Interview Transcripts

International Edition

Names starting with T to Z

This document contains transcripts of the expert interviews in *Introduction to The Science of Early Child Development, International Edition*. Transcripts are listed alphabetically by the name of the interviewee and the name of the video clip. Click on a name below to go to that person's interview transcripts:

Tomaro
Tremblay
Viruru
Walker
Warner
Watson
Weinberg
Werker
Yoshikawa
Young
Yousafzai
Zelazo

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Tomaro – focusing on mothers and children (3:11)

The major goal of the Aga Khan Foundation's health program is to improve the health status and well-being of mothers and children. And the reason behind that is because mothers of children, particularly young children--those who are under five--suffer a very high burden of vulnerability with respects to the developmental challenges, okay. So, if you're able to reach these two groups in an effective manner, you really have a sense that what you're doing in other spheres is really making a difference. Because if you can see changes in the conditions and well-being of the mother and children, you should be able to see some changes in the conditions of the others in the, in the community.

If you're dealing with adult health, or if you're dealing with the health of adolescents except for young women who are in the fertile age group, it takes a much longer period of time before you're able to see any changes. So by focusing on women of the reproductive age and young children, and by ensuring they have access to the care, to the information, to the assistance that they need, you can make a substantial difference.

This has been, this has been the major focus of work in health over the years. I've been here almost 15 years and during that period of time that goal has remained constant. And the goal's remained constant because the problem, or the challenge—let's put it in those terms—the challenge has remained constant.

You're probably aware of the fact that most of the, most of the major donors, and most of the G20 countries have just done an assessment of the Millenium Development Goals. And the two goals that have to some extent changed the least, and where these countries are now investing substantially, is in goals four and five. And those are, with respect to infant and child mortality, and to maternal mortality. So the fact that these are so far behind in relation to achieving the MDGs has really begun to motivate the countries to make these investments. And in that respect, ECD, in many ways, crosses the two groups. Crosses between mothers and children and also reaches into the education goal as well.

We're in, we're currently in about 16 or 17 countries right now. And these are quite a range in terms of where they stand on the socio-economic development scale, so we have some countries that are really, really, really quite poor—countries like Madagascar--I've seldom seen poverty to the degree that I've see it in Madagascar, or in parts of Mozambique, again another very poor country. And then on the other end of the scale, we see programs like Syria, which is a middle income country, has really excellent infrastructure, has a well-educated, well-educated population. But even in both of these, in these two countries which can manifest very different characteristics and are really at extremes, let's say, in the system, you see, you see the problems that, that women and young children face.

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Tomaro – adolescent girls' health (1:29)

And those interventions in ECD are going to change over time because clearly one of the things we have to think about early on in health is, is the adolescent girl, okay, is she, is she healthy? Okay. Is she healthy? Is she properly nourished because a mom who is not healthy is not going to have a baby who's very healthy. We've seen, from cohort to cohort, how malnutrition, you know, goes from one child to the next within a household where feeding practices or stimulation practices, where health practices are not, you know, are not appropriate.

So we, we at least in the health side, have to begin to intervene with the adolescent girl, okay, to make her aware of issues around reproductive health, to make her aware of the importance of ante-natal care, to make her aware of, you know, the importance of having an assisted birth, that is, that she's attended by a competent, a competent health professional who can deliver her baby whether it's a midwife, or whether it's a nurse-midwife, whether it's a physician is irrelevant, but someone who is clearly skilled.

And then, this mom has to be aware of the issues that she has to take care of with respect to the health of her baby, the health of herself, but also what has to happen between them in terms of the stimulation at the beginning of the development of this child, that is the intellectual, cognitive, physical development of this young child. And that's different. I mean, I think it's different in all contexts.

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Tremblay – early onset aggression; aggression and preschool period (3:15)

The Montreal longitudinal study helped us to understand that physical aggression is not something that starts during the elementary school years or during high school. Since they were at their peak in kindergarten and the frequency of behavior was decreasing as they grew older it forced us to start a study at birth to be able to understand the development of aggression during the preschool years. We've been following 2000 children from five months of age and they're now in kindergarten.

What we've been seeing is that from five months to approximately 24 months there is a rapid increase in the frequency of physical aggression; that the peak of physical aggression in terms of frequency is between age two and three, four years of age. And after that it starts decreasing. So that clearly, if there is learning of physical aggression it's starting very early but we believe that what we're seeing is that children do not have to learn to use physical aggression; this is a normal behavior early on and that the environment helps the child learn to use alternatives to physical aggression and this is why there is that early peak and then decrease of use of physical aggression throughout elementary school and adolescence.

We've also learned that there are children, although everybody does it at age two, there are some who use physical aggression more often than others and those are clearly more at risk of not learning alternatives. They need very good environments to be able to learn to put on the brakes. So that it's important for children during the first three, four years of life to have an environment that is helping learning alternatives to using physical aggression.

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Tremblay – intervention (2:25)

There were two main parts to the intervention. One was parent training, where we were going to the homes of the parents for every three weeks for a period of two years. We were doing a standard parent training intervention where we trained the parents to observe the behavior of their child; observe when they were behaving positively and reinforcing that positive behavior; observe when they were misbehaving and helping them learn to give proper responses to misbehavior. And also training them in sort of general problem resolution skills.

At the same time we were going into the schools and we were getting these children once a week into a social skills training program. And that social skills training program involved being in a group of highly skilled boys that we had identified before. So we had approximately five or six highly skilled boys with two or three boys who had behavior problems so that the highly skilled boys were acting as models for these low performing boys. And we believe that this type of intervention managed to get the boys who tended to be rejected to learn the skills to be accepted by the boys who have less problems.

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Tremblay – play fighting; rough and tumble (2:06)

Well, one of the most surprising findings that we are getting concerning the development of physical aggression is that play fighting is probably one of the best ways to learn alternatives to physical aggression. Play fighting is play and you can see that children are play fighting when they are laughing and having a lot of fun. You can see that they are not play fighting when they're crying that they've been hurt. So play fighting is a time where you are learning the limit between play and aggression. And if you are not play fighting it's hard to learn where are the differences. One of the best examples of play fighting is tickling. And if you've ever tickled someone, you may hurt that person the first time you do it. So you need to learn where the limit is, where it's fun and where it starts to be hurting the other person. And aggressive behaviors, if they are sort of in-built because we've needed them throughout evolution, there are behaviors that are fun. And that's why we see cats play fighting, and dogs play fight, and children spontaneously want to play fight. So having fun in doing these exercises, in playing, is a good way of learning alternatives to physical aggression.

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Tremblay – Montreal longitudinal experimental study; study of aggression (3:47)

The Montreal longitudinal experimental study is a study of boys who were in kindergarten in low socio-economic areas of Montreal in the early 1980s. These boys are now 26 years old and we have assessed them almost yearly since they were in kindergarten. It's a sample of approximately 1000 boys. The aim of the study was to understand the development of children who are at risk of having serious problems during adolescence. That's why we chose boys and that's why we chose them in a large city and from low socio-economic areas. The study has focused on a large range of topics, but one of the main focus was how can we prevent children who are at risk when they enter kindergarten from having serious problems in elementary school and then through the adolescent years.

