They Starved So That Others Be Better Fed: Remembering Ancel Keys and the Minnesota Experiment

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ABSTRACT During World War II, 36 conscientious objectors participated in a study of human starvation conducted by Ancel Keys and his colleagues at the University of Minnesota. The Minnesota Starvation Experiment, as it was later known, was a grueling study meant to gain insight into the physical and psychological effects of semistarvation and the problem of refeeding civilians who had been starved during the war. During the experiment, the participants were subjected to semistarvation in which most lost >25% of their weight, and many experienced anemia, fatigue, apathy, extreme weakness, irritability, neurological deficits, and lower extremity edema. In 2003–2004, 18 of the original 36 participants were still alive and were interviewed. Many came from the Historic Peace Churches (Mennonite, Brethren, and Quaker), and all expressed strong convictions about nonviolence and wanting to make a meaningful contribution during the war. Despite ethical issues about subjecting healthy humans to starvation, the men interviewed were unanimous in saying that they would do it all over again, even after knowing the suffering that they had experienced. After the experiment ended, many of the participants went on to rebuilding war-torn Europe, working in the ministries, diplomatic careers, and other activities related to nonviolence. J. Nutr. 135: 1347–1352, 2005.

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On November 19, 1944, 36 healthy young men entered the brick confines of the Laboratory of Physiological Hygiene at the University of Minnesota, where they were to embark on a grueling medical experiment. The men had responded to a brochure that asked: “Will You Starve That They Be Better Fed?” (1) (Fig. 1). World War II was coming to a close, and

Fig. 1 brochure that asked: “Will You Starve That They Be Better Fed?” (1)
During the study, participants were assigned to various housekeeping and administrative duties within the laboratory and were allowed to participate in university classes and activities. The participants were expected to walk 22 mi (35.4 km)/wk and expend 3009 kcal (12552 kJ)/d. The Laboratory of Physiological Hygiene, located in the South Tower of the football stadium at the University of Minnesota, also served as their dormitory. Keys referred to these windowless rooms as “our cage” (1). Extensive tests were given to the participants throughout the experiment. Body weight, size, and strength were recorded, and basic functions were tracked using X-rays, electrocardiograms, blood samples, and metabolic studies. Psychomotor and endurance tests were given as the men walked or ran on the laboratory treadmills, and participants received intelligence and personality tests from psychologists. Each man was required to keep a personal journal during the experiment.

Almost 60 years after the Minnesota Experiment, 19 of the 36 original participants were still alive and 18 were interviewed in an oral history project conducted from July 2003 through February 2004. The purpose of the project was to document how World War II conscientious objectors remember their participation in the Minnesota Experiment. The names of the participants have been published (3). A letter was sent to each participant, inviting him to take part in a tape-recorded, structured interview. After oral consent was obtained, 14 participants were interviewed in their homes or offices, and 4 were interviewed by telephone. The protocol was approved by the Institutional Review Board of the Johns Hopkins School of Medicine.

Each man was in his 80s when interviewed and each spoke passionately when discussing why he chose to be a conscientious objector. The men universally stated a simple, solid conviction not to kill another human being. For some, the conviction was borne of an upbringing in one of the Historic Peace Churches. Others were influenced by pacifist writers such as Wilfred Grenfell (1865–1940), leaders of peace fellowships, or the teachings of the Oxford Movement. Still others saw the life and work of Mahatma Gandhi (1869–1948) as a testament to the potential effectiveness of nonviolence. William Anderson put it most succinctly: “No one could make me kill anyone else.” Carlyle Frederick stressed that conscientious objection was not unpatriotic: “[Some] thought conscientious objection would be almost like being a traitor. But I was not objecting to my country as much as what my country was doing. In other words, my definition of patriotism included my refusal to kill.”

Despite their sincere belief that taking up arms was not the answer, many struggled with the desire to do something of real meaning for their country. Marshall Sutton remembered, “Our friends and colleagues in other places were putting their lives on the line, and you know, we wanted to do the same.” Samuel Legg spoke in similar terms: “So we in the CPS camps had been griping about not having what we called significant work, which very often it wasn’t. A lot of it was boondoggling... We were full of idealism... Everyone else around us is pulling down the world; we want[ed] to build it up.”

