



**Presidential Commission**  
*for the Study of Bioethical Issues*

## **TRANSCRIPT**

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DR. GUTMANN: May I ask everybody to please take his or her seat? Appreciate it. We're going to get started.

Good morning. I am Amy Gutmann. I am President of the University of Pennsylvania, and I'm Chair of the Presidential Commission for the Study of Bioethical Issues. And on behalf of myself and our Vice-Chair Jim Wagner, who is the President of Emory University, I would like to welcome you to our 18th meeting.

I want to begin by recognize the presence of our designated federal official, Bioethics Commission Executive Director Lisa Lee. Lisa, please stand up so that --

Lisa makes our meeting official.

And I would also like to ask our Commission Members to go around and introduce themselves, beginning with Nelson Michael.

DR. MICHAEL: I'm Nelson Michael. I direct the U.S. Military HIV Research Program at the Walter Reed Army Institute of Research.

DR. ATKINSON: Hi. I'm Barbara Atkinson. I'm the Planning Dean for the School of Medicine at the University of Nevada in Las Vegas.

DR. HAUSER: Stephen Hauser, I'm Chair of Neurology at the University of California, San Francisco.

DR. WAGNER: Go ahead, Raj.

DR. KUCHERLAPATI: Raju Kucherlapati, Genetics and Medicine at Harvard Medical School.

DR. GRADY: Christine Grady from the Department of Bioethics at the NIH Clinical Center.

DR. ARRAS: And John Arras. I teach Bioethics and Philosophy at the University of Virginia.

DR. GUTMANN: And Nita Farahany will be here in a few minutes. She is Professor of Law at Duke University.

So during this meeting, we are going to continue our work in response to the President's charge to review the ethical issues associated with neuroscience research and the application of neuroscience research findings.

Through our discussion and deliberations to date, we focused on several specific topics, because of their heightened relief in the neuroscience context. And because of the complex ethical issues they raise. We will explore a number of these topics in depth today.

They include cognitive enhancement, direct-to-consumer neurotechnology, clinical innovation through neuroscience research and capacity to consent to research.

We have a full agenda. In each case, for example, in cognitive enhancement, we are really asking, "What are the open ethical issues there?" (sic)

And before we begin, I want to turn our attention very briefly to what's next for this Commission. I'm pleased to announce that we'll begin work on a new project in the coming months, and it is a report that will integrate the two overarching themes of our work, education and deliberation about bioethics.

We believe that there is a virtuous circle between education, bioethics, understanding in society, and public deliberation. And we have, as a Commission, tried to focus heavily on opening up deliberations publicly, but also on trying to translate our work into education at different levels.

So we will do a report on the importance of education, both for informed deliberation and the importance of deliberation enhancing education about bioethics. And I think it is not an exaggeration to say that there is a dire need in our society, as well as globally, for more education in both science and ethics. And in particular, our focus is how important it is for science and ethics to come together.

So we are well-positioned to make an important contribution in this area. And I look forward to working with all of you on it.

Now, returning to today's meeting, I would like to take a moment to explain how

we take public comments at the registration table. And all -- and in the hands of all of our Commission Member staff -- would staff please stand up? There are cards, which you are welcome to -- anybody who would like to ask a question, just ask for a card or take one and have it on hand. Write your question on the card, write your name on it. Lisa or a staff member will pass it up to us and time permitting we will read the question and engage in an answer to it.

If time doesn't permit, we take all the questions and we actually read them and get back to you on them. So thank you in advance for participating in our discussion.

And Jim, would you like to say a few words of introduction?

DR. WAGNER: Only -- excuse me. Only to add my welcome to the Commissioners. Thanks to the staff. It's the staff that assembles this terrific slate of presenters. Thanks to presenters, as well.

We are covering -- we are crammed this day, and so I think I should say nothing more than thank you all, welcome, look forward to getting to work.

## SESSION 1: ETHICAL CONSIDERATIONS

### IN COGNITIVE ENHANCEMENT

DR. GUTMANN: So Jim and I will alternate in moderating sessions. And our first panel will focus on ethical considerations in cognitive enhancement. And as with all our meetings, each panel speaker presents for 10 minutes. And once we've heard the panel, I will open up the session for questions and discussions. And I assure our panel members that they will have more time.

We leave it to 10 minutes because so much of what our presenters contribute comes out in the question and answer period, and enables us really to focus on what's going to be most helpful to our report.

So we begin with Dr. Peter Reiner. Dr. Reiner is Professor and Co-Founder of the National Core for Neuroethics, and a member of the Department of Psychiatry and Brain

Research Centre at the University of British Columbia.

Dr. Reiner's scholarship focuses on public attitudes towards cognitive enhancement, and the impact of emerging neuro essentialist thought on modern society.

And previously, Dr. Reiner was President and CEO of Active Past Pharmaceuticals, which is a drug discovery company that he founded.

Welcome.

DR. REINER: Thank you very much. And I want to thank the Commission for inviting me. It's a real honor to be here and give me a chance to talk to you about cognitive enhancement.

So in my talk today, I'm not going to advocate for or against the use of cognitive enhancement, but rather in particular for the inclusion of public attitudes in the debate. And this is a point already raised by the President in his transmittal letter, and by the Commission in the Gray Matters Report.

A good place to start really is the much-maligned distinction between therapy and enhancement. And some people have suggested that there's really no moral difference between the two. And there is some merit to those arguments, as least as far as the kind of rigorous thinking that goes on in the Ivory Tower.

But what Laura Cabrera and Nick Fitz and I wanted to do was see if we could use empirical tools to explore what the public thought about the relevant issues. And we wanted to do so in the subtlest way possible. So rather than exploring a big distinction like therapy and enhancement, we explored a smaller distinction between what we call enhancement above the norm and enhancement to the norm.

So for example, if I were a shy person, okay, I'm kind of a shy person, I might take an SSRI to counter my modest social phobia, although I haven't. Even though I have no actual disease. And so that would be enhancement to the norm.

Now, we used the technique called contrastive vignettes. And in this, one group

of about 100 people were shown a vignette. The full vignette is quite a bit more detailed than what I'm showing you here.

But to summarize, it tells a story about a healthy man who has modest challenges being sociable. He goes to the doctor and he gets a pill that makes him more sociable. And I think you can see right away how this describes enhancement towards the norm.

Now, a separate group of 100 people saw the exact same vignette, with one small change; now the individual has no challenges being sociable, and so this is enhancement above the norm.

And then everyone was asked the same question, how comfortable are you with John taking the pill? And people answered on a 100 point scale from zero to 100, and you can see that people were considerably more comfortable with enhancing towards the norm, versus enhancing above the norm.

And this was the case not just with shyness, which is what I'm showing you here, but with each of the 12 cognitive social and affective domains that Laura examined in her study.

So one plausible interpretation of this is that actually the public are acting as, sort of, natural philosophers, applying the logic of Nussbaum and Sen's capabilities approach to the issue, endorsing the use of enhancement more strongly for those members of society who are less able.

So while there may be no biomedical distinction between enhancement to the norm and enhancement above the norm, there does appear to be a moral difference.

Now, let's move on to another situation. So it's widely reported that students enhance -- but I -- actually I want to turn your attention to -- for a moment to cognitive enhancement in the workplace, which is probably going to be an emerging issue.

And in a study published recently in Neuroethics, Nick Fitz, Roland Adler, and other members of my team used the exact same experimental approach, but this time we

compared people who enhanced and achieved superior results, with those who did not enhance and didn't achieve the same results. And we asked how worthy the individual was of promotion, and you can see right away that people who enhanced were deemed more worthy of promotion.

And so sometimes the public is more or less consequentialist; rewarding people for their success, irrespective of whether they're enhancing or not.

And I think that implicitly the public recognizes that people who enhance are aligning their performance with what's commonly known as the Protestant Work Ethic. They're taking shortcuts to success, no question about that, but they're doing so actually for reasons that are quite difficult to critique.

So up to now we've been discussing pharmacological cognitive enhancement. And although I haven't mentioned it specifically, probably everyone in the room has been thinking about prescription psychostimulants, like Ritalin and Adderall. They're widely reported to be used for enhancement purposes, particularly on college campuses. There's lots of debate about it, so I won't go over what's probably familiar territory for many.

But I really do want to draw the Commission's attention to the fact that fully a third of physicians report getting requests for enhancement each week. Some kind of enhancement, not necessarily cognitive. But the only policy guidance that they have been given is that they have neither a moral nor legal obligation to prescribe the enhancements. Nor a moral or legal prohibition against prescribing enhancements.