We have shown with this study that probably children are at their worst in terms of aggression, hyperactivity. If we start in kindergarten, they are at their worst in kindergarten and most children as they grow older tend to reduce the frequency of their problem behaviors. But if they don't substantially reduce that level of problem behavior then they get into more problems in terms of the reactions to their behavior because they're growing taller and stronger and people will not put up with an aggressive, physically aggressive 12-year old as they will put up with a five or six-year old aggressive child.

We did a prevention experiment with that study, so we gave parent training and social skills training to the at-risk children and the at-risk were of course those who showed most problems in kindergarten. And we've shown that an intervention, an intensive two-year intervention, with these highly disruptive boys in kindergarten, could reduce their level of problems later on. Those who received the intervention were more successful in school, they had friends who were more positive, less of them abandoned school before the end of high school and less of them had serious delinquency problems.

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Tremblay – variation in physical aggression (2:38)

Physical aggression in children is present in almost every child early, but there is variation and there's a lot of variation. Some are more peaceful than others at two years of age. I tend to say that some have turbo motors and some don't have turbo motors. And most probably these differences are genetically related. It could also be something that happened in utero, it can be something that happened during the first few years of life. Some children are already more in control than others early on.

And we can see that in the difference between boys and girls. Boys are clearly more physically aggressive very early on than girls. So even if there is a genetic component, it's clear that the environment is playing an important role. But the environment needs to be better in terms of the quality of the environment if you have a turbo motor. Cause if you have a turbo motor you need to learn to put on the brakes. And learning to put on the brakes is something that you learn in your environment. Some children have sort of the brakes are working spontaneously much better and clearly boys have more difficulty learning to put on the brakes. Not all the boys, but in general boys need more support to learn to put on these brakes. So we need to be attentive to this when we have groups of boys and girls. It's clear that boys tend to be more turbulent and they need to have the right support to be able to learn alternatives to aggressive behavior.

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Viruru – interconnectedness (0:49)

There’s definitely less of a focus on the child as individual. Like, in fact, too much individualism is very much discouraged. There’s much more focus on interconnectedness than the, especially between parents and child, or other family members and child. It’s not unusual for children to live in what are called “joint families” where there’s, you know, there’ll be, like the head of the family and all his sons and their wives, and their children. Now that is declining the more with urbanization but it still happens and so children are used to forming multiple relationships.

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Viruru – views of childhood (3:27)

And so there's much less focus on the child as individual. Like I've, I remember very clearly from my preschool research when they would pass out slates for the children to write on, and they had them in two different colours--orange and green—and the children every once in a while would ask for "give me a green one' or 'give me an orange one' and the teacher would say 'no, you have to take what I give you'. They don't encourage that kind of choice, that's sort of, that's in many ways perceived as self-indulgent and that the more you get, the more you sort of get yourself into worldly objects, you lose focus of the real thing which is academics and which ultimately, I think, are seen as liberating. And again, this is a very new perspective on 'learning kind of leads us to liberation'.

So, you know, traditionally potty training for example, has been something that was not based on the child as independent from the parent. It was more 'I anticipate your needs and you anticipate mine'. And that's kind of a context in which it comes from. And there's less, I think, childhood is not as psychologized maybe, as it is in the West, so schools are pretty much there for academic instruction. There's not a concern of 'we have to provide for their social development, their psychological development' and I read that as they're not trying to control every area of the child's life. There's always room for interaction and social worlds and, in fact, there are studies that show that children in India recognize complex emotions earlier, probably, than their counterparts in the West.

So I think childhood itself is, is definitely—now I don't even know that it's as strictly defined because age is not something that's indigenous to the Indian way of thinking. A lot of older adults, for example, don't know how old they are. So it's not as much about this age—like things like the "terrible two's" don't exist in India. Teenagers—that whole adolescence—that doesn't exist. There are no such stages that, and so you don't see that kind of perception. It's all, it's much more fluid and it's not as dichotomous.

There's a quote that I used in the childhood labour piece about when you—there's kind of a famous research study in which an American researcher asked this woman about differences in how we raise our children and she said, 'You raise your children. We live with ours'. So I think that kind of captures some of the complexities there.

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Walker – effectiveness of intervention (1:31)

Well, I think there are a number of things, it's delivered by community health workers who are women from the same communities, not necessarily the same community, but similar communities as the mothers they're working with, so they're able to develop a very good relationship with the mothers. Then we also have quite a lot of training of the visitors, so that they're very clear about what they should be doing in terms of the activities to do with the mothers. But what's most important I think is not even so much the activities that they do, but how they do it. So it's very much around demonstrating with the mother and the child, letting the child explore, and then making sure that the mother is comfortable doing the activities and over time, in a sense allowing the mother to take more and more charge of the visits because it's about helping the mother to be more effective at responding to her child, interacting with her child, promoting her child's development. So it's very much not about the child learning in the visit per se, but that in between the visits, the mother then is encouraged to do the things that she has learned, and to interact more with her child, to speak more with her child, 'cause we put a lot of emphasis on language.

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Walker – Jamaica study (1:13)

The Jamaica Home Visiting study began in 1986 and enrolled stunted children, and at that time we were just learning that they were particularly vulnerable to poor development. And it was a trial of nutritional supplementation, as well as psychosocial stimulation. And both of those, we found out over the two years of the studies, benefitted children's' development, and the children who received both did the best. But what we then followed up the children through childhood, and the latest follow-up at age 22, and what we found was that the benefits from the supplementation weren't sustained beyond age 7. But that the benefits from stimulation, which was really around a home visiting program were committed to health workers, empowered mothers to better promote their child's development, that the benefits from that were sustained, and that over time they spread from just development and IQ to other aspects, such as educational achievement and social functioning.

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Walker – quality (2:36)

We developed a number of manuals around it, so a training manual, a manual for supervisors. We expanded and made the curriculum more user-friendly, and we developed a series of films, so a film that gives somebody an idea what a home visit should look like from the beginning to the end. How you come in, introduce, you know, the rapport with the mother, some example activities and preparing for leaving and encouraging the mother for the rest of the week. And then we also made a series of films, much shorter films, just around particular activities that you might be trying to get across in terms of how to teach a child, how to engage a mother, so a lot of the "how" part, as well as some of the activities that you might do with a child, so some blocks or looking at books and things like that. So, there's a whole package of materials and so far, because we became concerned, we have the idea that we just pushed on the Web, make it freely available. And then we were a bit concerned, we thought about it, we were a bit concerned about how it might be used and not maintaining the effectiveness of the intervention if people didn't have some amount of engagement with somebody who knew about the training. So what we've been doing is working in 3 countries more in detail, and then we want to expand the number of people qualified to train, so that they can do in-country training and then we would release all the materials as long as somebody was going to have a qualified trainer involved.

While the Jamaica study is very exciting and influential, we have to understand that it was relatively small scale and very carefully done and intensive. So we want to know, well if we replicated maybe fortnightly, and people go fortnightly and they haven't quite that level of supervision and they have a benefit, but not as big a benefit as you would anticipate how sustainable is that benefit. And I don't think we really know the answer yet, but I think the information will be beginning to come out soon because I think people recognize it's a gap.