Those selected to participate in the Minnesota Experiment were a well-educated group of conscientious objectors; all had completed some college coursework, 18 had graduated, and a few had already begun graduate-level coursework. Many took advantage of the opportunity to take coursework at the University of Minnesota during the experiment, a few completing enough to obtain additional degrees. Initially, the blue pants, white shirts, and sturdy walking shoes they were issued upon arrival were all that distinguished them from other members of
the community. During the standardization period, the men
felt well-fed and full of energy. Many initially volunteered in
local settlement houses, participated in music and drama pro-
ductions in Minneapolis, and took advantage of the various
cultural activities available throughout the city. Robert
Villwock played the accordion and called square dances for
local groups, and Wesley Miller ushered for the Minneapolis
Symphony Orchestra in exchange for attending the concerts
for free.

On d 1 of semistarvation, February 12, 1945, the men sat
down to a meal that included a small bowl of farina, two slices
of toast, a dish of fried potatoes, a dish of jello, a small portion
of jam, and a small glass of milk. Although the precise nutri-
tion content of meals and the individual results from various
tests and measurements are presented in scientific detail in The
Biology of Human Starvation, the participants painted a more
vivid picture of their daily lives during the experiment. The
men ate their meals together in Shevlin Hall on the campus.
Two meals were served Monday through Saturday, at 0800 and
1800 h, and on Sunday there was one slightly larger meal
served at 1245 h. Originally, the football team also received
meals at about the same time, but the campus authorities later
announced a change in the schedule so that the players would
not be fraternizing with conscientious objectors. Participants
were supposed to lose ~2.5 lb (1.1 kg)/wk to reach the desired
25% weight reduction by the end of the semistarvation period.
The amount of food each man received at mealtimes depended
on how well he was progressing toward his weekly goal. Usu-
ally reductions and additions were made in the form of slices
of bread. Daniel Peacock remembered that emotions could run
quite high in the cafeteria when one man received even just a
little bit more food: “We were given our food along a cafeteria
line and if the guy ahead of you is given five slices of bread,
that’s pretty hard to conceal. And if you’re only getting three,
that’s pretty touchy.” He also spoke of the anxiety that ac-
companied the Friday night posting of the upcoming week’s
rations: “... every Friday late in the day ... they would post a
list of all our names and what our rations would be for the
following week ... [the] calories ... either minus or plus ...
Some of us ... we’d go off to a movie. In other words, we
delayed seeing that list; we dreaded seeing that list for fear that
it was certainly going to reduce our rations ... It’s pretty darn
certain that it’s going to be bad news because we’re supposed
to be descending.”

The men slept in a large dormitory-style room with 2 rows
of cots positioned with an aisle down the middle. Daniel
Peacock described the lack of privacy and explained how it
was in keeping with the spirit of the experiment:

The showers were all one huge line of showers. No partitions
or anything. And even the commodes were all open. There was
no privacy anywhere ... And in a way it’s just as well because
part of being a guinea pig is that they’re going to look at
everything that they can look at, touch and feel every part of
your body in one way or another, at one time or another, for
one reason or another.

After one participant broke diet and was excused from the
experiment, a buddy system was implemented that required
the men to travel in twos when outside of the Laboratory.
Jasper Garner was thankful for the buddy system for reasons of
physical practicality, as they were growing weaker by the day:
“... before the buddy system, I was in Dayton’s department
store downtown going to go in. It’s got a rotating door. I
couldn’t push it. I got stuck. Had to wait until somebody came
along. And then the other one was, you know, the library
doors. Oh you know, they’re big, and I couldn’t pull them. I
had to wait until somebody ... let me scoot in after.”