So what that does is it leaves the physicians to decide for themselves. But physicians don't have the kind of training that they need to make those decisions. And they've already expressed their ambivalence about being the gatekeepers for this issue.

And the reason that they're stuck with this job is because we, as a society, actually have no coherent policy on prescribing cognitive enhancement. And I think this is really what needs to change. And it's probably no surprise to you at this point, I think that

including the public in the deliberations is critical.

And I don't mean that we need to slavishly follow public opinion. I don't think that's the way to develop policy, but rather that policies that are more or less aligned with public mores tend to work better than those that are going to divide -- diverge too sharply from them. Irrespective of any sort of rational arguments that we can make that cognitive enhancement should or shouldn't happen. So perhaps not always, but at least in this instance, I think there's considerable wisdom in those crafts.

So now, let's move from drugs on to devices. And there's certainly some worry about smartphones, but it's mostly focused on the possibility that they might be degrading our attention, rather than the many ways in which they actually function as extensions of our cognitive toolkit.

We have instant access to Wikipedia. You can do complex math calculations on your smartphone. Lots of things. But they're really information devices. So as information devices, they're cognitive enhancers, but frankly uncontroversially so.

What's looming on the horizon, though, and very near horizon, is that these very same devices will begin to make decisions for us. And when they begin to make decisions a whole new set of issues come to the fore, particularly issues around our autonomy as human beings.

But really the most intriguing device in the cognitive enhancement toolkit, of course, is transcranial direct current stimulation or TDCS. These devices put a small amount of current through the skull and -- which enters the brain. And if the early data hold up, they're able to enhance a variety of cognitive functions, from working memory to math ability, to even creativity.

They're already available as direct-to-consumer products, something I think we'll be discussing later, such as the one that's pictured here that's marketed to enhance gaming abilities. I purchased one. No problem having it delivered to my address. It doesn't come

from within the U.S. or Canada.

But more importantly, do-it-yourself enthusiasts can build their own devices for easily less than \$50 in an afternoon.

FDA regulation of home use of TDCS is non-existent. And again, this is a problem that really merits a remedy.

So it's also likely that as this field matures, though, these devices will be marketed together with validated brain fitness software in a complete package, so that the software for the cognitive exercises and the placement of electrodes are carefully designed; all of this working with the software controlling duration, frequency, amplitude of the current. And because of the flexibility of this technology, where you put the electrodes determines a fair bit, but also the exercises that you do determines quite a bit.

Some people are suggesting that it may outstrip pharmacological strategies for cognitive enhancement, and I think that's possible, assuming of course that it actually works.

Now, I want to leave you with what may be the most challenging of the technologies that are on the horizon. So the cognitive genomics project at Beijing Genomics Institute, one of the largest sequencing facilities in the world, has as its goal to sequence genomes of highly intelligent people. They're using people with extreme math and engineering ability and identify gene variants that are overexpressed.

Ostensibly with --

DR. GUTMANN: So Shakespeare wouldn't make it on there?

DR. REINER: No, Shakespeare would not make it on this particular list. But if you win the field medal you do.

DR. GUTMANN: You just got 15 more seconds.

DR. REINER: Okay, great.

(Laughter.)

DR. REINER: But leaders of the program have already discussed the possibility

of offering pre-implantation embryo selection based upon genetic profiling for intelligence genes. It's pretty controversial, sort of, modern day liberal eugenics.

But there's a larger challenge, I think, for us all for -- in bioethics, which is that they have already indicated that they're going to proceed according to their own cultural values. That these may be different than those of Western bioethics. And I think this is going to be a challenge as more and more countries around the world develop advanced technologies; they will. And how do we navigate this interface between Western bioethical traditions, which are pretty young, and respect for cultural differences?

So I want to conclude by saying that cognitive enhancement is more complicated than it appears at first blush. We're already well on the way to enhancing ourselves with all sorts of drugs, devices, and more. But whether we're talking about enhancement of students or adults, developing embryos or aging baby boomers, we're confronted with challenging issues that merit resolution.

I would submit as we move forward, we need to give a fair hearing to the public's enthusiasms and their fears, their utilitarian dreams, and their visions for societal harmony for these are really the norms to which our policies should hue.

Thank you.

DR. GUTMANN: Thank you. Thank you. A lot to think about.

Our next speaker is -- is Rear Admiral Peter Delany. Welcome.

Admiral Delany is the Director of the Center for Behavioral Health Statistics and Quality at the Substance Abuse and Mental Health Services Administration, where he oversees a program to collect, analyze, and disseminate critical public health data related to substance abuse, mental illness, and related disorders.

He is the recipient of numerous service and civilian awards during his long career. And it is absolutely our honor and pleasure to have you. Welcome.

DR. DELANY: Thank you, very much. I appreciate the invitation.

So at the Substance Abuse Mental Health Services Administration we're charged with not only trying to find ways to prevent and reduce the impact of substance use and related disorders, but also we're charged with measuring them for the country.

And today I'm going to try to paint a very quick picture for you about part of that landscape for young people, who as we know are facing difficult challenges.

My kid just started college yesterday.

DR. GUTMANN: Congratulations.

DR. DELANY: So this makes a lot of sense to me. And he's really sick of hearing about drug use and mental illness from me, but he can quote you the statistics and can bore his friends for you.

I was invited to talk a little bit about some of the drugs that are often used for cognitive enhancement among young people in college. But I want to paint a little bit broader picture for you.

First, what I want to point out to everybody is that the lifetime non-medical use of Ritalin and related generics is about -- in 2012 was like 1.8 million people, and that's up from 2008 where it was like 1.5 million people, so that's a four-year stint.

Converly (sic), if you look at meth -- amphetamines, which includes Adderall, in 2012 it was about 4.4 million, so that's more than Adderall; that's in all the stimulants. The difference is it's up significantly from 2011, where it was a little bit -- about 4 million. So one of the important things that we found is it only takes about a -- it's only taken a year for a significant increase to happen among the amphetamines, where among Ritalin, which I swear I cannot pronounce it's chemical name, it took four years to find that significant change.

So looking at all the numbers for a number -- all the numbers for these issues, one of the things I think is really important to look at is that that we broke the numbers down for college age students. Full-time college students 18 to 22 were twice as likely to be using Adderall than not full-time college students and people not in college. So that was somewhere

between 542,000 versus 382,000, so it's a pretty significant break.

But the part of the picture that we started digging a little more deeply on is that three times -- these -- the students who were using Adderall non-medically are three times more likely to be using marijuana, at like 79 percent versus 27 percent. They're eight times more likely to have used cocaine in the past year, about 28 versus 3.6 percent. Eight times more likely to be non-medical users of prescription tranquilizers, which is about 24 versus 3. And then five times more likely to be non-medical users of narcotic pain relievers, at about 45 percent versus 8.7.

So obviously this is a significant risk factor. And for the most part we're finding the non-medical users, there's a significant chunk that are using them, they have a prescription and they're just using them non-medically. But there's a large percentage, more than 50 percent, who are getting them from their friends and from their friend's medicine cabinets. So sometimes they're being passed around, sometimes being bought, sometimes just taking.

The other very frightening statistic for me was that 90 percent of those who were using non-medical pain relievers in college -- or non-medically using the Adderall in college, 90 percent of them were also binge alcohol users. And another 50 percent of those were heavy alcohol users on a regular basis. So what we're seeing is a lot of co-occurring drug use among this population.

The other thing that I think it's really important to begin thinking about, is the number of people ending up in the emergency room at this age, has grown from 1300 in 2005 to about 5.7 -- 5700 in 2012. But we also found for Ritalin it was 5700, so there's almost no difference. So a lot of growth in the number of people entering the emergency room.

And when we've been tracking it, what we're finding is that they don't see these as dangerous drugs. It's prescribed. It comes in the form -- they were holding off on some of the other drugs because you can never really know exactly what you're getting with cocaine. You can never really get -- know what you're getting with heroine. And even now there's a

little bit of hesitancy about marijuana because the marijuana rate, the THC level in marijuana has gone up to about 65 percent.

So what we have is this growing pattern of young people taking these drugs for non-medical reasons, but they're not just taking the Adderall; they're taking a number of other drugs. And 18 to 25 year olds, predominantly drive the drug -- illicit drug use in the country.

The last thing I want to leave you with is to begin -- is the issue that we're also finding that is related to this, is the number of people who are ending up in the emergency room because of energy drinks.