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Walker – reaching more children and families, part 2 (3:32)

So moving on to the next area of work that we're doing, which is expanding access through training. As you've heard, the Jamaica Home Visit Program has a strong evidence base, it's feasible in low resource settings, and has been replicated in other countries. So we wanted to develop, and this is in partnership I should say with Grand Challenges Canada, we are developing an innovative web package with training and technical support, which is targeted to organizations in low and middle income countries.

So our goal is to increase the capacity of staff in these organizations to implement programs, and so to be able to train the visitor who's shown in the picture at the bottom of this slide to deliver the program to the mother, and also to monitor the quality of the program. And so the goal then would be for the child to have a more responsive, interactive caregiver. We've produced a whole series of films. The work started this year, and our focus this year has been on developing the program materials. So we've produced films in Jamaica, Peru, and Bangladesh, and the Peru and Bangladesh films were done in collaboration with Cuna Mas and ICDDRB. So they're three 15 minutes films which demonstrate the steps you would take in a home visit, and 28 short films which depict specific activities and concepts that are needed for training. We're also working on revising and updating the curriculum which is designed for use by the home visitor, developing training manuals for use by the trainer including a guide or use with the films, and a guide to how to adapt our program by the program leads or the specific needs of their country or context.

In the coming year we're going to be working with organizations in our countries who we've termed early users. And this is for us to learn what are the challenges with implementation, and to maybe modify some things that we can still modify, and to do some evaluation of how the package works. So in these countries we'll be providing some more detailed on the ground technical support, including workshops, helping them with adapting the materials, and very importantly working on tools or monitoring and evaluation and training in how to use these so as to maintain quality. So really a lot of emphasis on how they would supervise and monitor the program.

And just to say, the next step following that, hopefully by the middle of next year we expect to have the films and materials online, and we'll be developing the technical support over the course of the year. We're hoping that the first organizations will do some further evaluation of how it works so that we can further modify and develop the technical support, which will also be available online.

And one of the things I just wanted to point out is also that the package is going to have a creative commons license, which allows users to adapt it freely for their needs as long as they attribute the original to the developers, and also as long as they share what they develop under the same guidelines. Thank you.

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Walker – scaling (1:16)

The work that we're doing in scaling up is not so much ourselves scaling up, but that we wanted to do some work to facilitate others who wanted to implement similar interventions at scale. So what we've done is to develop a program which we call the Reach Up Parenting Program, and based on the Jamaica Home Visit intervention, and developed a training package and some technical support, so that we can empower others to implement similar interventions, because one of the big challenges in taking early childhood to scale is having the human resource capacity. So having people at different levels, people who understand an intervention sufficiently to train and supervise or mentor, as well as people who can train community health workers or other similar people to actually deliver the intervention to families. So this was really an attempt to expand the human resources available in various countries to deliver early childhood interventions, particularly around home visiting.

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Warner – ecological framework (2:00)

The ecological framework is really important for looking at the returns from early childhood programs. And my concern with the way economists have come in and looked at the child development studies is that they fail to acknowledge the ecological framework. We need to think of person, place and context. A child is not a biological unit that you insert a little bit of early education and you get these huge results. And that is the way many of the economic are interpreting these investments in formal preschool: 'bad parenting is the problem, formal preschool is the solution. We'll give it three hours a day when you're four years old and voila we'll get returns of 17 to one returns. That's crazy.

A child is a human being. It's born into a family. It's not a biological unit, it's a person. And it's born into a family of parents who most likely work. They have a dual role in society of being caregivers and workers. And they live in a neighbourhood which may not even have any child care facilities. And they work outside their neigh, and they have long commutes and they have high stresses and all those stresses come back on to them, affect their parenting and affect that child's development. Three-hour a day preschool when that baby hits four-years-old is not going to make very much difference.

You need to begin investing early, and you need to think about the child nested in an ecological context. The child as a biological system, a human being, sitting inside a family as a social system, and that family is sitting inside a neighbourhood as a community system, and that neighbourhood is a part of a city, and that city is a part of a policy, a government that decides to care about children and value them as citizens, or to ignore them and treat them as only the private responsibility of their parents.

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Warner – social benefits of early education (2:05)

Traditionally we think of social welfare expenditures as negatives in national income accounts and we think of economic developments as positive: investments are positive, expenditures are negative. What's happening now with the new research on early care and education is a reinterpretation of those expenditures as investments, and this is a radical shift because when government or business thinks about something as an expenditure, it's just money lost. But when you think of something as an investment, it's money that yields a return. And it turns out that both in the short-, medium- and long-terms, early care and education investments yield a positive return.

And this is huge because as governments are stressed in terms of the amount of taxes they can raise and what kind of expenditures they feel they can handle, those things that are thought of as expenditures pure and simple are more likely to be cut. And programs and activities that are considered investment activities are things that you really need to do to for your short- and long term economic health.

So they are investments and we need to start talking about them in that way and thinking about finance vehicles that we use in other physical infrastructures. We don't have to pay for the full cost of a bridge today in order to build it. We know we can't wait and build it brick by brick over the next 20 years but we expect our children to wait. And while we wait in policy trying to figure out what to do they grow up without the care they need. When we need a bridge, we build it immediately: we finance it with long term financing. We build it immediately. We need to start thinking about an investment system in early care and education that acknowledges these highly positive long-term and short-term and medium returns and then goes ahead and builds it today.

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Watson – powerful friends (1:50)

Early childhood advocates have been in the trenches for decades, fighting for better recognition and more funding for early childhood, and they continue to be the experts on what the system should look like. But as a colleague of mine once said, "Powerless children need powerful friends." In order to get the dramatic increases in public funding that we want, we need powerful people to use their reputation and their clout to convince policy makers that this is in the best interest of their community, their state, their nation, whatever nation that is. So, we used business leaders not as a substitute for the advocacy of the early childhood community, but as a supplement to show that this investment helps everybody.

So when we say unexpected champions, we mean leaders, powerful people outside the early childhood field, who are willing to say that early childhood is an essential part of improving a country's wellbeing. These can include business leaders, not people in the childcare field, but business leaders from other companies. It can include police officials who are willing to say that early childhood is a wonderful way to reduce crime and violence. It can be athletes, celebrities, doctors, teachers of older children as well, all of these people can say even though we're not in the field of early childhood, we believe that this is an important investment. And those statements carry a lot of weight with policy makers, specifically because those people aren't from the early childhood world.

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Watson – Ready Nation (1:34)

Ready Nation is a global business organization of 1400 executives and all of our members want to improve the economy and work force, and they believe that investing in children starting in the earliest ages is the best way to grow the economy and produce a strong workforce.

Business leaders can do a wide range of things to support young children. We talk about this in 6 categories of action that I'll describe briefly. At the most local level, they can donate money and volunteer as an expertise, a traditional corporate social responsibility role. Secondly, they can work through their employees, giving them family friendly practices, as well as educating them on the importance of early childhood. They can use their customer base as a way to educate more people about the importance of early childhood. Fourth, they can develop products, goods, and services that make money but also contribute to the social good. Fifth, they can use their platforms to speak out on the importance of early childhood through the media or other prominent venues, and then perhaps most importantly, we want them to use their clout and their reputation in their power to influence policy change so that we can increase public funding for early childhood investment from the local level, to the national, to the global levels.