Nearly all the men remembered the walks they took with
their buddies to fulfill their weekly 22-mi (35.4-km) walking
requirement. Although some of the requirement could be met
indoors on the treadmill, many preferred to use the paths along
the banks of the Mississippi River. Jasper Garner recalled one
particular strategy for meeting the requirement: “Roscoe
Hinkle and I figured out we’d take the eleven mile walk every
Sunday night, and then we had half of our walking done, and
the rest of the week was no problem at all. In contrast to some
who suddenly on Saturday night are walking on the treadmill
for hours to get in the time.”

As semistarvation progressed, the enthusiasm of the partic-
ipants waned; the men became increasingly irritable and in-
patient with one another and began to suffer the powerful
physical effect of limited food. Carlyle Frederick remembered
“... noticing what’s wrong with everybody else, even your best
friend. Their idiosyncrasies became great big deals ... little
things that wouldn’t bother me before or after would really
make me upset.” Marshall Sutton noted, “... we were impa-
tient waiting in line if we had to ... and we’d get disturbed
with each other’s eating habits at times ... I remember going
to a friend at night and apologizing and saying, ‘Oh, I was
terrible today, and you know, let’s go to sleep with other
thoughts in our minds.’ We became, in a sense, more intro-
verted, and we had less energy. I knew where all the elevators
were in the buildings.” The men reported decreased tolerance
for cold temperatures, and requested additional blankets even
in the middle of summer. They experienced dizziness, extreme
tiredness, muscle soreness, hair loss, reduced coordination, and
ringing in their ears. Several were forced to withdraw from
their university classes because they simply didn’t have the
energy or motivation to attend and concentrate (3).

Food became an obsession for the participants. Robert
Willoughby remembered the often complex processes the men
developed for eating the little food that was provided: “... eat-
ing became a ritual ... Some people diluted their food with
water to make it seem like more. Others would put each little
bite and hold it in their mouth a long time to savor it. So
things that wouldn’t bother me before or after would really

I don’t know many other things in my life that I looked forward
to being over with any more than this experiment. And it
wasn’t so much ... because of the physical discomfort, but
because it made food the most important thing in one’s life:
... food became the one central and only thing really in one’s
life. And life is pretty dull if that’s the only thing. I mean, if
you went to a movie, you weren’t particularly interested in the
love scenes, but you noticed every time they ate and what they
ate.

Several of the men, like Max Kampelman, agreed that
nearly immediately after semistarvation began, all interest in
women and dating was lost: “I can tell you, the sex drive
disappeared. There was none.” Samuel Legg recalled that the
most poignant moment in the experiment for him was related to
an emotional reaction caused by his increasing physical
weakness and exhaustion:

I was walking along ... [with my] buddy ... it was deep into
the semistarvation, and we were tired ... we would look for
driveways when we got to a cross street ... so we wouldn’t
have to walk up one step to get from the road to the side-
walk ... And so we would walk in the gutter for awhile,
looking for a driveway. We were tired and weak. And so we
were standing at a corner waiting for a light or something, and
a kid came along on a bicycle, and he was really moving,
pumping away... And I looked at him and said, “Wow, look at that boy. He’s really whizzing.” And then I said to myself, “I know where he’s going. He’s going home for supper. And I’m not.” And then for a very brief, I hope it was brief, moment... I suddenly hated the boy... I hate at this point to tell you this, because it doesn’t speak very well for me. But I remember... with... horror that I could feel such a thing. So utterly irrational, but there it was. And you ask an experience that I remember; I sure remember that. That was rough.

The men became more noticeable around campus as they began to manifest visible signs of starvation, sunken faces and bellies, protruding ribs, and edema-swollen legs, ankles, and faces. Other problems such as anemia, neurological deficits, and skin changes became apparent. Suddenly, the story reached millions of Americans. Robert McCullagh remembered: “Well, there was a long period when nobody gave any attention to it because they didn’t even know the experiment was going on. But somewhere it broke... we were then besieged by the Minneapolis and St. Paul press. They wanted to know all about the experiment. And then out of that I think grew the contact with *Life* magazine.” The July 30, 1945 edition of *Life* magazine carried an article entitled “Men Starve in Minnesota,” with several striking photographs of the volunteers (14) (Figs. 2, 3). Local papers began tracing the progress of the human “guinea pigs” and detailing their bodily decline. Even with the increased media attention, the design and execution of the experiment remained constant. The St. Paul Dispatch reported: “... the men on the starvation diet have lost so much physically and mentally that their ambition is gone, their will to go forward is gone, and they cannot do heavy work such as farming, mining, forestry, lifting and many other types of work necessary to rebuild war-torn Europe” (15).

