing how these salamanders do it. In the axolotl, they’ve found, various tissues work together to detect limb loss and coordinate regrowth. In the process, the animals reactivate the same genetic circuits that guided the formation of those structures during embryonic development, causing generalist stem cells to specialize.

Axolotls are only one of several regenerators in the animal kingdom. Flatworms called planarians are even more resilient—able to surge back after losing 90% of their bodies. One small fragment of those 2-centimeter-long aquatic worms can rejuvenate the brain, skin, gut, and all the other functional organs. Again, stem



cells are key, and a special set of genes active in muscles tells those stem cells what to do, activating growth and specialization genes in the right cells at the right time. So the planarian can rebuild itself almost from scratch, whereas the axolotl can rebuild only if the main body axis is intact. This year, researchers took another step toward detailing the molecules underlying regeneration by sequencing the genomes of those two species. The ultimate hope: One day, we’ll be able to coax injured humans to execute the same repairs. —Elizabeth Pennisi

needed reassurance that the information was purely for research, she says.

Before and immediately after the intervention, and again 11 months later, the teenagers also answered surveys about their mental health and sense of security. “To what extent do you fear for your family in your daily life?” one question asked. “To what extent do you fear or worry about losing your family’s source of income?” read another.

To lighten the mood, one of Dajani’s research assistants—a Syrian refugee herself—volunteered to paint the girls’ nails before interviews. But those nail painting sessions often ended in tears. Both the fieldworkers and the teenagers came to dread the questionnaires because talking about past traumas was so upsetting, Dajani says.

In response to the teens’ and fieldworkers’ requests, “we decided to ask the teenagers how they deal with negativity, not just remind them of it,” Dajani says. The team crafted an Arabic translation of a survey called the Child and Youth Resilience Measure, originally developed by Canadian psychologist Michael Ungar. It queried the teens about sources of resilience in their own lives by asking them to rate 12 statements such as “I am aware of my own strengths,” and “My family stands by me in difficult times,” gauging their feelings of belonging and optimism.

In the end, the scientists determined that Nubader had a positive impact—but whether it nurtured resilience depends on whom you ask. The teenagers enrolled in Nubader felt moderately safer and more secure than members of the waitlisted control group—a benefit sustained 11 months later, the team reported in *The Journal of Child Psychology and Psychiatry* in October 2017. Findings from the hair strands, too, suggested a benefit: Average cortisol levels in the intervention group dropped by a third, the researchers reported in January in *Psychoneuroendocrinology*. In a subgroup with statistically low levels of cortisol—a phenomenon linked to higher risk of PTSD—cortisol production increased by nearly 60%, a healthy sign.

Those changes aren’t dramatic. But participating in the program was clearly better than nothing, says Danny Pine, a child psychiatrist at the U.S. National Institutes of Health in Bethesda, Maryland.

Mercy Corps interpreted the findings as a win. “Now we can confidently say that our work does make a difference,” says Noura Shahed, a project coordinator at Mercy Corps in Amman. But Dajani and Panter-Brick say the reality is more nuanced: Although teens had less fear and stress, the study did not meet the scientists’ strict definition of resilience, and the program did not appear to strengthen teens’ social support, even though Mercy Corps’s inter-

nal evaluations suggested that it did.

Dajani and Panter-Brick suspect that’s because the intervention lasted just 8 weeks and largely targeted one source of resilience—individual strengths. “You could go to a great program every day, but if you go home and your family life is terrible, you’re not going to build resilience,” Dajani says. The surveys support that conclusion: Teens who scored high on the resilience measure from the start described close family ties and supportive communities, Panter-Brick says.

Resilience “isn’t simply in the child, but embedded in their family, caregivers, and community,” agrees Masten, who has noticed that same trend among children in Minnesota and elsewhere. That doesn’t mean Nubader didn’t benefit the teenagers in Jordan, Panter-Brick says. But ideally, she says, interventions should be more sweeping, reaching parents and communities, too. Mercy Corps is now doing just that through a support program for parents and caregivers that teaches them about the impacts of long-term stress on the brain, Shahed says.

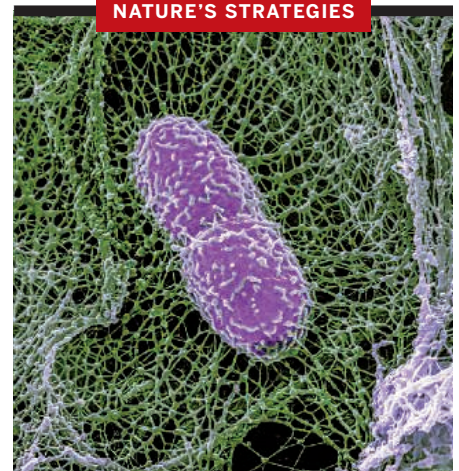
Dajani and Panter-Brick’s experiment was “important, even groundbreaking,” Pine says. The experiment wasn’t perfect, in part because the control group was just a waitlist. Comparing it with a slightly different program—for example, recreation with no educational content—would have helped the researchers identify the active ingredient of Nubader’s success. Still, Pine says, the team showed that rigorously testing humanitarian programs under trying circumstances is possible.

Other NGOs are now applying science to their resilience interventions. In Lebanon, War Child Holland, a branch of the global NGO that assists children in conflict zones, is evaluating three efforts: a life skills program, a program to reduce parents’ stress, and a World Health Organization–designed mental health intervention for Syrian refugees. War Child Holland’s ultimate goal is to find the best way to support resilience at the individual, family, and community levels all at once, says psychologist Mark Jordans, War Child Holland’s director of research and development in Amsterdam.

For Panter-Brick, one of the most valuable lessons out of Jordan came from the young people themselves. They reminded her that resilience research “is not about rescuing victims of chaos,” she says. Rather, it calls for identifying potential sources of strength that young people can draw on to survive, even thrive. “It’s about reshaping your lens on the world,” she says, “to what people feel respects their dignity.” ■

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NATURE'S STRATEGIES



Stealing genes to survive

Imagine a raging infection in the lungs of a hospitalized cancer patient. When a powerful antibiotic floods the patient’s system, the bacterium responsible, *Klebsiella pneumoniae* (pictured above), seems to be doomed. But it can deploy a resilience strategy honed over billions of years: borrowing a gene from another cell that enables the pathogen to survive.

When environments change, organisms adapt or die. *K. pneumoniae* and other bacteria have turbocharged the process of adaptation by snagging genes from elsewhere, including various bacteria and DNA molecules loose in the environment. Such horizontal gene transfers allow the bugs to gain valuable new traits, everything from the ability to thrive on cheese rinds to antibiotic resistance.

Researchers think that *K. pneumoniae* acquired its antibiotic disrupter gene, *blaKPC*, from another, still-unidentified bacterium. Bacteria outfitted with the gene churn out an enzyme that breaks down several antibiotics.

As with many resilience strategies in nature, stealing genes has its costs. Sometimes microbes incorporate harmful genes instead of helpful ones. And much like a new player on a basketball team, the protein produced from an acquired gene may not mesh with the cell’s other proteins. But unfortunately for patients, *K. pneumoniae*’s strategy works all too well: Those bugs kill between 40% and 70% of the people they infect. —Mitch Leslie

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