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Weinberg – animal models (3:33)

I work with animal models of prenatal alcohol exposure. And animal models have been very important to this field. When fetal alcohol syndrome was first described in articles that kind of reached the public in 1973, there was tremendous skepticism that alcohol actually could cause this syndrome called Fetal Alcohol Syndrome, which was so severe. The notion was people had been drinking since biblical times and nobody ever described this, and now suddenly in 1973 we have this “new” thing called Fetal Alcohol Syndrome. And people didn’t believe it, they said it can’t be, alcohol is not doing this, it must be drugs, it must be liver disease, it must be malnutrition, it’s got to be something else. And so the animal models were developed very early in this field, really shortly after FAS first came into the literature. And they were critical in showing that alcohol really is the teratogen. A teratogen is something that can cause birth defects, and they cause not only physical defects, but behavioural defects, cognitive defects.

And so that’s why animal models are critical. They first of all, work in the animal models; and there were a variety of animal models early on, from miniature swine, and that’s one animal that actually likes to drink alcohol. People did some early work with dogs, of course rodents, rats and mice were used the most, and work in primates. And all of that work showed that, really mirrored what was being seen in the human studies, in the clinical literature, that the effects exist on a continuum, on a spectrum from very mild to very severe. That you could directly link whatever you saw to alcohol, because in an animal model you can control for all of the things you can’t control for in clinical studies. You can control maternal health, nutrition, the dose of alcohol, the timing of alcohol exposure. You can control the genetics, so you can use animals that are more sensitive to alcohol, or less sensitive to alcohol, and that eliminates some of this genetic variability in the clinical situation. You can control environment. So, under those very controlled conditions the animal models were critical in showing that alcohol really causes the changes that you’re seeing in the clinical situation, from the facial dysmorphology, the facial features that are characteristic of FAS, all the way down to behavioural changes, learning and memory, things like that. So that’s why animal models have been useful, that’s the first reason they’ve been useful. Really confirming the fact that alcohol is a teratogen.

And then the second issue is that they allow us, the animal models allow us to look at mechanism. How is alcohol having its effects? How does alcohol work on the organism? How does it work on the brain? And then we can take the brains directly from an animal study and examine the brains carefully and understand exactly what alcohol does to the brain.

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Werker – bilingualism advantage (1:57)

So I like to think about what babies are figuring out in infancy as advantaging them for their particular linguistic environment, and if it has other cognitive consequences, I think those will be really interesting to study as well and I'm sure that there are some advantages to bilingualism, as I said they have been demonstrated, but I suspect, and there is evidence, that there are some costs as well, so the rate of processing information is just a little bit slower. The rate of labeling, of responding and pushing a button to which object a word goes with is just a little bit slower in bilinguals because there are two lexicons that have to be consulted, so this is not a surprise. Does that rate difference have any consequences? Maybe not, maybe not at all, and the cognitive advantages may far outweigh, but I still think the most interesting question is how the human mind adapts to the input that its getting in a way that optimizes the environment that the child is going to be living in.

There isn't any good evidence that bilingualism or trilingualism makes one more able to learn yet another language at the perceptual and cognitive processing level there is no good evidence. It's very likely that it has an impact at the willingness to learn level, but perceptually and cognitively there is no good evidence that it facilitates learning of yet another language.

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Werker – bilingualism advantage research (4:22)

I'm often asked whether babies growing up bilingual have an advantage or a disadvantage in language acquisition, and I think it's an interesting question but it's not exactly the way that we try and approach this work. There are groups who claim and show some good evidence there are advantages to bilingualism in terms of flexibility and problem solving and perhaps in reserve in aging and there's some nice work from Aggie Kovaks and Jaques Mailer that shows that babies who are growing up bilingual are better able to simultaneously learn or to learn one set of rules then change to another set of rules, but if you think about that in the context of language learning, you can think of that as an advantage or you can think of that as an adaptive developmental achievement. So a baby who's growing up bilingual being able to learn one set of rules then learn another set of rules, you can see how that would be something that they've had experience with growing up bilingual

What our work shows is that there are definitely differences in babies who grow up bilingual versus monolingual and some of those can be, could be imagined, and they might be just overall advantages. So a baby growing up bilingual for example maintains sensitivity to the consonant distinctions used in both of their languages, something they need to do. Even if the da-ta difference is, the categories are different in English and in French, and a baby who is bilingual in English and in French by the time they're a year old they have the d-t distinction in English as well at the d-t distinction in French whereas a mono lingual baby only has one of those. It's an advantage for the bilingual baby because they need two sets of distinctions, it wouldn't be an advantage for the monolingual baby to have two sets of distinctions, it could be seen as a disadvantage if they maintained that. We've looked at a lot of different aspects of bilingual acquisition. One that we've looked at is visual language discrimination, so a young baby can discriminate the change from one language to the other just by watching the face of somebody who's speaking to them. So when shown videos of three French English bilingual speakers just with the sound turned off, so reciting little sentences first in English then in French, babies at four months, monolingual or bilingual can discriminate change from one language to the next. By eight months of age, monolingual babies are not sensitive to that cue anymore, and what we've published in previous work is that French English babies continue to be sensitive so that's certainly an advantage for a bilingual learning baby to be able to continue to use cues just in silent talking faces to distinguish them. The monolingual baby can't do that, so maybe that's a disadvantage, but maybe they're paying attention to something else, we don't know.

Recently we showed that, and this is work with Nuria Sebastian Gallas in Barcelona that even Spanish Catalan bilingual babies can discriminate the change between visual English and visual French, so it does look like, those are two unfamiliar languages to them, so it does look like there is some kind of heightened sensitivity in the perceptual or attentional system in bilingual babies for paying attention to possible cues that will distinguish languages even when they're unfamiliar. Is that a general advantage that has consequences in other learning domains or is it something that's just specific to the language domain we don't know the answer to that question yet, and we think that's a really interesting question for further research.

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Werker – critical period for language acquisition (1:59)

The question of whether there's a critical period for language development, I think is one of the most interesting questions in language acquisition. And if someone had asked me this question five years ago, I would have answered very confidently Yes, that there is a critical period for language acquisition. And there is indeed a lot of evidence that is consistent with the notion of a critical period. And this comes from children who are hard of hearing and are not exposed to any patterned language input until they have the opportunity to see a sign language. And this is the work of Elissa Newport and Rachel Mayberry and others that have shown that children who are exposed to a sign language before the age of seven have a much better chance of fully developing a language than do children who are not. And there's similar work from children's ability to acquire a second language. There the "critical" period looks a little bit later, maybe to age 11.

On the other hand, more recent data suggests that even the sort of sacred notion of a critical period for language acquisition needs to be qualified. That there may be a critical period for acquisition of the first language. You may need to have some kind of patterned input in the first several years of life in order to be able to acquire a language but the idea of a critical period for a second language acquisition may be a little bit more plastic than we once supposed. That if we change the exposure conditions and the training conditions, there may be more adaptability and capacity to acquire a second language, later, than we once thought.