The Minneapolis Star-Journal described: “… one of the men was walking past a bakery and was so tempted by the rich odors wafting from the place that he rushed in and bought a dozen doughnuts. He gave them to children in the street and watched with relish as they ate them” (16). An article in *The Christian Advocate* provided details of some of the various tests administered:

A smaller treadmill can be speeded up for exhaustion tests. It is also used for psycho-motor checking while the men walk. For instance, the men try to guide a stylus through a maze without touching the sides and another device records their reaction time to signal lights. They take tapping tests to determine muscular coordination. The ataxometer measures body sway or sense of balance. Another gadget—and incidentally, many of them have been invented by experimenters here in the laboratory—will determine the angle of vision (17).

Despite the challenges of starvation, there was a determination among the men that somehow kept them committed. When each was asked if he had ever considered withdrawing, the reply was repeatedly firm and succinct: “No.” Harold Blickenstaff recalled:

I had just decided that this was what I was going to do and so I was going to do it... and so I would say walking by a bakery was like walking by a bank. It might be nice to have what’s in there, but it’s out of the question. I never debated whether or not I should break diet or do anything else.

Daniel Peacock suggested that there was a religious element in their dedication: “… the experiment kind of became our religion in a way. And we were keeping the faith with that. And that was a pretty big job. So I think it would be fair to say that during that year that experiment was almost our religion. That’s what we were dedicated to.” Marshall Sutton found a certain kind of discipline in the stress that helped him to get through the experiment: “I worked on keeping a discipline every day of some reading, and just sitting in silence, and it fitted in my state of being.” Both Max Kampleman and Roscoe...
Hinkle suggested that the relatively extensive coursework they took at the university provided them with a distraction that facilitated their commitment. Dan Miller was more succinct: “Damn it, it was will power! Don’t try to fuzz it up with something else.”

The 3-mo rehabilitation period began at the end of July 1945 and continued until October 20, 1945. With VE Day in Europe on May 8, 1945, and the Japanese surrender on August 14, 1945, the results of the experiment were becoming increasingly relevant. Several of the men, like Earl Heckman, expressed disappointment that the results were not available in a more timely manner: “We had hoped to have an effect on the world hunger situation following the war . . . but the experiment was a little late.” Although the complete monograph was not published until 1950, Keys released early results related to the most effective of the various rehabilitation diets before the experiment even ended (18,19). At a conference in Chicago in 1945, Keys noted:

> Enough food must be supplied to allow tissues destroyed during starvation to be rebuilt . . . our experiments have shown that in an adult man no appreciable rehabilitation can take place on a diet of 2000 calories (actually 2000 kcal (8368 kJ)) a day. The proper level is more like 4000 [4000 kcal (16,736 kJ)] daily for some months. The character of the rehabilitation diet is important also, but unless calories are abundant, then extra proteins, vitamins and minerals are of little value (20).

Keys also stressed the dramatic effect that starvation had on mental attitude and personality, and argued that democracy and nation building would not be possible in a population that did not have access to sufficient food. Information from the experiment was shared with various national and international organizations and the military as they worked to develop a postwar relief plan.

