

Web-Based Radio Show

Visual Spatial Processing and Visual Spatial Reasoning:

Continuation of 4/7/05 show – how children with autistic spectrum disorders connect their feelings, emotions, or intentions with what they do


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Good morning. Welcome to our Web-Based Radio Show. This is Stanley Greenspan and we'll be joined momentarily by Serena Wieder.

As you recall, for the last few weeks we've been talking about visual spatial capacities. What we mean by that is the ability of the child to make sense of what they see and to coordinate what they see with what they hear, and what they touch, and what they feel emotionally, as well as what they smell, and how they move. As we discussed before, one of the biggest challenges for children with special needs, but also for all children, is to have all the parts of their mind and brain work together. So, we know that children with autistic spectrum disorders, for example, have a hard time, often, connecting their feelings or their emotions or their wishes or their intentions with what they do. So, instead of taking mommy by the hand and walking her to the door and showing her the toy they want, they may just line things up. Instead of saying, "Gee, I want some juice" they may just repeat a script sometimes, saying something they heard on TV or the radio.


These well-known symptoms of autism are often thought of as mysterious and not understood. But, when you think about it, we really do understand why this is happening. It is happening because the different parts of the mind and brain aren't working together as an organized team. If you have the child's actions, or what they do with their arms and legs not coordinated to what they wish or what their intentions are or what their desires are, or what they want to do, they may just do repetitive actions. If their words are not connected to their wishes, so that when they want a hug or a kiss they can't connect that desire to a set of words that expresses it, they may just repeat things they've heard. It may have only partial relationship to what they really want.



How does all this relate to the visual spatial world? Well, we traditionally have worked a lot with language skills and motor skills and social skills, but we haven't worked as much with helping children make sense of what they see. In recent years, through the work of colleagues like Harry Wachs and his colleague who has now passed away, Hans Firth, who both worked with Piaget during the middle part of the century, we have become more aware of the importance of visual spatial cognition or visual spatial thinking and processing. That is, how the child makes sense of what they see – how they connect what they see to the other parts of the nervous system, to what they do, what they do with their motor system, to their language, as well as most importantly, to their desires or their intentions, to their wishes, to their emotions, and to their evolving sense of who they are as a person, to their sense of themselves in terms of their body. For that reason, as we try to understand children with autism and other special needs conditions, we are spending an extra bit of focus on the child's visual spatial world and visual spatial thinking, because it has been so unattended to. In our recent work, we have been paying more attention to it and realized that we can help children with this part of their thinking, and this becomes a very, very important part of that mental team, along with language, motor, and other capacities.

As some of you may know, who have been listening, but for those who haven't, we have just completed the new ICDL – Interdisciplinary Council for Developmental and Learning Disorders Diagnostic Classification System for Infancy and Early Childhood Mental Health, Developmental, Regulatory, Sensory Processing and Language, and Learning Disorders. This new classification system includes visual spatial processes as one of the axis, just like language and emotional skills. So every child is profiled in many different areas, regardless of their diagnosis. If it is a diagnosis of autism as part of a neurodevelopmental disorder, or whether it is a diagnosis of a regulatory sensory processing disorder, or a mental health disorder such as anxiety or depression, they also get profiled in terms of visual spatial and language and motor capacities. The new manual, the new diagnostic manual, will be available in a few weeks at our upcoming spring training session. Those who are interested can order it from www.icdl.com and you can start ordering it right now and we will have it ready to send out within two weeks.

But now, with this introduction, what I want to do is go back to where we were, and Serena is going to join us in just a second, and share the next step in visual spatial thinking. We had talked about some of the earlier levels, which Serena will briefly




review where we have been, and then continue on in mapping out visual spatial processing or thinking, or as Harry Wachs likes to call it, “Visual Spatial Cognition.” Again, as a vital member of this mental team, and one that helps, actually, the team work better as a team. Implicit in the visual spatial processing is the connection to the underlying body image and the underlying wishes and desires. Serena?

SW: Good morning.

SG: Good morning. Why don’t you take over.

SW: Ok. One of the things I want to again emphasize, is that although I will be talking today about the different components of the visual spatial experience, all of these aspects are occurring together. We have been covering the six basic capacities that constitute your visual spatial understanding of the world. These started first with knowing about your own body, where your body is in space, knowing your own left side and right side, knowing how to move your body in space, knowing how long it takes to move yourself across space, and how the body, in the nature of motor development becomes coordinated, organized, and purposeful. We exist in this visual spatial world and have to learn how to navigate it, which led us to a discussion of the second core capacity, which is location of the body in space as children begin to move, as they get oriented – that if they move, the world doesn’t move as well – they are moving through space or around space, if they turn around – east, west, north, and south remain the same. This, of course, is very crucial because if you don’t know where you are, it is very hard to relate to where others are. It’s hard to play games if you don’t know what direction to go in or to catch a ball, and to become more and more purposeful in a world that is always dynamic and always moving. You have to be able to find yourself – first the parts of your own body and then your own body in space and the immediate surroundings, then of course, in the broader environment, which is always a changing environment.

So while this is so automatic for most children and for most of us, I think everyone would recognize the residuals of what happens when you are not really strong in this and just think of your own sense of spatial direction and trying to find a new location. These are challenges that we face every single day in terms of our being organized, by knowing how to get to a new place, our sequencing the tasks you want to accomplish – all pull on these very basic capacities.