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Werker – interpreting the research (5:11)

So there were two possible explanations for this pattern of results. One is that SRI exposure just disrupts the circuitry in such a way that it interferes with learning or perception or performance in the tasks that we were looking at, and there is indeed evidence that exposure to SRIs does change tonotopic organization in the primary auditory cortex, so that was one possibility. The other possibility was that exposure to SRIs had moved the whole sort of sensitive period earlier in development and that changes had been taking place even before six months of age, and that had we tested the babies at a younger age, we might have seen discrimination. So what we had in our data set, we hadn't tested them at four months or two months or even at birth, but what we did have in our data set was we had looked at discrimination of vowels and consonants in utero, at 36 weeks of age by measuring the fetal heart rate deceleration to a change. You get a deceleration if they hear like da da da da da da over and over again and then it changes to ta you get a temporary deceleration in heart rate and previous work has shown that at 36 weeks gestation fetuses discriminate vowels, but there's no evidence that they discriminate very similar consonant sounds that early. So we tested them on a da ta distinction as well as an ah e distinction and what we found is that we had babies, we had fetuses whose mothers were taking SRI in our sample and fetuses whose mothers were not depressed and were not taking SSRIs. We didn't have a group of non-exposed depressed moms' babies in that sample. What we found is that both groups of babies discriminated the vowel distinction, well both groups of fetuses at 36 weeks, so discrimination was still in place in the SRI babies. They were doing exactly what had been reported in the previous literature for a typical population. Interestingly, we also replicated the inability of 36-week fetuses who had not been exposed to SRIs to discriminate the consonant distinction, but the SRI exposed fetuses did discriminate it.

So the interpretation we have for this whole set of findings then is that SRI exposure accelerates this onset of plasticity and the pathways by which it does so may not be. They may be the typical pathways by which serotonin works, but they may also instead be different pathways that have already been implicated in changing plasticity in gaba pathways that have already been implicated. So it may be a different set of pathways so that sensitivity to the properties of native language and then the decline in sensitivity is all pushed earlier. So we think then that SRI exposure accelerates the onset of plasticity, but the answer for depressed moms is not don't take SRIs because there are also developmental implications of maternal depression that is not treated with SRIs. The take home message that we want to give mothers here is to not beat yourself up if you're depressed, the incidence of depression is very high, people, women in particular, are much too likely to experience a period of depression in their lives. The message is that by doing this kind of research that allows us to understand what the effect is and then we collaborate with, Techau-Hinch does animal model work, where we can get into the circuits and understand exactly how depression and/or SRI exposure modify development that we're in a position to work with moms and say okay, you're depressed. You had this happen you had that happen. All sort of things happen to our infants and to us while we're pregnant or while we're raising our children that we can't control, but by understanding more mechanistically what the effects are on the process of development we're in a better position to optimize development for children and for their mothers.

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In our lab, we haven't so far, looked at how the quality of mother infant interactions can impact and interact with these different sort of trajectories of development but I think that's a really interesting and important area for further research.

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Werker – Korean study (2:31)

I think the question of a critical period for language acquisition also needs to be addressed at different levels of language. So vocabulary we can probably continue to acquire throughout our lives. There's no critical period for the acquisition of vocabulary. Syntax, or the grammar of language, becomes more difficult. Phrenology, the sound properties of language becomes more difficult. And there the question of exposure and training conditions I think becomes really important.

There's one recent study that I think is really interesting and makes us all pause when we think about the notion of critical periods. And this is a study that was done in France by Christophe Pallier and others, where they looked at French speakers whose initial language was Korean. They were Korean war orphans who were adopted into French-speaking homes in isolated little villages, up to the ages of eight or nine. And subsequently, at the time of adoption they spoke no French, they spoke only Korean. Subsequently they had virtually no exposure to Korean throughout the rest of their lives. And now as adults, middle-aged adults many of them, their ability to speak French is no different than any other French person. They can't find any differences in their perceptual capabilities for French; they can't find any differences that are really significant in brain-imaging studies of their response to French and conversely there's nothing left of Korean that they can reveal at any level of analysis.

And so this I think is a powerful example of how there is more flexibility after the age at which we thought there wasn't and it's in a circumstance where interference from the first language has been removed. So many of us now are reexamining our assumptions about critical periods. And when we see evidence of something that looks like a critical period in language acquisition, how much of it is based in something that's unchangeable and how much of it is based in sort of an interaction between biological development and the types of learning and listening experiences that the child has had.

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Werker – motherese (0:59)

Motherese refers to the way that we speak to infants and young children. Some of us have suggested that maybe it should be called parentese because it's not just mothers who do it. But what it refers to is the fact that we modify our voices as well as the style of speaking and, to some degree, the content of what we say when we're speaking to infants and young children. So for example, speech directed to young infants is usually higher in pitch; the vowels are elongated and it's quite musical in quality. As children get a little bit older, the pitch exaggeration isn't as great. So it's still high in pitch but not as high in pitch, to a little bit older infant or a young child. But the sentences are simplified and the choice of the vocabulary may be a little bit tailored to the developmental age of the child. So that's what motherese is.

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Werker – native language sensitivity (2:31)

Babies are born with perceptual sensitivities that prepare them for, among other things, learning language. And we know now from decades of research really, that when babies are first born they're sensitive to the individual sounds of the world's languages, they're sensitive to the rhythmical properties, to the stress patterns etc. And one of the remarkable changes that happens in the first weeks and months of life is that babies become more attuned to the properties of the native language, so they get better at discriminating the consonants and or vowels that are used in the native language. They get better at parsing, pulling multi work units in the native language in comparison to the unfamiliar language, and they get worse at doing these same things with nonnative speech.

What's interesting is this tuning to the sound properties and visual properties of the native language actually is important for later language acquisition. So as babies begin to learn words, they have to determine, or they have to be able to listen selectively to those sound differences that are going to be important and those that are not. So for example a baby learning English will need to treat different pronunciations of the word doll as all referring to the same object. So whether their mother says do you see this doll, or this is our doll, both of which change the character of that initial d, the English learning child needs to treat those pronunciations of doll as the same word, and hence learn how that refers to a particular object, whereas a baby in a Hindi learning environment, the d that would follow the s in this doll is a little bit different than the d that would follow the r in our doll. One of those is a dental d and one of those is a retroflex d, and those refer to two different words, those are two different words in Hindi, so the Hindi learning child needs to pay attention to that difference because it allows them to learn different words.

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Werker – newborn communication (2:47)

Newborn infants are prepared in a number of ways for acquiring language. I wouldn't say that they really speak yet, at birth. They have some vocal repertoire, primarily crying and vegetative sounds. Some people say, and there's some research to suggest, that those ultimately turn into the vowels and consonants of language. But what newborns do have is wonderful skills for listening to language. They seem to have been prepared both by biology and by prenatal experience for listening to the mother's voice and to the sounds and rhythmical characteristics of the native language.

So at birth, newborn infants show a preference for their mother's speech; their mother's voice over other female voices. They show a preference for language samples with the rhythmical properties of their native language versus an unfamiliar language. So for example, an English-exposed newborn will prefer listening to English and German and other languages with that kind of rhythm over languages like Spanish and Japanese that have different timing characteristics.