In the period 2007 to 2011, we had an increase of 74 percent, not statistically significant because it grew regularly each year. But as you know, the total amount of caffeine in a bottle of energy drink varies between 80 and 500 milligrams. So it's between about a cup of coffee or five cups of coffee. But the challenge is that they're not drinking one.

First of all, they're very sweet. They're often very cold. And they chug down three, four, five, six a day. Conversely, when they go to parties, they're mixing them with alcohol. Vodka is the favorite alcohol of choice.

Actually, I went out with my son to dinner is a -- and we were in a restaurant bar, and it's on the menu. So you can get a Redbull and vodka. Again, starting talking to him, eyes glazed over, so you got to be careful with that.

(Laughter.)

DR. DELANY: So --

DR. GUTMANN: May I ask what you were doing in the bar with your son?

DR. DELANY: I did say bar/restaurant.

DR. GUTMANN: Oh.

DR. DELANY: It had a bar. It was a restaurant. The chicken wings were delicious.

So the other thing that we're finding is that they're getting into treatment quicker,

though. The problem is they're getting into trouble much more quickly. It used to be about seven to eight years before somebody ended up in treatment because of the problem. But because they're using a lot of prescription drugs, they're ending up in treatment an average of five to six years from their initial treatment.

So these are multi drug users. They're starting to have multiple problems. Sometime -- wait until after college, though, because they seem to be able to hold up for a while before their systems breakdown. But they're also -- there's a number of other tables that we can show you, but they also have a number of co-occurring anxiety stress disorders, and in some cases major depressive disorders.

So one of the things I was asked to talk to you about is that these are data that we gather every day. This is -- we get -- the National Survey on Drug Use and Health, the Drug Abuse Warning Network, which has become the emergency departments study, which is about to go back into the field with -- our partnership with National Center for Health Statistics, and our facility survey. So these are data that are available. Every year we publish them.

I've talked to Misti. We're going to give her the tables. But this is something that we do for every day sharing, and we have about 45 tables that include Adderall, Ritalin and other kinds of stimulant drugs.

So that concludes what I have. And I've left samples of reports on the --

DR. GUTMANN: Right. Thank you very much.

And I also think it's important for everybody here to know that Admiral Delany has won the Public Health Service Outstanding Service medal, the Excellence in Health Leadership award, and the Stanley Kissel, Jr., award. So congratulations on all of that. And it makes what you say all the more impressive, given your own service.

Our next speaker is a colleague of mine at the University of Pennsylvania, Dr. Adrian Raine, who is the University Professor -- the Richard Perry University Professor of Criminology, Psychiatry, and Psychology at the University of Pennsylvania. And Dr. Raine is

also the President of the Academy of Experimental Criminology.

Previously, he was the Robert Wright Professor of Psychology at the University of Southern California. And Dr. Raine has published seven books and more than 300 journal articles and book chapters for the past 37 years.

His interdisciplinary research has focused on the biosocial basis of antisocial and violent behavior in both children and adults, and the implications for prevention.

Welcome, Adrian.

DR. RAINE: Good morning. And thank you for the introduction and inviting me here.

I was asked to talk about the links between nutrition and antisocial violent behavior. And also whether nutritional enhancements could improve antisocial and violent conditions. So I'll talk about those two themes. Then, thirdly, I'll add in possible ethical implications of work like that.

First of all, the relationship between antisocial violent behavior and nutrition was established in a groundbreaking study conducted in the Netherlands on 100,000 individuals, documenting that mothers who were pregnant and had poor nutrition during that time, their offspring were 2-1/2 times more likely to develop antisocial personality disorder in adulthood. That's lifelong criminal offending. And that's controlling for all social background factors.

And the studies I'll talk about are controlling. For the confound, of course, that children with poor nutrition tend to come from different homes to children who do not have poor nutrition.

The second study was conducted in Mauritius, which is the African subcontinent. It documented that three-year-old children with poor nutrition are more antisocial at ages 8, 11 and 17 years. So throughout the life course. Again, controlling for social background conditions, poor nutrition links to later antisocial aggressive behavior.

This study also documented that the poor nutrition results in lower cognitive

functioning. And it's the lower cognitive functioning that predisposes to the later antisocial and aggressive behavior.

In the United Kingdom, 11-year-old children who eat candy are three times more likely to become violent criminal offenders at the age of 34, again, controlling for many different social background factors. That's a sample of 17,000 11-year-old children.

Also in England, in Avon, mothers who eat more fish during pregnancy, their offspring are more prosocial at age 7. In other words, they are less antisocial. Fish contains Omega-3 long chain fatty acid, which is important for brain structure and brain function.

In the United States, children with low levels of Omega-3 are more likely to be callous and unemotional. These are precursors of later psychopathic behavior.

And Joseph Hibbeln has documented across the world that rates of fish consumption are associated highly with homicide rates. The lower the fish consumption the higher the homicide rates.

But these of course are correlational data and what we need are experimental research. So the next studies, in terms of treatment will be all randomized controlled trials.

So one of the first ones in Australia documented that given Omega-3, and I'll focus here just on Omega-3 because this is where we have most of the research, that giving children with bipolar disorder Omega-3 reduces their antisocial behavior. Initially giving Omega-3 to adults in the community reduces their aggressive behavior. The same finding was observed also in Japan.

In Sweden, children with ADHD, attention deficit disorder, again giving them Omega-3 reduces their antisocial behavior.

In Thailand, giving Omega-3 to university staff reduces their antisocial behavior.  
(Laughter.)

DR. RAINE: In the United States, again, children with ADHD, giving Omega-3 reduces conduct disorder, which is antisocial aggressive behavior by 43 percent.

In Mauritius, again, in the African subcontinent, we've been finishing a randomized control trial giving Omega-3, three to six months to children in the community, showing not just that it lowered their aggressive antisocial behavior at the end of the three months of Omega-3, but it also reduced their antisocial behavior six months after the treatment study finished.

What we did not predict in this study is that the children given Omega-3, their parents' antisocial behavior also diminished. We don't know why that is. It may just be that if Omega-3 improves the child's behavior, then you know, the child is easier to deal with, so the parents chill out a little bit more. But it could be that antisocial parents steal the Omega-3 that should go to their children, and it's the Omega-3 that's actually reducing their antisocial behavior.

What about prisoners? Only two randomized control trials have been done on prisoners.

The first in England in 2002 documenting that five months of Omega-3 reduced serious offending in the prison by 35 percent.

The Ministry of Justice in the Netherlands heard about that and attempted their own replication study, and they did replicate that finding, that it did reduce offending in young offenders in Dutch prisons.

But those are only two randomized control trials. There have been no others. So what about potential ethical spinoffs of this? Perhaps there are three.

One comes to punishment and retribution. That if we are to accept that poor nutrition beyond the child's control raises the odds that they will develop into a criminal career in adulthood, then the question emerges to what extent do we punish them, as much as we do to what extent are they fully responsible for their behavior? And this opens the whole issue of agency and other issues in the criminal justice system.

The second issue that comes to my mind is I'm struck that after 12 years there's

only been one attempt to replicate the nutritional benefit to young offenders. And in the back of my mind I wonder if this comes about through the concern of doing any type of biological research with prisoners.

Of course there are appropriate and justified safeguards for manipulating the brains of prisoners. On the other hand, do those barriers, to some extent, take something away from research that could benefit that class of individuals, prisoners, who are most in need of cognitive and brain enhancement.

But then again, that opens the whole door to the fact that there may well be a brain basis in part to crime and violence, and ethically where do we go with that?

The third issue that comes to my mind is while a default position might be what's wrong in giving better nutrition to both children and also prisoners, what's wrong in such an enhancement? But could it be that there is something wrong in that? To what extent is Omega-3 really any different to drugs, medication?

Our bodies don't produce Omega-3. Yes, it's natural, but in some ways it's nothing short of a drug. Now, we wouldn't give drugs to sedate prisoners in prison. We couldn't give drugs to children to reduce their antisocial and aggressive behavior. So why really would we give Omega-3 to reduce such behaviors that are unwanted in society?

Let me put it another way around; if we are willing to use Omega-3 with young prisoners to make them more amenable to be held in prisons, then why wouldn't we use drugs with prisoners to also make them more manageable?

So those are three ethical issues that come to my mind when I consider the topic of nutrition and antisocial behavior.

Thank you.

DR. GUTMANN: Thank you very much.

We've gotten a lot to think about. And it's actually heightened some of the things that we are definitely thinking about, and want to.

