

An Interview with **Bonnie J. Spring**

By Nelly Papalambros and Simona Morochnik

Bonnie Spring, Ph.D. is Director of the Institute for Public Health and Medicine (IPHAM) - Center for Behavior and Health. She is Professor of Preventive Medicine (Behavioral Medicine) in the Department of Psychiatry and Behavioral Sciences at Weinberg College of Arts and Sciences at Northwestern University.



Nelly Papalambros (NP): *Can you tell me a little about what type of work you do in the field of health behavior?*

Dr. Bonnie Spring (BS): The department of Preventive Medicine has many observational academologists, but I'm an interventionist. I like to produce health behavior change. Often we try to make the solution to health promotion an 'either or'. We're either going to change policies and the environment or we're going to change individuals' behaviors. But we really need to do both.

One question we address is 'whether it's all over by the time you are an adult?'. For example, if you've established bad health habits, have you done irreversible, undoable cardiovascular damage? Or can you reduce or reverse the damage by making healthy lifestyle changes? I kept saying to my Northwestern colleagues, 'look, you have these huge population studies, why can't you find people who made healthy lifestyle changes?' Many [of

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my colleagues] argued that it was unlikely that people made healthy lifestyle changes late in life; if anything they got worse. But one of the advantages of having these cohorts of thousands of people is that there's got to be some variation in behavior. Sure enough, when we broke down the data in the Coronary Artery Risk Development in Young Adults (CARDIA) study—around 25% of the people actually did improve their behavior; a third stayed the same, and the rest got worse. But that's enough of a distribution to see a dose-response association with their likelihood of having subclinical atherosclerosis. Those data suggest a couple of things: (1) even if you're

an adult and you improve your health behaviors, it's helpful and (2) there is no safe period. Just because you get to adulthood and you've been living a healthy lifestyle doesn't mean you're out of the woods. You have to keep it up. We can't just attend to the healthy lifestyle habits of kids. We have to think about our whole lifespan.

NP: *What types of behavioral interventions are you currently working on?*

BS: In some interventions, we take advantage [of the fact] that someone is in the right space to exercise. For example, we have a study in the field with college students called the *NUYou study*. This is with NU freshman and sophomores. It is a very important age group—one we’ve taken a very long time to recognize is important because the age between 15 and 25 is when people pick up a lot of their bad habits—habits they will keep for the rest of their lives. It isn’t only that you have to get through childhood [healthy], but you have to get through those college years! We have an ongoing study where we try to prevent people from picking up health risk behaviors: smoking, becoming physically inactive, developing a poor quality diet, or weight gain. Other behaviors we’re trying to preserve are sun protection, safe sex, vehicular safety and hydration. Physical activity in particular falls off pretty quickly in college. We can prompt people with suggestions about when they can get in physical activity. It helps to know that they’re not in class and that they might be near a gym or that the weather outside is nice. So the technology is pulling from their calendar and GPS to let us know, are you available now? We’ll leave you alone if you’re in class...(if you’re really in class!)

NP: *This is great because they’re not kids anymore, but potentially still malleable.*

BS: And they’re still healthy! What our focus groups told us was pretty spooky. We can see this is the age when you are losing 28% of your cardiovascular health. We think students should be worried about this, but it’s very clear it’s just not on their minds. They care about academic success, about future professional success, about saving the world, and about having a big impact on public welfare. The things that they tell us are important to them are reasonable, but not to the exclusion of their long-term health.