Newborn infants also show a number of other biases and preferences that are harder to explain on the basis of prenatal experience. They show a preference for listening to speech over non-speech. They show a preference for, or an ability to discriminate words that will ultimately carry meaning versus words that will ultimately carry structure in language. So content versus function words have different characteristics. Nouns, verbs, adjectives–words like dog, run, pretty; they treat as different than words, function words, that will ultimately carry structure like with, the, of. And they discriminate those two classes of words categorically.

So the set of abilities, some of which are probably given, as I said, by biology or an interaction between biology and prenatal experience and some of which are completely tailored from prenatal listening experience, prepare the newborn infant, at birth, to listen to speech over other types of sounds, to listen to their mother's voice, to listen to and pick out members of their linguistic community, and to begin to classify those words that they're hearing into the two big categories that will ultimately be necessary to put together meaning and grammar in acquiring a language. So they're pretty well prepared at birth for acquiring language.

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Werker – newborn language abilities (2:22)

It's really fun to work with newborn infants. And to try to figure out what they know and don't know about language, or what kinds of biases and preferences they have. And researchers who work with newborn infants take advantage of the repertoire of behaviors that a newborn infant has. In my lab, we take advantage of the sucking reflex. So when they're born, newborn infants have a reflex to suck. You put your finger in a baby's mouth and they'll start sucking on it. Many babies are born with a blister from sucking their thumbs in utero. So the sucking reflex is something that's very well developed. And you can change the properties of the sucking reflex by presenting infants with stimuli, sounds or sights that they find interesting. So if you make it that every time a baby gives a strong suck for them that they get to hear a sound, they will change the number of strong sucks that they give per minute. They will give more strong sucks so they can hear more sounds.

You can condition the burst interval in sucking. Babies suck in bursts. They go (sucking sound) and so the strength of the suck, the duration of the suck, and burst, and the interval between bursts; all of those babies will change in order to see or hear interesting stimuli. And so, in my lab, when we test newborn infants on their preferences for different properties of language or on their ability to discriminate one type of sound from another, we use high amplitude sucking. So we present babies with a sound every time they do what is a strong suck for them, a high amplitude suck, and over the course of several minutes they suck quite vigorously to hear sounds. And they will suck more vigorously to sounds that they prefer over sounds that they don't like. So we can count the number of high amplitude sucks per minute to the native language versus an unfamiliar language, for example, or to speech versus non-speech, and newborn babies will show us what their preferences are by the number of times that they choose to suck in order to hear those sounds.

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Werker – predicting later language and literacy (4:29)

One of the most important questions in the field of language acquisition is whether we can predict from early language development, later language skill. So can we identify in infancy, toddlerhood or the early school years, the child who's later going to have difficulties speaking, reading, spelling with some more complex use of language. If we could identify, reliably, those children who are developing well, those children who need just a little bit of a push to achieve their potential, and those children who need more specific targeted intervention and just what that intervention is, I think we would all feel that our work on basic language acquisition had been able to make a difference in children who may not be developing so well. And there is an enormous amount of work showing continuity in some realms of language acquisition from early to later years.

So, for example, there are the studies, the Hart and Risley study showing that the richness of the vocabulary input that the child hears in the toddler years predicts the size of their vocabulary. There are a number of studies showing that phonological awareness, so children's ability to rhyme, to show alliteration, and that's recognizing the same sounds at the beginning of words, to count the number of syllables in a word or the number of phonemes, the word cat, for example, has three phonemes c-a-t; those kinds of phonological awareness skills at three and four, predict reading readiness very well. And there are a number of researchers around the world, including in Canada, who have shown that if you go into a kindergarten or grade one classroom and identify the children who do not have good phonological awareness skills, or simply introduce an across-the-board program for all children, with little games to facilitate phonological awareness, that the number of reading problems decreases significantly.

So knowledge of the properties of sound of words is useful in translating between listening and reading. And using, sort of, the orthography to map sounds to letters. There's no question about that. So that's some work that shows a relationship between early language acquisition and later literacy.

There's also work on the pragmatics of interacting with children. Children whose parents read to them, just open a book, turn the pages, those children have a more positive approach to learning how to read and are more successful when they start school.

A focus of my work and the work of a number of other infancy researchers now, is to try and reach down into infancy and to see if some of the pre-language skills that emerge in perception of language, in simple associative word learning and even in things like the quickness with which you can recognize a familiar word in the first couple of years of life; whether those will predict later language skills and later literacy. I can tell you that we're working on these questions and that the results to date look very promising. There are a number of other labs around world, also working on these questions and it's kind of exciting that infants' speech perception and early word learning research has reached the level of maturity where we have stable enough findings about the descriptive aspects of typical language development in the infancy period to be able to use these milestones we've identified in infancy to see if children who are not achieving these milestones at the same age as other children or as successfully as other children are those children for whom early intervention could be very effective.

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Werker – studying the babies of depressed mothers (4:25)

Typically one thinks about tuning to the properties of the native language as a kind of self-contained system, that the language input that the child receives or even the more active sort of interaction that the child has with other speakers of their language will provide the system with the information that's required to tune the perceptual system to the properties of the native language and then set all the sequela in motion for language acquisition. So it seems to be in many respects the standard body of evidence would suggest that this is a perceptual tuning that is marching along according to maturation and then the input has an effect at the time that the system or the developing brain or the circuits in the brain are ready to become attuned to that particular input. But we know that in the visual system and other perceptual systems that more extreme environmental differences can change the timing of change. So we know that enriched input, very enriched input or pharmacological, like drugs, can accelerate timing, and we know that dark rearing, so not getting enough visual input or not getting any input at all can sort of put critical periods or sensitive periods on hold and so delay timing until a later age.

So in collaboration with Tekau Hinch and Tim Oberlander who studies maternal depression, and Whitney Wycomb, we asked whether exposure to certain pharmacological agents like anti-depressant medication and or exposure to maternal depression that isn't treated with anti-depression medication might have an impact on the timing of developmental change. So we worked with a cohort of mothers who had been depressed throughout their pregnancy and had either been taking or not taking anti-depressant medication, serotonin reuptake inhibitors, and we compared them. We also had a control group, control cohort of mothers who were not depressed during pregnancy and we tested their babies on the timing of tuning to the properties of the native language and what we found is that exposure to maternal depression that had not been treated with SRIs seemed to be like dark rearing in visual development in that it seemed to put the whole developmental sort of trajectory on hold so that at ten months of age the babies were still discriminating the non-native consonant distinctions that are typically not discriminated at that age. So that seemed to be changing the course of development whether it's for good or bad we don't know yet; we need to test whether there's a later outcome. But in the babies whose mothers had been depressed and had been taking SRIs throughout their pregnancy what we found is that they didn't discriminate the consonant distinctions or the visual language change, I should say this holding pattern for the untreated maternal depression was there for visual language discrimination as well. These monolingual developing infants were still discriminating French from English at ten months so is that a delay, that's a bad thing or is it just a different trajectory. But in the babies who'd been exposed to SRIs in utero, serotonin re-uptake inhibitor anti-depressants, what we found is that they weren't discriminating the consonant change at either six or ten months, or the visual language change at either six or ten months.