And now we conclude with Professor Nick Bostrom, who is Professor in the Faculty of Philosophy at Oxford University. He's the Founding Director of The Future of Humanity Institute, which is a multiple disciplinary research center that enables mathematicians, philosophers, and scientists to think carefully about global priorities and big questions for humanity.

He's the author of about 200 publications, including human enhancement, and the forthcoming book, *Superintelligent -- Superintelligence: Paths, Dangers, Strategies*.

Professor Bostrom is the recipient of the Eugene Gannon award. And earlier this year was included on Prospect Magazine's World Thinkers List.

So welcome to our world thinker.

DR. BOSTROM: Well, thank you, I appreciate the invitation to come here today.

So our cognitive capacity is very important in the modern economy and in modern society. I think will become increasingly so as automation is able to perform many of the tasks that otherwise could be performed with less education and less cognitive ability. So to remain competitive in the global economy I think one wants to look at the wide range of measures to improve the intellectual capital of the population.

In addition to the instrumental benefits, though it's important to remember that cognitive capacity also unlocks the doors to all kinds of things that are intrinsically valuable, the ability to engage with literature at a deep level, art, film, movies, mathematics, creativity in all forms. So it's a very fundamental parameter of the human condition.

I think that the main problem with the cognitive enhancers that we have today is that they don't work. Or they might work slightly for limited periods of time for some people on narrowly defined tasks.

We don't have, in terms of biomedical interventions, anything that really seriously lifts general intelligence in a big way. So this is partly due, I believe, to it just being

difficult to find such interventions, but also partly also due to it having been neglected.

There is this paradigm in medicine that medicine is about fixing thing that goes wrong. It's about curing diseases. And that has made it difficult for researchers to, like, obtain funding and support for efforts to try to increase normal capacities. And that's probably one of the reasons why we are not farther along than we are.

I was asked to, sort of, try to reflect particularly on the relation to -- concerns about inequality from possible cognitive enhancement. And there I think it might be illuminating to compare biomedical interventions with other interventions that are aimed to increased cognitive capacity.

Some biomedical interventions have the potential to be cheap. Like, a pill is something that can be mass-produced. Perhaps it is expensive first, but once it -- the patent runs out, it can usually be produced very cheaply. And even drugs that are used today like Ritalin and Modafinil. Like Modafinil, it's cheaper than like a Starbuck's coffee, whereas education, for example, is hugely expensive, like, to really raise the level of the amount of education, hire more teachers. It's something we spend a significant fraction of the national budget on, with possibly diminishing marginal returns.

And other kinds of biomedical interventions might or might not be cheap, so it depends. If it's like a simple pill you take, it has the potential to be very cheap. If it's something that requires ongoing treatment, surgical interventions in the human body, then it might be more expensive, like other medicine is.

Genetic interventions are in a particular category. They might or might not be expensive, but there is a possible additional barrier there, in that some people might, even if it were totally free, subsidized by the state, might have various religious and moral objections to taking it. So you could imagine a scenario where if genetic interventions become really effective, that there would be some groups of people who would choose to refrain from using those maybe for their children. And that inequalities might grow there. Not as a result of cost

barriers, but for more fundamental principle reasons. It is -- insofar as we're thinking about access to current cognitive enhancers; so some are widely available, like caffeine and nicotine and so forth.

Others, like Modafinil, I think it's useful to realize that the key cost of inequality and access there, it's not so much cost because the cost is fairly low, a more important barrier is that it requires some social capital to get access to these because they're not readily available. You either have to be able to find a friendly physician and persuade him or her to prescribe it. Or you have to know the right people who might share some of their prescriptions. Or you have to be able to go online and then look at online pharmacies, identify the fakes from the real ones, and -- which can be done, it's not difficult, but for some people if they're not grown up -- if they don't know anybody to ask it's actually a big barrier. And I think that's the main cost today.

The most cost effective interventions today are probably, I mean, ones that like more research into, say, the fish oil, iodine is still actually a problem in many places around the globe, including the U.K.

I'm sorry to report there was a study just last year that suggested there was actually widespread iodine deficiency in the U.K., which is a known cause of -- well, in severe forms mental retardation, but in milder forms perhaps a loss of a couple of IQ points.

So that's real easy to fix by just iodizing salt, but still something that is neglected. Perhaps because there is not this very serious focus on how to make incremental improvements in the biological functioning of the populations' brains. But with more attention to that I think there might be other little opportunities like that to make a positive difference.

Another thing to consider here is the degree to which it will be -- so there are already large inequalities in cognitive capacity. Partly biological, partly because different people have different amounts of education and so forth.

So one question one can ask for a hypothetical new cognitive enhancement

intervention is whether it would increase or decrease that. So that might partly depend on what system we have for letting people have access to it. If it's illegal or if it's very expensive, then obviously fewer people will be able to access it.

But another that I mention here is just how difficult it turns out to be to enhance in particular individuals. I believe that for a wide range of parameters it might turn out to be easier to increase the cognitive capacities of people who start off from a lower level.

Think about it like some kind of -- our brains is like cognitive machinery with a lot of different wheels and stuff like that that produces thinking, like as a metaphor. And it's not so much that different people are born with different machines; we all basically have the same kind of machine from an evolutionary perspective. It's clear that we are not different species with totally different adaptations, it's the same basic brain structure. But there is different amount of sand in these gears. We all have a lot of sand, but some have more, some have less, and that then creates inefficiency in the way that our brains process information. But the more sand there is to begin with, the easier it is to remove a given amount of sand.

So one, if you have a brain that's already where all the neurotransmitters and everything is already very carefully balanced to, like, yield close to optimum behavior, it's going to be much harder to go in and adjust something and hope to make it even better. It's more likely that you will break something. But if there is something clear that's broken, you go in and fix that, and you might see an enhancement.

So we might find that, sort of, orthogonally to these economic dimensions that there might just be different levels of susceptibility to different kinds of enhancements. I would be surprised if there were a simple chemical that would just generally uplift everybody. It's more likely that there is some optimum for a given level of some neurotransmitters or some other parameter, and some have a little too much, some have a little too little, and we might enhance by moving people closer to their personal optimum. And what works for one will not work for another.

So we can contrast this with education, where it seems to be rather that the more you have the easier it is to get even more. Like, this -- it's easier just to accumulate more knowledge and you have a, kind of, snowball effect.

So education might not benefit from this kind of -- well, there are also diminishing returns. But it's a lot more complicated in education. There is to some extent, like, kind of, the winner wins even more. The more you learn the easier it is to acquire more knowledge. But with some of these biomedical enhancers we might find that the opposite is the case.

So I have a lot more points, which I will not try to -- we can bring them up later. I think I circulated or suggested this -- we were invited to submit, sort of, readings and stuff like that, so there's this paper on the reversal test, which I think can be a useful tool, far as thinking about some of the possible tradeoffs that might result. And the discussion about how that might be applied to -- in issues of inequality is there, but it's towards the end of the paper, so it's easy to miss.

But I'll put down the pause there and look forward to the discussion.

DR. GUTMANN: Thank you very much.

We're open for discussion. Let me kick it off by throwing out four propositions for you to agree, disagree with, expand upon. But they're four basic propositions that come out of the four taken together, really excellent -- I don't say this lightly, really excellent presentations.

So Proposition Number 1, I'm just -- I think it will just clarify us. Proposition Number 1, there's nothing unethical with cognitive enhancement per se. That's Proposition Number 1, nothing unethical with cognitive enhancement per se.

Proposition Number 2, often there's something good about cognitive enhancement. That is you can improve people's -- you know, people can improve their brain functioning. So Proposition Number 2 is often there's something good about cognitive

enhancement.

Proposition Number 3, there is something wrong with the over-prescription of cognitive enhancement drugs like Ritalin with dangerously undesirable side effects. So Proposition Number 3 is that there's something wrong with the over-prescription of cognitive enhancement drugs that have dangerous side effects. Again, dangerous; you have to weigh it against but -- of the positive.

DR. WAGNER: It's a safety question.

DR. GUTMANN: But it's safety -- safety question or side effects that are -- go beyond what their desired -- the reason for their being taken. Okay, that's Proposition Number 3, that while -- so note Proposition Number 1 is there's nothing wrong, per se with taking -- you know, with cognitive enhancement, but Proposition Number 3 is there can be something wrong with -- and there is often something with the over-prescription of drugs.