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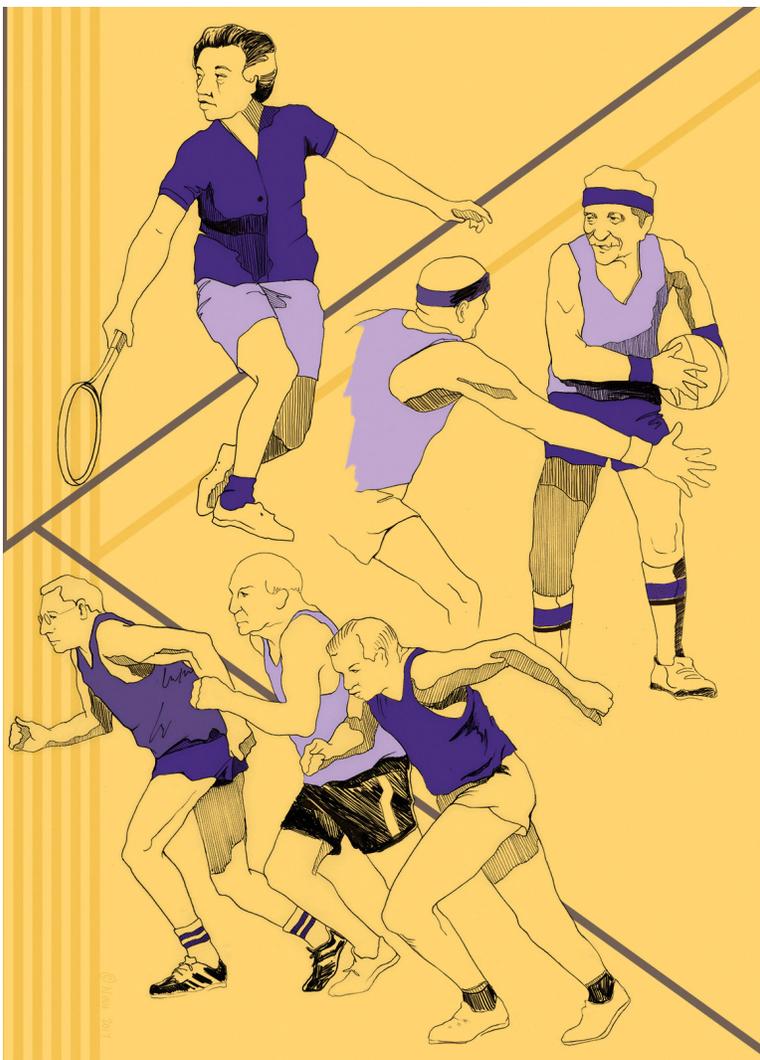
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We had to learn to frame their health in ways that align with what they value, what they care about. We are having them assess their health behaviors, stress, and cognitive function on an app so that they can track how their behaviors impact their stress and cognitive performance. They can actually see that when they’re living a little healthier there are benefits that they care about.

NP: *This type of self-tracking intervention is great, because you can see what you’re doing now has immediate consequences now, rather than 30 years from now. Do you have any projects focused on nutrition or weight management? There is a lot of information out there (some contradictory) about nutrition. It can be overwhelming.*

BS: It is overwhelming! I think that is part of the reason why healthy eating is the worst behavior from a public health standpoint. Less than 2% of the population is adherent to nutritional guidelines. In part, it is because of the complexity [of the knowledge] needed to eat healthy. There’s got to be some way to simplify and make healthy eating accessible and feasible for people.

In our research group, we do interventions in diet, physical activity, smoking, and weight loss. We work with the most prevalent health risk behaviors, with people who are eating too much saturated fat and not enough fruits and vegetables, who are not getting enough moderate physical activity or getting too much sedentary time.



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What's interesting about these behaviors is they fall into two types. One type of behavior has a low rate problem—it's a healthy behavior that doesn't occur often enough (like fruit and vegetable intake or physical activity). The other type is an unhealthy behavior that happens too much which means that the interventions are sort of opposite. So it's been interesting to ask questions like 'is it easier to increase something (give me something to do) or is it easier to cut something down?' The answer seems to be it's a mix. Having people increase fruits and vegetables is wonderful. Almost everybody can do it and it's very reinforcing.

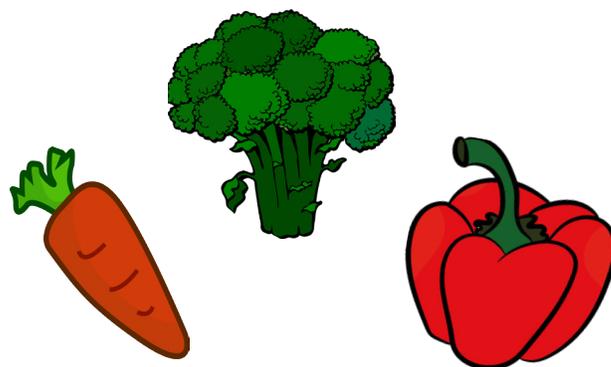
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On the other hand getting someone to increase their physical activity is much tougher. There, it's much easier to have them cut down their sedentary time. So we look at these tradeoffs. Basically, the problem we are trying to resolve is: if you deal with the basic reality that most people have more than one bad health habit, how do you manage to maximize the healthy change across the board, on multiple behaviors? Usually, we will use an intervention to try to change at least two of them with the least burden. For example, if we can get people to increase their fruit and vegetable intake, it crowds out and cuts down their saturated fat without them having to think about it.