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Yoshikawa – integration policy challenge (2:30)

One of the critical challenges for governments is to think of the combination of policy supports that will support the multiple domains of early childhood development. We know from the science that physical, cognitive, social, emotional, executive function, self-regulation -- these skills are intertwined across the life course and especially during the first years of life. But that creates quite a complicated policy challenge in every country that invests in early childhood. That is because typically, the services that we think of as associated with some of these areas of development have their own disciplinary perspectives, their own organizational and institutional structures and their own ministries, most often. So, whether they are ministries of health, education, social protection, women and children's issues, child protection, there is often a way in which the structure of governments is sliced up and arranged at the national, sub-national and local levels for which the intertwining of these skills and the support of these skills is quite a challenge.

We know that the family is certainly important, community contexts are important, early care and learning environments are important, and economic security kinds of supports are all important. And yet, they are often within these different ministries.

The challenges of conceptualizing and implementing policies have come up repeatedly in our workshops so far. I think for all of us in the early childhood field, the words coordination and integration come up very often whether they are in the rationales for investing in early childhood, the actual legislation for early childhood development, of which there has been a growing number of low and middle-income countries with national legislation across all these different sectors or areas, and then, most particularly, in the national action planning and the ways that the strategic plans are actually implemented across sectors. So this is not an easy topic.

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Young – EDI (4:20)

We have been looking at a measurement still very much on output, on processes, so very much on a deficit model. Whether we look at from education, we look at children's drop out, children's repetition rates. And we look from health we're looking at mortality rate or morbidity. Very seldom we can, we have looked at the child well-being as kind of a measure, an outcome, and also looking at, you know, what do we really want to attain in terms of our investments to early development programmes that will be able to maximize children's capabilities in terms of cognitive, social, emotional and interpersonal skills.

Therefore, measuring outcome is tremendously important. Not only to leverage or inform policy makers but to introduce a measure of accountability to be able to learn from how do we do it, how to and how to scale up those programmes under the various circumstances. The challenge is that we from different disciplines still look at our traditional measures of processes and output and we don't see outcome as something that we want to attain. And then, there is still to this date, there are limited, or up to now with Early Development Instrument there really is no outcome measure of child development.

The EDI has been implemented here in Canada, has been implemented in Australia, but increasingly there is that uptake in developing countries. Still kind of, we're still kind of moving slowly but now that there is such an instrument, and there's such kind of a knowledge about, what can be done. I see this tremendously important that we continually learn from. How do we adapt such instrument for developing countries and to be able to help them understand that, you know, that with this they can demonstrate the impact of their programmes and be able to leverage more? So I see this discussion that we are having now, of a very tremendous important value for developing countries who are eager to see it as what we can do early development programmes and to be able to leverage more.

Children's development, as we have, as has been portrayed with EDI really captures brain development and that...that it is universal, whether we, no matter where we are. And because of that I think countries are recognizing that "we have an outcome measure of children's brain development" at around the time of school entry. They really can help them understand or be able to monitor much better. Retrospectively how well they've done and prospectively how children will be able to benefit once they go into primary school.

One example of Jamaica – Ministry of Education – has noticed and the Minister herself, she noticed that children have, upon entering, they have attained almost universal enrolment. But by third grade they have such a high drop out. So the minister asked, requested for EDI because she wanted to know, what is the quality of entry at school so that they will be able to say "well what are the, who am I working with?" So I think having the EDI in developing country settings can be very instrumental to help us leverage to understand how effective our resources put in one sector which can be much which can be done, can be made more effective if we understand better what we have upon school entry.

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Young – measuring outcomes (1:30)

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Young – nutrition and stimulation (1:46)

There are many programs that has been evaluated on the importance of nutrition, the synergy of nutrition and stimulation. Many of the studies that have been done, even though at a smaller scale – pilot scale - has provided us evidence that, you know, it's not just nutrition, not just feeding but you need the stimulation to go with it to be able to enhance the effectiveness of those programs. And we have taken that to scale. For example, conditional cash transfer programs that has been implemented in Latin America but also, increasingly in other countries, show that through raising awareness about importance of nutrition and stimulation, parents working with their children, talking with their children, interacting, in addition to nutrition, has made a tremendously positive impact on children's overall development. So yes, there are programs that show, examples that we can learn from, take ECD to scale.

I think Lancet added the new dimension: it's not just your child survival, its nutrition and stimulation but health, but there are sufficient evidence from developing countries that substantiate why it is important for us work in a coherent manner to address children's development. And that the number, the magnitude is so huge that we cannot afford not doing, not doing more on early child development programs.

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Yousafzai – PEDS background (4:01)

This trial was designed because we found there was a real missing gap in addressing childhood interventions for the very young children from birth to two to three years of age. And the reason we found this was important was because there is so much, there is tremendous evidence from the neurosciences which tells us how we can modulate the quality of brain development in those early years and how is good to intervene early; and we know it's the health worker who is the person most likely to be able to support families and very young children.

And in many countries around the world like Pakistan. We also know that the risk factors that we are dealing with that cause poor development like malnutrition they are not only going to affect the physical well-being of the child but, the development of the well-being of the child.

And so, the health worker is ideally placed to integrate all of the interventions to do with better health, better development and to serve that child more holistically. So, that was the rationale for it and we began in July 2009 and the partnership that we have is with the lady health workers who are government based community health workers.

We wanted to implement a realistic intervention for them that they could integrate a child development module that complemented the health and nutrition services they already provided. So, we took the Care for Child Development module design by UNICEF and WHO, we adapted it and we've been training and supporting lady health workers to implement it over the last eighteen months.

So, it's an existing nationwide program in Pakistan. They provide very basic health care to mothers and children in rural communities and in disadvantaged and remote communities throughout the country; and like many other community health workers you find in India, in Bangladesh, in Kenya, they have probably a grade ten level of education. They are from the local community they serve and they have basic health care training and a very large workload.

We give the lady health worker a baseline training of three and a half days, which is not very much and we provide them with an ECD supervisor or an ECD facilitator, who provides on the job, continue on the job training and mentorship; and the lady health worker will deliver this to a group of mothers in her own area once a month.

And then she will do a follow-up home visit to that mother to see well, how the mother is getting on at home and do more individual counseling. So, the advantage of the group meetings is that the social interaction, the mothers get to see how children of different ages develop, see how different mothers work with their children, learn from each other so there is peer to peer learning and there is the social aspect, there is the… By using the groups I think we've created a demand in the community for early childhood development, so there is the message that's spread; and then the home visit is the opportunity to really build the mother skills on one to one basis; and so the lady health worker is able to follow-up and she integrates that so she does that with health and nutrition.

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And now we're beginning to see that mothers see these things linking up so the discussion on the development of the child and the activities is the focus point for talking about everything to do with the child. So, that's how it works on the intervention side.

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Yousafzai – PEDS methodology (3:19)

On the research side we're following a group of children whose families have participated in the study so we're following them from birth to two years of age. And we're taking measurements of their growth, their nutritional well-being, their health. We're taking measurements of their caregiving environment, their malnutrition status and their functioning: their cognitive development, their language development, their fine and gross motor development, their social emotional development.

We are observing the interaction between mother and child and we are also seeing whether we have any impact at all on maternal stress. Whether if the mother participates in this, if she is focusing on her child, if she is getting that peer-to-peer support. Does that have any benefits for the mother, as a women, not just as a mother with benefits for her child.