And Proposition Number 4 is, and this goes -- you'll see each one of you hit on one of these propositions without stating them quite as starkly as I'm stating them, Proposition Number 4 is there's something wrong with the highly skewed access to desirable cognitive enhancement, where the blocked access exacerbates unequal opportunities to education, employment and so on. That's Proposition Number 4.

What I've tried to do in these four propositions is to hit on why some people just react strongly negatively and why some people say, "Look, there's nothing wrong."

I think -- I think, at least in their simple form, all four of those statements, propositions are correct, but I could be wrong. So I would like people to react to those.

Yes.

DR. BOSTROM: Yeah, I wonder if you could clarify 3. I mean, in one sense, if something is overprescribed it's almost by definition prescribed too much. Whether -- the claim is instead that it is, in fact, prescribed too much, then I would be more agnostic about that. There are huge variations in the rates of prescription. It might be prescribed too much

in --

DR. GUTMANN: So let me --

DR. BOSTROM: -- some places and too little in others.

DR. GUTMANN: So let me -- since I was -- I wrote this down, why don't I not -- it's a loaded -- it's a truism what you said, what I -- that. So let me make it not a truism.

We ought to be concerned about cognitive enhancement drugs when they may be prescribed -- you know, they maybe -- you'll -- you can put it in -- someone can put it for me in a way that there is a concern about the over -- a legitimate concern. There is a legitimate concern about the over-prescription of cognitive enhancement drugs, just as there's a legitimate concern about the over-prescription of other drugs that have dangerous side effects.

In other words, the problem -- there are two problems, 3 and 4 are pointing at. The third proposition is pointing at that a lot of the reaction to something like Ritalin is its over-prescription, not the fact that it's a cognitive enhancer.

The fourth proposition is pointing out that a lot of the reaction to drugs that are cognitive enhancers is not that they're cognitive enhancers, but that some people have access to them and other people don't, and it's skew -- it's further skewing the opportunity that people have to succeed in life.

So there -- what I'm trying to get at is whether there's anything wrong, per se with cognitive enhancement, as opposed to the over-prescription of drugs on the one hand. And the skewed access that people have to things that enable them to succeed in life in basic ways, like pass -- you know, get through high school, get through college, get a job.

DR. WAGNER: Certainly, those of us at universities hope there's nothing wrong inherently with cognitive enhancement, right? I mean --

DR. GUTMANN: But it's, I think, important for us when we go into a neuro -- you know, talking about neuroscience, to allay the fears that there may be a cognitive enhancement, per se. Am I --

DR. WAGNER: Gotcha.

DR. GUTMANN: Yes. Okay.

Christine?

DR. GRADY: First, thank you all for very interesting presentations.

And I like your four propositions, Amy. But I want to talk a little bit more about the third one, because I think I agree with Dr. Bostrom that "over-prescription is over-prescription" is probably wrong.

But there's another issue that I heard, and especially heard from Admiral Delany, and that is --

DR. GUTMANN: Dr. -- could you take your light?

DR. GRADY: The sort of safety issues related to overuse, and that doesn't have to be overprescribed. Like, the Redbull story, I think is a really interesting one. And also the fact that the statistics show that people tend to be poly-pharmaceutical takers or something like that, I don't know what the right words are. So there's a safety issue then that goes beyond over-prescription, I guess is what I'm saying.

DR. GUTMANN: Yeah. It's accompanied with it, though.

Ritalin, you know, some of these things don't have to be prescribed, right? Redbull is not prescribed; it's just used. It's over-the-counter, as they will.

So and other of the things are not used for cognitive enhancement, they're used to chill out. Yeah.

So I'm trying to separate some of the things from others. We've had -- we have alcohol overuse without any of -- any other drugs. Alcohol is the drug of choice --

DR. DELANY: A drug.

DR. GUTMANN: -- for most of our college-aged children.

DR. DELANY: Could I challenge the premise of enhancement?

DR. GUTMANN: Yes, please.

DR. DELANY: Because these are --

DR. GUTMANN: I threw this out --

DR. DELANY: Yeah.

DR. GUTMANN: -- because I want to see what --

DR. DELANY: I -- as somebody who treats a lot of adolescents during his career, one of the things I would offer is that "enhancement" is a really loaded word. And it's a more positive word. And I think what we're really looking is people using substances or other things for cognitive alteration.

Sometimes for a purpose of enhance, but let me -- my position would be in relation to the use of medications and misusing medications, it is not necessarily for enhance in many cases. It's really for altering.

You know, people want to feel good. They want to feel better. It's pretty much the two reasons they use drugs.

DR. GUTMANN: So could I, because I think it's important for us to be, you know, carefully analytic here. There are drugs that people take for non -- for reasons other than cognitive enhancement. And some of those same drugs, some of the people take for cognitive enhancement, so -- right?

DR. DELANY: Yeah. I don't --

DR. GUTMANN: So Ritalin, for example, is taken for non-cognitive enhancement and cognitive enhancement purposes.

DR. DELANY: It's primarily taken to alter a state.

DR. GUTMANN: Right.

DR. DELANY: And when prescribed --

DR. GUTMANN: But --

DR. DELANY: -- appropriately, you know, I think there is a --

I think we can say -- and this is the same problem we have with dealing with

prescription drug use, is you know, this is a key drug for a lot of people. And first of all, it is -- it is more available. I mean, 20 years ago we had no really good prescription drugs for -- narcotic pain relievers, except for morphine and some others.

Same thing is, we've come a long way in understanding the problems with -- with Ritalin and amphetamine use for people with specific disorders. But as with every drug there is the potential for abuse, and there's the potential for diversion.

So is there something wrong with the prescription? I get really antsy about that because I do think most physicians -- and I will say most physicians because we do have -- we have pill mills, but most physicians are doing this in the best interest of their patients.

Where it becomes problematic is there's a lack of connection with helping their patients understand is, (a) you do not give this to other people. It's dangerous for them. But it goes earlier. I mean, we don't treat -- we don't educate young people early.

So there's something not wrong with -- it's the "something wrong" in the environment that doesn't support people making better decisions. And I would say as a -- having taught in academe, there is a hyper sense in many instances where children 18 to 22 are really looking to do better, so they're looking for anything to make that work.

So that's a substantial proportion. But a lot of them are using it because they like the feeling. And it's not so much to be enhanced.

DR. GUTMANN: John?

DR. ARRAS: Terrific panel.

I want to offer a tweak to Amy's final point, and then a global question about how we should approach these issues of ethics and policy.

The tweak, Amy, is on your last point regarding opportunity and unfairness, there's an empirical gap in that question because I think that it's an open question, just how successful or efficient these drugs are presently, at least. You know, and the extent to which people really do get a positional advantage from them. That will probably change in the

future.

DR. GUTMANN: Yeah.

DR. ARRAS: Yeah.

DR. GUTMANN: No, but my proposition didn't assume that using it would create it. I said there could be something wrong "if."

DR. ARRAS: Right. Exactly.

DR. GUTMANN: In some cases we may think it's -- it decreases them.

DR. ARRAS: Yeah. Yeah, and I -- I was struck in the --

DR. GUTMANN: Or levels everybody into non-performance.

DR. ARRAS: I was struck in the readings by the claim that a lot of the people who use these drugs are, kind of, low performers, you know.

Okay, but anyway, on to the global question. Okay, so we're struggling with --

DR. GUTMANN: That's just -- that's empirically not --

DR. ARRAS: Yeah.

DR. GUTMANN: -- the case in our colleges. There's always been --

Prior to Ritalin, by the way, I can, you know --

DR. ARRAS: Sure.

DR. GUTMANN: -- there were other drugs of choice for students who had access to them on the eve of an exam. And there's no doubt, there's just no doubt that for some kinds of exams speeding up your brain helps you get through it.

There's also good evidence that there are bad side effects to that.

DR. ARRAS: Yeah, right. Right. Right. Yeah.

DR. GUTMANN: This goes to the public. You know, there's informed public opinion and uniformed public opinion, but people who know, you know, what some of these drugs do, use them for specific purposes that --

DR. ARRAS: Right. NoDoz was my drug of choice.

DR. GUTMANN: -- are not --

DR. ARRAS: Okay. So on to the global issue, okay?

So we're struggling with the question of how to think ethically about these drugs and how to regulate them ethically. And I'm just hearing a couple of, sort, global strategies for doing that, right.

So one of them, is a kind of individualized cost benefit approach, so when confronted with any of these drugs we ask, "Well, what are the pros and what are the cons?" You know, "What's the up side/down side?" without any reference to, sort of, categorical exclusions or inclusions, right. Essentially, a kind of utilitarian approach to it.