NP: *I can see why it's challenging. There are plenty of interventions I've seen that tackle just one issue, but two at a time, yikes!*

BS: That's precisely the challenge with these studies of multiple health behavior changes. We can get people to be more physically active and increase their fruits and vegetables but...*whispers* they're not going to lose weight! Or we can get them to lose weight by cutting down their saturated fat and increasing their physical activity, but they won't maintain it.

How to maximize the portfolio of health behaviors is a tricky [problem]. So far, we've gone about health behavior change by using treatment packages that include bundles of treatment components such as 16-45 in-person group sessions, telephone coaching, text messages, tracking technologies, perhaps financial incentives. Treatment works but it's really burdensome and expensive. We don't know which treatment components are really essential and whether some could be removed to make intervention less expensive and demanding.





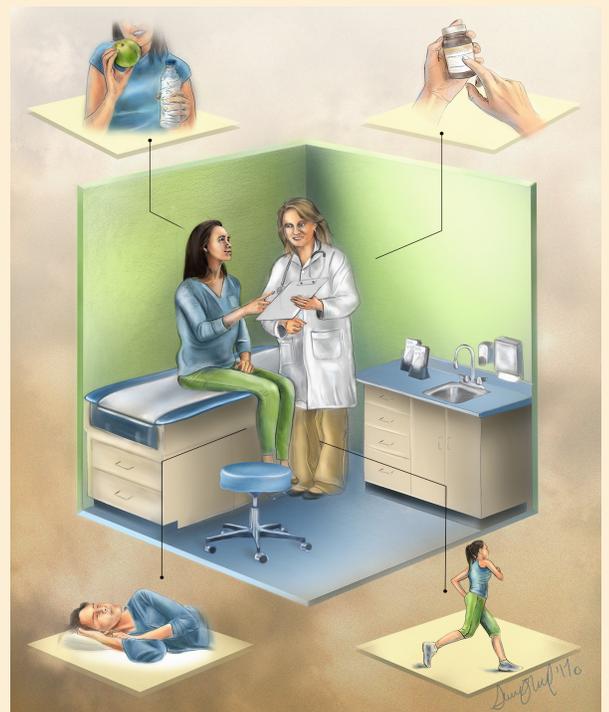
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The research methods that I'm heavily into now try to learn how to optimize interventions and make them more efficient—both in terms of the burden they place on people and their resource utilization. All the studies we have now are coming out of that framework. For example, we have a weight loss study that is literally turning on, and off, different components in the kitchen sink of behavioral interventions to see which have an impact on weight change. People either get 12 sessions or 24; they get feedback sent to their primary care doctor or not; they get meal replacement recommendations or not; they get text messages or not; their buddy gets supportiveness training or not. Each component will have a certain effect size and a certain cost and we will reverse engineer the maximum amount of weight loss that we can get for the least cost. This way, we'll assemble the leanest and meanest intervention package we can before testing it in a clinical trial. In the old days, we'd throw the kitchen sink of components into the intervention to be sure to have an effect. But the intervention would be so unweidly and burdensome that it just sat on the shelf. No one used it.

Another kind of problem we deal with is the fact that one size doesn't fit all. We know that. But we don't have treatment algorithms that tell us who needs what or what to do when the treatment is not working. Our other trials assess what treatment is the best first step, what to try next if it doesn't work, how much to step up, when to step down, by how much.