For some, the rehabilitation period proved the most difficult part of the experiment. Many were surprised when they initially lost additional weight after being provided a bit more food, a result of losing the excess edema fluid in their bodies. Charles Smith remembered dropping to 99 lb (45 kg), a result of losing the excess edema fluid, and the other consumed huge amounts of gum and admitted to eating scraps of food from garbage cans. Both also suffered severe psychological distress during the semistarvation period, resulting in brief stays in the psychiatric ward of the university hospital. Another participant broke diet and later suffered some urological complications that prevented his data from being included, but he was asked to stay on and help in the kitchen. Initially the participants were allowed to chew gum, but some of the men began chewing up to 40 packages/d. One of the participants was later excluded because his pattern of weight loss was not consistent with the amount of food intake and energy expenditure, and there was concern raised about excessive gum chewing.

When specifically asked to reflect on how the experiment was explained to them and how they were treated throughout, several pointed out that recruitment information for the experiment and the descriptions provided by the scientists during the selection interviews stressed the difficulty of the proposed endeavor. Max Kampilman noted:

> They explained what was going to happen. There was nothing held back. They explained that they could not assure me that there would be no permanent damage . . . They did not know what would happen. This is what they were trying to find out . . . really they emphasized the discomfort . . . this was not going to be an easy task down the road.

Most also spoke of a feeling of medical safety throughout the experiment. Robert McCullagh noted, “I knew that they were keeping track of me and that nothing was going to happen to me physically.” Charles Smith felt secure due to the: “. . . very high levels of professional responsibility . . . there was no physical threat to one’s long-term survival because you were surrounded by experts who were watching you very closely.” At times, the men seemed almost apologetic about the relative medical safety, wanting to make clear that they distinguished their hunger from that of those starving in unmonitored environments. Samuel Legg’s concluding comment related to this issue: “The difference between us and the people we were trying to serve: they probably had less food than we did. We were starving under the best possible medical conditions. And most of all, we knew the exact day on which our torture was going to end. None of that was true of people in Belgium, the Netherlands, or whatever.”

Participants remembered Keys for his professionalism, always in his white coat with notebook in hand and sparring with conversation. The men were both reassured by his presence and expressed that they felt safe in his hands. Marshall Sutton
commented that the university accepted the conscientious objectors and the project “because Ancel Keys accepted [them].” Richard Mundy suggested that perhaps Keys and the staff, upon seeing the dramatic physical effect of starvation, had more ethical concerns about the experiment than the participants themselves: “Mrs. Keys said that Dr. Keys went through terrible times during the experiment as we lost weight and became gaunt and so on. And he would come home and say, ‘What am I doing to these young men? I had no idea it was going to be this hard.’ ” Perhaps the strongest testament to Keys’ leadership is the fact that the participants agreed that if the clocks were turned back, they would again make the same decision to participate, even after having experienced the physical sacrifice required. Although, like Daniel Peacock, most of them added: “Now remember, I’d do it again if I were 24 again!”

After the Minnesota Experiment, many of the participants continued to follow their convictions about peace. Seven of the 18 interviewed participated in Heifers for Relief, a program that delivered livestock shipments to postwar Europe; the men were responsible for cleaning and caring for the animals on boat trips across the Atlantic. From 1948 to 1950, Harold Blikkenstaff worked on a transport team in Poland to bring building materials to people whose homes had been destroyed during the war, and participated in international voluntary work camps in Europe. Samuel Legg worked with the American Friends Service Committee to raise money for food to be sent to Germany, and later spent time in France and Switzerland working on various Quaker projects. Marshall Stern was elected to the Minnesota State Senate in 1948. After leaving the Senate in 1952, Marshall Stern went on to work as a community organizer in Minneapolis. He was active in the civil rights movement and worked to improve conditions for African Americans in the city. He was also involved in the Minnesota Civil Rights Coalition, which worked to end discrimination in housing and employment. Despite his various accomplishments, the men continued to look back on participation in the Minnesota Experiment as one of the most important and memorable activities in their lives. Wesley Miller reported, “It’s colored my whole life experience... [and was] one of the most important things I ever did... I’m proud of the work the Civilian Public Service did during the war.” Samuel Legg seemed to speak for all of the men when he commented, “I think probably most of us are feeling we did something good and are glad we did it, and that helps us live a better life.”

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LITERATURE CITED


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