Another approach, which was embraced I think largely by members of our predecessor Commission, right, employed categorical exclusions, right. In other words, the idea was, well, if a drug acts directly on the brain, say, then it's going -- it should be disfavored. Or if it takes people above a commonly accepted average human norm or a statistical human norm it should be neglected or de-emphasized, right.

Or we referred earlier to the distinction between getting people up to a certain level of decent functioning, you know, versus curing a disease condition. And those can be very different. You can have low functioning but not be diseased, right.

So I want to ask you folks, you know, your take on this. I mean, just in terms of our broadest possible intellectual stance on thinking about these issues, do you largely approve of a kind of case-based cost benefit approach? Or would you say that, indeed, some of these categories that have been deployed in the public debate are valid and we should acknowledge them and enforce them?

DR. GUTMANN: Those are our only choices. But go ahead, Peter.

DR. REINER: So I would like to speak to both those issues. And I -- actually I want to broaden the conversation.

We've been really talking about memory and attention, but there are actually a

number of cognitive affective social domains that our brains manage --

DR. GUTMANN: Adrian --

DR. REINER: -- and Adrian was talking --

DR. GUTMANN: We're not talking only about that.

DR. REINER: Yeah. So I -- but we tend to come back to Ritalin and these psychostimulants too often.

But when we think about them, I think that part of the cost benefit analysis that you want to put in there is not just overt safety; are they going to cause your arm to fall or some kind of bad physical side effect, but actually the social dynamics of going down this road. And it's a much more difficult issue to deal with in a sensitive way. But it's not one -- it's one to ignore at our own peril.

And I -- one of the issues that comes up again and again, I think, in the debate that is difficult to ignore is the effect on character. And people have talked about the erosion of character by the shortcuts to success. And one of the -- and self-image with that.

And one of the more compelling accounts of this is a recent book, I can't remember that author's name, but a young woman who began on Prozac in her teens, and talks about what it's like to grow up, coming -- I think it's called Coming Of Age on Zoloft is the name of the book. I recommend it highly. It's actually -- really gets you to think about some kind of deeper personal issues of using enhancements, at large, especially at critical periods in young people's lives.

DR. GUTMANN: But I thought you were going in another direction, because those aren't enhancements at large, those are one substrate of enhancements, whereas Omega-3 is another substrate. And what's wrong with, you know, if -- if it is the case that providing more, you know, fish oils to -- and providing them, you know -- having access to them makes young people able to function better cognitively, what's wrong with that?

DR. REINER: Oh, I don't think there's anything wrong with --

DR. GUTMANN: Okay. So that's --

DR. REINER: -- with that.

DR. GUTMANN: -- a cognitive enhancer, though.

DR. REINER: Yeah. No, I --

DR. GUTMANN: And so that doesn't -- that might enhance character, it may enhance functioning. So it's the substrate of -- it can't be cognitive enhancement, per se that's the problem. That's -- right?

DR. REINER: So that's correct.

DR. GUTMANN: Okay.

DR. REINER: I think that the enhancement of cognition, per se is not --

DR. GUTMANN: And the intent -- and the intentional, you know, use of some substance to do that can't be the problem, because Omega-3 is a substance, it's an -- can be intentionally used to do that.

I'm not trying to diminish the other problems, but I'm trying to figure out what the definition of those problems is. And it's not cognitive enhancement.

DR. REINER: So I think going back to what --

DR. GUTMANN: Yeah.

DR. REINER: -- Peter?

DR. GUTMANN: Peter, yeah.

DR. REINER: Peter talked about, is we have this association of use of cognitive enhancement with general drug use. And I think that it's a sense that we all have about this. It may -- it may be a misguided sense, but actually the statistics bear it out, that people who are more -- whether -- it's not the cognitive enhancers probably, it's just people who are more experimental do this, but I think that that leads to some of the attitudes towards cognitive enhancement.

DR. GUTMANN: Nita? Thanks.

DR. FARAHANY: So, thank you.

This has been an incredibly interesting conversation, and I think really helpful in highlighting a few key points. I have a couple of comments and then a question more generally that ties together some of the issues that you all raised.

So the first is thinking about the issue of safety that's come up a lot and how you think about that in the context of cognitive enhancement.

So if we take the FDA model, for example, of trying to benefit safety and the benefits of a drug, it's more challenging it seems like in cognitive enhancement because what you count as the benefit and how you measure the benefits relative to safety, is not a model that we're used to. And we discount the "above normal," as Peter describes it, which is an inherently personal value.

And so, you know, kind of in thinking about that, I would love your thoughts about how we might better think about safety versus benefits.

The second is a concern about the use in children, which we haven't really talked about much, but Peter alludes to in some of the use of these different devices.

So for example, using transcranial direct current stimulation on a child could improve prefrontal cortex activity, but it might actually come at the cost of some other activity in the brain, which would have long-term development consequences. And that seems to me to be a separate but an important concern as we think about in whom and by whom these different technologies are being used.

But all of this, sort of, brings me to a question for all of you about the modality of enhancement versus the question of an enhancement itself.

And so each of you discussed different modalities, and some of the ones that are on the table are drugs; whether they're vitamins or natural, as Adrian points out, versus synthetic types of things that we're using, or devices like transcranial direct current stimulation or TENs or other types of devices that are being used. Or if it's pre-implantation genetic

diagnosis or if it's brain games and non, you know, hard interventions.

So is -- does the modality matter, aside from safety, right, because safety seems to me to be a separate and important concern. But does it matter how enhancement occurs for an ethical or other perspective and how we should think about regulating it?

DR. GUTMANN: Nick.

DR. BOSTROM: Yeah, I could say something about that. Just very briefly first, I can answer maybe both, what John was bringing up.

Yeah, I do think that moving to a more case-by-case approach is the way to go. The -- your predecessor panel didn't have a very -- I mean, they went out on a certain limb, which a lot of people had a lot of things to say about in the bioethics literature. But I do think that the way forward is to have a more fine-grained analysis of the precise context and consequences of different types of enhancements, rather than bundling them all into one big category. At least that's my view.

On the safety and benefit question, so I think that's true. It would be more analogous to traditional medicine if there were an enhancement that just made everything unambiguously better at no cost. So that would be like ideal if we could find such a thing. But more likely there might be things that enhance one kind of performance, maybe to the detriment of something else. So maybe you improve your ability to concentrate and at the expense of less peripheral awareness or something like that.

So with those things, I think the tradeoffs have to become much more individualized. Like, this -- whether the costs are worth taking for a particular intervention depends on what it is you're trying to do. And different people are trying to do different things, and are pursuing different aims.

So I think that the individual user will have to play a larger role. You want to have -- make sure that they have the best information about what the side effects might be and what the drug might do. But I don't think you can have a system where, like, the doctor will

decide for everybody whether having this improvement in concentration is worth, like, X-percent higher cortisol level, which might increase the risk of heart disease.

You didn't ask about children; I'm going to pass over that. I think somebody has something more insightful to say.

On the modality, I think fundamentally it's hard to see how it would matter. I mean, it might matter in practice in as much as modalities are correlated with a lot of other things.

So if the modalities say genetic selection, then the context would be one in which some people make choices as to which new people should come into existence, and that has a whole host of unique ethical issues associated with it.

Other modalities, there are different costs, different tradeoffs. But I don't think in and of itself, whether you're taking something in a pill or like affecting your body in some other way has, like, a fundamental, orthogonal moral significance.

DR. GUTMANN: Peter.

DR. DELANY: I'm really reaching back into my long ago training in social ethics. So one of the questions you appear to, kind of, be nudging up against is are we really talking -- and I'm going to be more specific about medications -- are we nudging about -- up against improving somebody's life and the safety issues around that, versus reducing problem behavior?

So in other words, are we -- you know, in terms of the prescription behavior, are we prescribing to address what we're deciding is abnormal behavior, or more likely annoying rather than abnormal, versus improving somebody's life.

And I have to agree with my colleague on the far right, I think we have to do a case-by-case basis, because --

But I also want to go back, you know, do we -- is the ethical question really about do we build a larger conversation about changing the basic egalitarian approach to

society where some people are blocked from getting medications that might enhance their life, rather than cognitive enhancement. I think maybe it's a broader term.

You know, I have worked with kids who there's a miracle when they get put on a medication. But we do a lot of work before we go to the miracle medication. But we, again, we're -- I think what we're seeing is this overuse of the medications not for the kind of cognitive enhancement that you may be thinking about.