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NP: *This technique goes along with the personalized medicine approach, what everyone hopes is the future. Is there anything else you feel is important to discuss in terms of the future of medical sensing?*

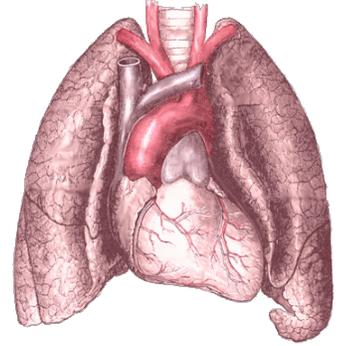
BS: I think you picked right up on this when you talked about the fact that we've got all this continuous big data. The other thing that's changing in this space is that sensors are getting better and better, they're getting smaller and smaller, more wearable. Rather than a chest strap, very soon you'll probably be able to get a wristband, and then probably a little flexible tattoo. This is what we should expect to continue to progress in the future.

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NP: *Exactly how are you using these sensing technologies in the field right now?*

BS: We know that stress causes all kinds of unhealthy habits such as smoking. So you might think that tells you that whenever somebody's getting stressed you should reach out to help them. But I'll tell you what happens to me if I'm stressed and you're reaching out to help me: I'll scream! So we are doing these trials now to try to sense when someone is stressed and when they're not stressed and determine the optimum time to put out an intervention, even if the intervention is something non-intrusive like opening a relaxation app on your phone. These are the kinds of questions that we can now ask, balancing the sensing of when they're vulnerable (which is when they're stressed) and when they're most receptive to being able to benefit from help.

There is a wearable device called an “Auto Sense” chest strap, which senses electrocardiogram signals and respiration. It pulls thousands of signals every minute, while we run an algorithm on the phone in real time to decide “is this a stressed minute or is this a non-stressed minute”? The algorithm learned what stress looks like from laboratory studies in which we had people descend their arm in a bucket of ice water. To tell if a person's Autosense data matched the stress pattern, it used to be that we'd have to send the data to the cloud to process, which meant that by the time we figured out what was going on, it was too late to intervene. But now, we can do data analysis on the phone in real time.



NP: *Socioeconomic and demographic-wise, how do you get to the people that might need intervention the most?*

BS: This is a really important question. It is the digital divide question. We were very worried about it at the outset. We used to gauge the digital divide by disparities in household broadband internet connectivity. There are massive disparities in that globally and in the U.S. But low broadband access has led to the rise in mobile phone use, particularly among the underserved. Low income populations have always been ahead of the more affluent Caucasian sector in mobile use. It leads to the phenomenon called “smart phone dependence” where you've got a large swatch of the population whose



smart phone is their access to the internet. [Mobile] technology has actually been a way to leapfrog over a lot of digital divide issues. You've got a place like Africa where 29% of their roads are paved and 25% of their population has electricity but 80% have a mobile phone. You have the infrastructure built already, and health promotion interventions can capitalize on this.

NP: *In your experience, are certain interventions more effective in certain populations?*

BS: Technology is new to all of us so we tend to focus on it and we think of it as the thing that's doing the work. But my view is that these widgets are simply new channels, giving us more information about people and real-time ways to reach them. The things that are doing the intervention work are the same evidence-based behavior change principles that we have always used: things like feedback; it is potent and you can get it in real time when it's coming from an app, things like tracking your own behavior, social support, and reinforcement. Those are effective change mechanisms that can be delivered in new engaging ways on an app.

Technology is continually changing so the art of optimizing a technology for new generations is really the art of trying to skate to where the puck is going to be.

A long time ago we learned you do best by giving people whatever channel they are accustomed to using.

We used to do everything in person face to face, but some people want their contact to come by telephone, others over email, other others via text. You tailor for whatever the person wants.

Another thing that changes over time is the optimal density of messaging—the pace of communication. Text messaging interventions are being widely used now. But

we can't give as many text messages now as we used to when we first started to do these interventions because people are more overloaded, particularly young people. It's sort of like when email first appeared, it was just wonderful because only the people you wanted to communicate with [were on it] but now everybody's on it! And the channels do that, they become saturated and the new generations always hit that saturation point first and go looking for another channel. I think we're striking a balance between trying to sense when people need help and also trying to sense when they're receptive to it, so that we're not going to overburden them and get shut out. With sensor technologies, we are coming closer to being able to do this.