So, we are, we have another year to go for the study but our early trends are promising. So we are seeing the ECD children who are exposed to these interventions compared with the controlled children thriving a little better, their development is a little better, their growth is a little better. So, we are slowly starting to see a picture, but we will not be able to tell the final results until next year.

So, it's a cluster randomized control trial and it's implemented in a two by two factorial design, so to put it very simply, there are four groups: one, is receiving the lady health worker standard services, so the basic health care that she already provides to the community. The second group is receiving the early childhood development module plus the lady health worker services. The third group is receiving enhanced nutrition counseling and sprinkles, which is a multi-micro-nutrient sachet which they mix into the complementary food from six to twenty four months of age; and the fourth group is receiving everything so they receive the basic health care services, the ECD interventions plus the nutrition.

And an expectation, as classical work from Jamaica has shown in terms of research, that the children that are exposed to the integrated package whether receiving health, nutritional care and child development interventions, the stimulation, the responsive care for development, those children will benefit the most. And behind that what we really hope to see and over time what we're beginning to see is, that as the mothers start to, as their capacities, as the quality of the sensitivity in their responsiveness skills begin to develop, that will have a spill over affect not just in how the children develop cognitively, but how the mother responds to early signs of illness, how she responds to feeding care, how she responds to the child's emotional needs as well. So, we hope to see that emerging in our data as well.

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Zelazo – developmental outcomes (1:33)

Executive function is emerging as a very important determinant of key developmental outcomes. Including, for example, academic performance in high school. So executive function measured during the preschool period predicts children's SAT scores in high school. And it predicts other important developmental outcomes. It's a good predictor, for example, of substance abuse problems, and criminal convictions, and so forth, much later in life.

And so there's been an awful lot of research in recent years, aimed at discovering ways to promote the healthy development of executive function. And increasingly, people, I think, are coming to realize that it is indeed something that is quite malleable, and can be trained. It's a skill like other skills. And our research has emphasized the extent to which the key underlying skill is the ability to step back and reflect upon one's own representations.

Not to just act impulsively, or immediately in response to a situation, but instead, to stop, and think, and consider the current context, and consider the long term outcomes of different potential behaviour, behaviours.

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Zelazo – infancy (1:35)

Executive function emerges in infancy and may be measured, for example, at the end of infancy by looking at children’s ability to solve very simple problems like, an object is hidden very conspicuously at a particular location, and then a delay is imposed, and infants are provided with the opportunity to search for that hidden object. And in order to search successfully, they need to keep the object in mind, and use a representation of that hidden object in order to guide their responding.

And in some versions of this type of task include, for example, Piaget’s famous A not B task where an object is first hidden at one location, and the infant is allowed to retrieve it, and then the infant is shown the object being hidden very conspicuously at a new location. And a delay is imposed. And at about nine months of age or so, infants tend to go back to that initial location even though they just saw it being hidden at a new location.

And the ability to search flexibly in that context, to inhibit the tendency simply to go back to the location where the object was found previously, and keep the relevant, current location of the object in mind, and act flexibly in light of that representation, that’s a good example of executive function in the infancy period.

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Zelazo – introduction to executive functions (2:16)

Well, executive function is a term that overlaps considerably with self-regulation. But it's a neuropsychological term that is used to refer specifically to those psychological processes that are involved in the more deliberate top-down, so to speak, aspects of self-regulation. So, when people use the term executive function, generally speaking they're talking about the processes that are involved in the deliberate self-regulation of behaviour. And more specifically they tend to refer to processes including cognitive flexibility, inhibitory control, and working memory, or keeping something in mind in order to use it in kind of a deliberate fashion to guide your behaviour.

Cognitive flexibility refers to the ability to think flexibly about a particular thing. To view, it for example, from multiple perspectives simultaneously. And it's manifested in interpersonal interactions, for example when understand that I think one way about something but somebody else thinks differently about it. And it's absolutely essential for flexible problem solving to be able to re-imagine, for example, an alternative way of achieving the same goal.

Inhibitory control refers to the ability to suppress a tendency simply to repeat whatever one has done in the past. And one may need to inhibit a particular motor response—a kind of overlearned behavioural routine, but also to inhibit attention to distracting or irrelevant information. And then working memory is typically used, the term is used to typically describe not just keeping something in mind, but also being able to turn it around in your mind, and manipulate it in addition to just maintaining information.

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Zelazo – parents (2:19)

Parents, I think, can play an important role in cultivating these kinds of skills. The ability to stop, and pay attention to what you're doing and consider the context. And consider what it is that one is doing in light of a broader range of considerations.

And that, that process of reflection is sometimes referred to as psychological distancing from a situation. So that one doesn't approach it in a more concrete and immediate fashion but considers it in relation to other things. One thing that I think is important for parents to keep in mind, is the, the relatively slow rate at which executive function develops over the course of childhood. It emerges early, in infancy, but it clearly continues to develop until at least early adulthood. And so we've looked at performance on particular measures from three to 85 years of age and you find an age-related increase, peaking at about 25 years of age, and then starting, rather precipitously, to decline over the course of adulthood.

Keeping in mind the relatively slow growth of executive function, parents, I think, might be encouraged to be patient with their children at particular times. Though it's quite a normal developmental phenomenon for children to, for example, be told what to do in a particular situation and you know they heard you, and they can even tell you right back what it is that they're supposed to be doing. But when they're in that situation, keeping the relevant information in mind and bringing it to bear on one's behaviour, in the face of distractions, and habits, and impulses, and so forth, is really challenging for young children. And so, so what looks like willful disobedience, is often just difficulty actually translating what one knows into behaviour.

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Zelazo – preschool years (2:24)

Because executive function refers to the deliberate, the processes involved in deliberate, goal-directed problem solving, it's necessary to create more and more difficult problems in order to assess executive function at different ages, as children get older. And so one task that we've investigated quite extensively, is something called the dimensional change card sort which is quite useful for studying executive function during the preschool period, between, for example, about three and five years of age.

And in this task children are shown target cards and then, for example, a red rabbit and a blue boat. And then they're given a series of test cards that would be sorted differently depending on whether you were sorting by shape or by colour. So they match one target on one dimension, and the other target on the other dimension. And children are told to sort the cards, for example, first by shape, and then after they sort a card or two by shape, they're told, "Okay, stop. I want you to play a new game. We're not going to play the shape game anymore. Now we're going to play the colour game."

In the colour game, red ones go over here, blue ones go over here. "Here's a red one, where does it go?" And curiously, three-year-olds typically perseverate in that task. They persist in sorting by that initial dimension even though they've been told the new rules. And you can ask these three-year-olds, you can say to a child who's persisting in sorting by shape, but now being told to sort by colour, you can say, "We're playing the colour game now, right?" And they say, "Right". And you say, "So where do the red ones go in the colour game?" And they point to the right box. And you say, "So what about this red one?" And they turn around and they sort it incorrectly by shape.

So again, that's a situation where you need to think flexibly, you need to keep the relevant rules in mind, you need to inhibit a tendency to persist in sorting according to the old dimension, and younger children have considerable difficulty with all three of those aspects of executive function. Whereas older children tend to behave correctly in that situation.

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