It's -- a lot of people are using these medications to do way beyond what anything was thought of. So the safety is when we start to misuse these medications.

But it's also an ethical issue, how do we stop it from happening as a society? That's a broader question of prevention that goes way back upstream, not do fish oil, but way back upstream.

DR. GUTMANN: Um-hmm. Jim.

DR. WAGNER: Actually, I -- I would like to hear more thought about Nita's question. Everybody seems quite sanguine about the assertion that it really doesn't matter what the modality is, that a brain game is equivalent to a drug.

I was only partly tongue-in-cheek as -- the more I thought about it, about the notion that we should consider education as one of those things that does enhance. To the extent that we're talking about making life better; you know, we hope so. And if that aspect of cognitive exercise, which is about acquiring, retaining, managing knowledge and information, and formulating new ideas with it, I would certainly hope that education does that.

It nevertheless has the same questions about access and fairness, okay. It has some questions about character and authenticity that you have brought up. So it -- I would like to toss it in among the modalities of enhancement.

Somehow -- somehow I sense we're more comfortable with that, as we would probably be more comfortable with brain games for the same reason; one could imagine that much of what young people get out of education is the brain game and not the actual material

that they retain or have forgotten once they graduate.

Do you really believe that the -- and should be really believe that modality doesn't matter?

DR. GUTMANN: And you also might want to speak to that, coupled with Nita's question about children -- you know, interventions on children --

DR. RAINE: Yes, thank you.

DR. GUTMANN: -- because you've done a lot of experiments on this.

DR. RAINE: Yes, I think it's an important question, Nita, on -- you had raised on transcranial direct current stimulation with children. I've got a parallel example.

If we take medicating children for their aggressive disruptive behavior, there's no question that medications do work with both children and adolescents. And doctors will prescribe medications for such children when the caregivers take them in.

The reality is that there is a large body of research documenting the efficacy of stimulants and mood stabilizers, atypical antipsychotics in reducing aggressive behavior. And it's come from 45 randomized controlled trials. So ultimately I suppose the issue will be with transcranial direct current stimulation is, where's the research? Where's the research evidence?

But that raises another question to me, in all questions we have, how much evidence do we really need before we are prepared to move forward? And that's something that I struggle with in a number of issues.

Just quickly on a couple of the other issues. The issue of something wrong with access, the fourth principle that Amy raised, is that I have that concern, too. So let's think of the counters.

As one of the counters that we do have an equal opportunity. We have an equal opportunity, which we're trying to change in education, for example. But the idea is education can enhance society overall. So if we are to block those individuals who can get the cognitive enhancements because we think it's an equal, there may be a loss in that if those individuals

can do more for society, per se.

And just lastly --

DR. GUTMANN: Adrian, hold the last for a moment --

DR. RAINE: Right.

DR. GUTMANN: -- just so we clarify. You can agree with the Proposition 4 and also agree with your statement that is there's something to be concerned about in unequal access but that doesn't mean one should block it. I mean, you still have other considerations.

DR. RAINE: Yes.

DR. GUTMANN: So that's an important -- I think this getting at a lot of the complexity of this issue.

Go ahead, your final answer.

DR. RAINE: Yes. Just the last thing, is your first principle, is there anything unethical about enhancing people cognitively? This may be an extreme case, but I have wondered about the ethics of cognitively enhancing prisoners. Insofar as if we do cognitively and emotionally enhance them, do we just make them better criminals and when they're let out they'll be smarter, wiser, escape detection and be more likely to perpetrate crimes and do harm in society and we lose something about protection of society from the retributive's approach of imprisoning them.

DR. GUTMANN: So I don't want to pull a philosopher but I will on you. That isn't an objection to cognitive enhancement, per se, it's a concern about the consequences of it. But that also shows the complexity of this.

But the modality -- does anyone want --

DR. WAGNER: Peter had a --

DR. GUTMANN: Peter on the modality?

DR. REINER: Yeah, I'm usually somebody who waffles a little bit on these kinds of questions and I'm going to not waffle at all. I'm going to say that modality doesn't

matter a wit. And I would even go back to your educational modality and fully endorse it as cognitive enhancement.

So the point is that if you change the brain you change the brain. And in this conversation, hopefully we're changing each other's brains to some degree, and maybe even cognitively enhancing each other.

But what does matter --

DR. GUTMANN: It is the optimistic scenario in this case.

DR. REINER: Well, that is the optimistic scenario, indeed.

But what does matter, and I think it's important to think about is reversibility. Because I think when we go down the road in an irreversible way, then we don't know exactly -- we don't have a fallback position in case things don't look as good.

So I -- I'm a little more concerned about reversibility, but not at all about modality.

DR. WAGNER: Thank you.

DR. GUTMANN: Yeah. Although on reversibility, John Stuart Mill famously said that certain truths, once they take hold, can't -- you know, they'll never be denied because there are certain truths. And that is, again, the optimistic scenario.

DR. REINER: It sure is.

DR. GUTMANN: I mean, it's the good -- so not all things do -- does one want to reverse. I mean, some of our principles of respect for persons, we would love it if we could end slavery once and for all. So we don't always hope for reversibility in our brains.

DR. REINER: Except it's the option of reversibility, not the requirement for reversibility.

DR. GUTMANN: That -- that is -- I mean, we can have a longer discussion --

DR. REINER: We could.

DR. GUTMANN: -- on that -- you know, whether the option of reversibility is

always a good thing.

Okay, I want to go to -- now, I have Nelson (audio cutout) but I'll go on -- in the order. Nelson is next.

DR. MICHAEL: Okay, so I'll be brief.

So I wonder if the issue if modality is conflated with the issues of access? And so that's why when you said that modality doesn't matter a wit, I think purely one could say that. But since drugs and devices are regulated by third-party payers or regulated by the federal government, I think it is caught up with the issues of access. Especially if you're looking at interventions that are enhancing toward the mean, and therefore are fixing problems in and old paradigm.

Then I wonder if modality doesn't matter, because they are more likely to -- to be accessible to individuals through modalities like insurance.

DR. GUTMANN: Go ahead.

DR. REINER: Well, so in terms of the access, yes. But I guess I was answering modality, all other things being equal.

DR. GUTMANN: Right. Yeah. Yeah. Right.

DR. MICHAEL: Right.

DR. GUTMANN: Christine.

DR. GRADY: I have a very specific question. I think maybe Dr. Reiner said this, about physicians don't have any guidance about whether or not to give prescriptions for things like cognitive enhancers.

And so I was wondering in light of this discussion about risks and benefits, what do you think ought to be out there? Do you think there ought to be rules or guidance or regulations?

And I think the same thing applies to the research questions. You know, they -- you talked about the barriers to doing research with prisoners, which is a negative, so

do you think there ought to be changes to those rules? I mean, these are about, you know, how do we put things in place without too much burden?

DR. REINER: So I think that we do need some, not just guidance but actually education of physicians, because ultimately they will have to make on-the-ground decisions. At the moment, people go to physicians and some physicians prescribe enhancers for enhancement purposes, solely without any medical necessity. And they have the opportunity to do so, they can prescribe them off-label. And they talk about that -- the fact that they do. They're ambivalent about it.

But again, going back to the notion of enhancement as improving well-being, that's really what physicians are struggling with now as part of their mandate. Or is it part of their mandate? And it's a larger question about the aims of medicine.

DR. GRADY: Just ask though, in light of the previous discussion, is there anything different than saying, you know, consider on a case-by-case basis the risks and the benefits and figure out what to do?

DR. REINER: No, there isn't anything different, except that again the physicians are telling us that they're not -- they're not comfortable with this particular decision that they're having to make. And they've -- they talk about it.

DR. GUTMANN: Raju.

DR. KUCHERLAPATI: So Amy, the four -- that you made, I think they're very crisp, very good.

I think it's also important for all of us to be able to say, what are some things that we agree upon, consensus? What is that we don't agree upon, or where there's discussion I know is needed?

I think, at least my view about the -- what you said, the first two aspects as to whether or not, you know, cognitive enhancement is useful, necessary.

I think that clearly, you know, from my point of view, there are large number of

human disorders, some of them genetic, some of them not, all of -- you know, all of which cognitive enhancement is desirable, and would be considered to be necessary. So there is -- I don't think that there would be any issue; certainly would benefit.