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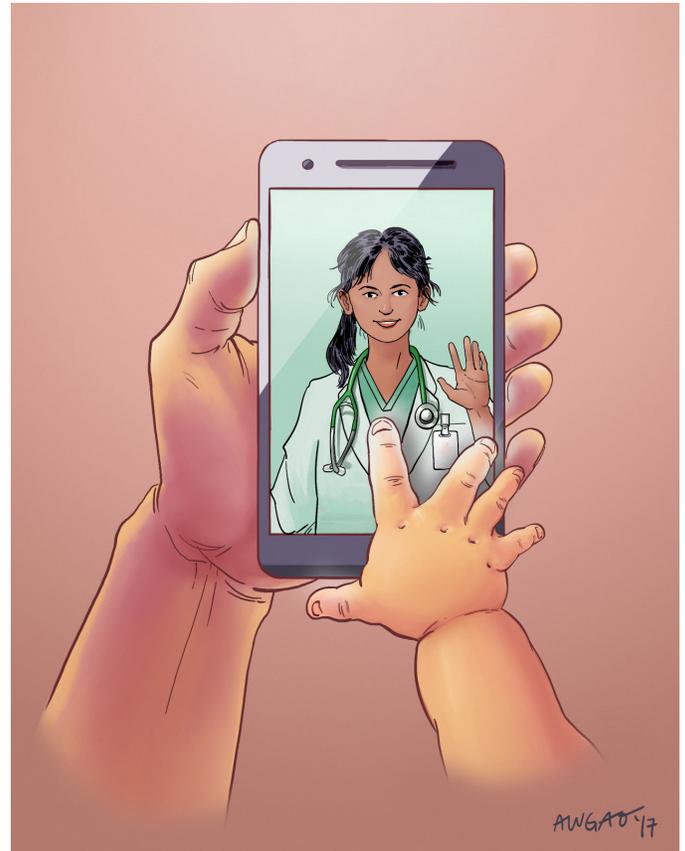
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NP: *What kind of health behavior studies do you do with older populations? Do you employ technologies in these studies?*

BS: We have a fair amount of collaboration with people that are working on healthy lifestyle changes for older adults, particularly collaborations with Dr. Mary McDermott, who does exercise interventions with frail elderly. We do use technologies in that study. Actually, our very first study with a mobile health technology was in an older population. I wanted to do that study because I wasn't convinced that older people could master these technologies with tiny screen sizes. Could they even see it, let alone use it? We did the study when palm pilots—do you remember those?—they were cutting edge. We were working at the VA with older adults not one of whom had ever used a palm pilot. They were in their 60s and needed help with weight loss. I come from the perspective of being a psychologist so I'd like to help everybody in a 50 minute therapy [session], but that's just not realistic from a public health perspective. For something like making food choices, this [hand held technology] is decision support you can carry around with you. You can look up nutritional information or track how many calories you consumed. The advantage of these technologies is they can be with you all the time when the therapist isn't there.

Before doing the study, we created focus groups. I will never forget giving them the technology, and watching them try to use it. We were really unsure how well this would go, but it worked great! We learned a couple of really important things. You may be too young to remember when this was really an issue, but when technologies were first coming online they were new to all of us! With technologies, a lot of times you can't get them to work. We found the main differentiator between generations is that young folks—you keep trying stuff! Eventually you get something to work. Older generations are afraid something is going to break. We learned we would never let somebody go home with a technology until we had sat with them, let them play with it, get them into trouble a few times, help them get out, watch them so they would learn that it didn't break, and that they should try things. At the end of the day if it wouldn't work they could call us and it was crucial to have warm tech support on the other end of the phone. Because the worst thing is if you've got somebody who's a little freaked out by technology, and then they're calling somebody

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who's mean to them or saying something complicated; they're just going to give up. And if we [had warm tech support], it worked fine. In fact, the group that had that technology in that study did better than the people who were recording on paper and pencil. So our very first study was a technology we used for older people and we got great results. They loved it and now we are using more technologies with older participants. For example, [senior citizens are] using fitbits and uploading their data onto tablets. They love the feedback. And they love that they're wearing the same thing their grandkids are wearing.