The question that comes up, and I think people have earlier talked about, is that if we agree that there is going to be a need in some certain cases, society and the people are just basically a continuum. There's a bell-shape curve under which people belong. The question is, where do you draw the line? Right. And I think that's -- that is what is partly what we're debating. And I would love to hear, you know --

Peter talked about that a little bit, but we haven't talked about what are the criteria that we would use to be able to draw a line and say, "This is ethical and this is unethical."

The other observation that I also want to make about this third postulate that you made, and I talk with Peter, is that this issue about the so-called over-prescription, is maybe a more medical issue. Because, you know, as you know, I mean 40 years ago, you know, attention deficit disorder or attention deficit hyperactivity disorder or autism are considered to be relatively, you know, rare events. And some of those names didn't even exist. And now we diagnose all of these different people with all of these different disorders, and the drugs that are developed for whatever the purposes is, and the physician feel that their patients would be able to benefit from the use of those drugs.

So it is -- may not be, you know, an ethical issue about over-prescription, but it's a medical issue and maybe that it will solve itself as we understand more about, you know, the biological basis for these disorders and how we would be able to intervene.

I would love to hear, you know, people's comments about both of those aspects.

DR. GUTMANN: Nick.

DR. BOSTROM: Yeah, I think that's a very important observation about the consequences of this disease model. That, kind of, has shaped the way medicine is practiced, which implies that if there is a drug that seems to benefit some people, then it's necessary for

those people to be classified with a disease so that you can then prescribe the drug to treat the disease.

And if in reality they are not distinct in any way, they're just a certain part of the Bell curve, then you have to invent some new disease or expand a category of disease so that they cover these previously normal people.

There is something perverse about this whole exercise. Like, do we have to in the end all be diagnosed with diseases just so we can get access to these drugs that might help us?

I think it would be better to just recognize that in addition to curing diseases there might be other reasons to take drugs. And then that would, kind of, free us up from having to stamp people with these, kind of, defective labels.

On the -- just to very briefly come back to the question of whether the modality matters. I think -- I agree with the claim that from a fundamental moral point of view, holding on to things equally does not matter. But there's still ways in which empirically it can matter in certain cases because it might be correlated with other things.

I have a paper which might be of interest -- of interest on that issue, which is called The Wisdom of Nature, where -- I won't explain the details of it, but the idea is that sometimes the fact that something is an enhancement might give us clues about what the likely profile of side effects are. That can help us, kind of, estimate the consequences better. And that intuitions about this idea might help explain why some people do have this feeling that there is something morally significant about the treatment enhancement.

DR. GUTMANN: I think that's a very important point, just because per se there's nothing wrong with it. You have to explain why -- and this goes back to Peter's earlier -- why public opinion, certain parts are so concerned about this, and it -- there's a correlation between over-prescription of some things, wanting quick fixes rather than long-term cognitive enhancers. So there's a lot of correlation effects of --

DR. BOSTROM: Yeah.

DR. GUTMANN: -- that we have to be concerned about.

DR. BOSTROM: Yeah. And I think that because those effects are hard to articulate, and argue about clearly, the basic feeling that are these effects, instead gets translated into a fundamental/moral language because that's how we express it if we can't see clearly what is going on.

DR. GUTMANN: Good. Helpful.

Steve and Barbara.

DR. HAUSER: Thank you.

So I wanted to move, if I could, for a moment about a different aspect of neural function; motor system enhancement, which is an area as we all know today we can actually do things that are beyond incremental. They clearly have functionally significant benefit over the short-term. Certainly safety issues are at play, but that doesn't seem to be central to the public debate about the -- about motor enhancement strategies, particularly the quick ones with drugs.

And the question is, in an area where at least society seems to be weighing in in 2014 that this is wrong, are there -- do you -- how do you feel about this? Are there fundamental differences between how we think about enhancing motor system function and cognitive function? Do you think this will move over time in terms of how people feel about it?

DR. REINER: Well, I think that this goes back to our intuition about what these cognitive enhancements that act on our cognitive toolkit, versus our motor toolkit might be doing. And I think the intuition is that "we," the "we" that we really care about is somewhere inside there. And that our motor actions, the intuition, although it is part of us, is less central to the "we" that we care about and want to defend in some way.

And we haven't really talked about this notion of self in this debate. But I think that it's part and parcel of the intuition of the fear that people have about using anything to

change "me," the "me" that I really care about, my -- the essence of my brain in some way. And people would not have that same intuition about motor function, whether that's correct or not.

DR. GUTMANN: Not sure all athletes would believe that.

Barbara.

DR. ATKINSON: I'll be really fast, because my question was very similar to Christine's.

But just in a very concrete way in children, because their brains are changing so fast and there's so much that can impact them, would you really set a limit personally on treatment of behavior disorders, as opposed to treatment of a disease, versus bringing kids up to normal versus enhancement above it? Is there some level personally that you all think there should be a limit set?

DR. GUTMANN: Adrian.

DR. RAINE: Not for me. I mean, I go back to case-by-case basis, I think, is the -- is how I would default.

DR. GUTMANN: Peter.

DR. DELANY: You know, I -- I mean, I struggle with this every day because I get to deal with the, kind of, negative consequences on a broader scale. And I actually would agree that it really is a case-by-case basis. But we probably need guidelines actually for society about how do we think about these issues of, you know, "Do you really need to take that Adderall to get through the test?" I mean, we're setting this whole hyper-success society about --

I mean, so to me as a public health officer, I'm thinking what's the prevention message? Because how do we really go back upstream and find out why people are falling off -- what's -- is the bridge broken and people are crossing and falling off? Or are they jumping?

In this case, what I see is a lot of young people jumping. And jumping for, like, very strange reasons sometimes. You know, and my son would say, "Chaw," which I'm still trying to figure out what that means, but I think it means --

(Laughter.)

DR. DELANY: -- "Dad, your grandfather could answer this question."

But I -- so I think it is a case-by-case. There are metrics we should impose. But we do need to help the physicians, the prescribers, the educators, these things, because we're not --

I mean, there's this battle. There was a battle recently about whether we were going to drop the age of alcohol use so that we didn't have so many problems on campus, or at least the legal problems. So I mean --

DR. GUTMANN: Yeah. Let me just add a third option to the case-by-case versus categorical. Because cases themselves don't give you a cutoff. I mean, they don't tell you what you should do.

I think if I could modify, a friendly amendment is we need to look at specific cases in all their complexity because they are complex. But we have to draw on some principles or general understandings of how we want to react to those cases. Which is very different than the -- take a modality and say, this modality is right and this one's wrong without regard to actual -- what it -- how it actually functions on the ground.

Is that a fair thing? Because case-by-case, the cases are not going to tell you anything by themselves without some principles applied to them.

Nick. I'm the philosopher.

DR. BOSTROM: Yeah, no, that's fine. So there are general concepts that are useful that can help us think through these. I think modality's not the right focus.

But for example, the concept of a positional good, which helps explain why we feel, say in the context of elite sports competition, that there is really no point to pumping

everybody up with steroids. Like, there's still going to be only one winner and one silver medalist and one bronze medalist, so if they risk their health for the sake of running like a hundredth of a second faster, there is no net, overall gain. It just reshuffles the order. And not even that if everybody takes it.

DR. GUTMANN: And that's worth analyzing because there are rules of the game, and one you set the rules if people don't abide by the rules, if they -- you know --

DR. BOSTROM: Right.

DR. GUTMANN: But you've --

DR. BOSTROM: And the rules, there are --

DR. GUTMANN: -- and you can argue about what the rules should be, whether they should allow steroids or not allow steroids and the argument against it, is there's going to be a winner anyway and why are we pumping up the competition at risk for people's lives?

DR. BOSTROM: So it's -- exactly. And so it's important to distinguish that from other context, like say immunization. Okay, if I get immunized it's no harm to you, you're not competitively worse off.

Cognitive enhancement has both aspects, both intrinsic benefits and positional ones. So if the only purpose of being smarter was you could get better grades, and therefore get better jobs, then there would be no reason for society to subsidize research into enhancement.

But we think that learning more is good, not just because it makes you able to edge out the competition, but also because it makes you like a more productive worker or have a richer mental life, or there are these intrinsic dimensions. And it's for those -- the presence of those dimensions that we have reason to pursue it.

DR. GUTMANN: I'm going to end on that note; that very positive note.

I mean, did you -- you wanted to --

DR. BOSTROM: No, that's --

DR. GUTMANN: No, I think that really helps make more complex and nuanced the -- and which you've all done. So I -- we're going to take a 10-minute break. But first I want, on all of our behalves, to thank this wonderful panel.