The last thing we focused on, I think it was the last session, was the relationship of yourself to things or to objects, and of course the most important object are the people in your life, starting with your mother and father and your caregivers and then moving on to the expanding relationships. Here we were looking at just how children begin to understand the impact they have on objects and objects on them. This, of course, includes people and how people affect them and how they begin to develop an understanding of how you interact – the rules and expectations of belonging and not belonging and the boundaries of your space and someone else’s and how to negotiate how to get along. So, the relationships are occurring not only emotionally, as we have described so often, and the shared attention and engagement and communication, but also occurring in this visual spatial world, which is part of all that as well. So again, we talk about it as separate factors, but they are all simultaneous.

Today I would like to move on to the next capacity, which is part of this system, which has to do with the more cognitive components. Here I will be talking today about the conservation of space and the beginning of visual logical reasoning. Then depending on our time, to representational thinking. This would be through drawing and visualizing and how we represent the visual spatial experience – the visual spatial world – in our own minds and the impact and interaction with feelings, and the effect of others on us.


Let’s think about what really begins to happen in the cognitive kind of aspect of understanding space. We call this “the conservation of space.” As part of understanding the world, the child needs to know whether what he sees changes when he moves, changes when he’s not looking at it, or changes when he turns around. If he starts to walk and move, does he realize that he is moving through space and it isn’t space that is moving? This is called the conservation of space and mental operation. It’s the thinking or cognitive part of looking.

During the first year of life, space is very one-dimensional for the infant. He sees in one direction. Just the other day I was watching a little girl really working hard to put a shape into a shape sorter. She tried, she put it in this one and she put it in that one, and was really very delighted, of course, to finally get it in. She could see it going down. But, she had no idea of how to turn it over to get it back out. Similarly, the baby who drops something on the floor from their highchair, likes to look down, but they don’t know how it’s going to get back up again. They don’t really have a vision of something going in the reverse direction. That’s what we mean by uni-dimensional. It goes in one



direction, but it doesn't kind of come back again. The child cannot alter what he sees. They can only see what is happening. They don't imagine in advance how they are going to get it back.

Eventually, they are going to learn to turn over the shape sorter or gesture to mommy or daddy to pick up what they dropped, or pick it up themselves, as they have those motor capacities. This is developmental. It is something that you don't actually teach. You can model, you can demonstrate, but it is only when the child kind of gets it in a developmental sense that it emerges. It kind of clicks, that they will then move into the automatic level and just turn it over. When a child is ready to do it, if you are ever fortunate enough to see those moments, they are quite remarkable to watch. You just see the gleam in the child when they discover that they can make this happen. This is where space becomes three dimensional, and you can move and you can see the world changing in a different way. This is because of mobility. Once the baby is crawling, and certainly on their feet, they can move in and around space. They can climb up the ladder to go down the slide, pull over the chair and climb up to get to the cabinet, and they can start playing chase and this time they aren't crashing into whatever is in front of them, even if they look back to see where you are. This is also one of the early times that we begin to see some children struggling with some of this. This is one of the wonderful things about learning to go up the slide because children kind of go up – they only see the immediate space in front of them, and coming down is great. It's quick and they come down, but guess what? It seems a lot higher from the top than from the bottom. This is also why we'll see some children who are ready to jump from a high space suddenly freeze because they are looking at things usually from the down, up. You're looking up at the kid on the diving board or on top of the slide, but when they are up there, wow! If they don't begin to develop this three-dimensional component of space, what we call "conserved space," that the space isn't different if you are looking down than if you are looking up, it can be very frightening. Many of us have seen children kind of freeze in that moment. That is the reason why that happens. We either coax them down and they try again and again. It's a developmental process. When they are very, very young and you're just putting them up and down the slide, it may not be an issue. But when they, themselves, have to navigate the space, then they begin to sense the great distance and that they have to develop an understanding that moving one way or the other is the same – that the reverse is the same.



This is when children love to start batting balloons and they look up and you can really see them waiting for it to come down. They watch it and they track it. They are learning reversibility of space in playing those kinds of games.

As they keep growing and in the third year of life, this is year three, children are really learning about three-dimensional space. They can bounce a ball and it'll come back to them. They can intercept it by moving quickly in one direction or another. Remember, when children first learn to catch a ball, what do they do? They hold their little hands in front of them and they wait for the ball to come to them. They don't move their hands at all and that is what we tell them to do. "Hold out your hands and the ball will come to you." As you see the children figure out how to play ball, you see that really shifting to these kind of automatic movements where they can see the ball coming, judge the speed it is coming at, and get ready to move and have their hands reach out for the ball at the right time. Needless to say, we talk a lot about playing ball and practicing balloons...

SG: Serena, when would you expect the child to get their first sense that space is in two directions? Like, the balloon will come down?

SW: That would be considered three-dimensional and that would be by the end of the second year of life. So, between two and three, children are beginning to do this.

SG: By the end of the first year, you would expect what?


SW: By the end of the first year, you expect them to be able to pick up objects and move them or they are beginning to sense the reversibility so they can turn over a toy to get pieces out. Or, they can manipulate the objects, but not actually move with the objects.

SG: And by the end of the second year, you are seeing...

SW: They are beginning to move with the object.

SG: By the end of the third year, they've got that three-dimensional down.

SW: Right, and by the end of the three, and that is when children are just delighted in playing kick-ball, catching the balloon, and running. It's between 2 ½ and 3 that a few children are able to chase you back. Every little kid who loves the chase game, but when can they reverse? So, it's just these typical day-to-day kinds of things




that you can use to assess where the child is developmentally. I just want to add that for children with special needs, we can support the development of these capacities. Often, it means being their partner – being their partner moving through space. Many parents will say that they can chase their child, but their child can't chase them. Often with a little extra support, you be their partner: Mommy and Joey chase Daddy and vice versa. Then they'll begin to get a sense of that. But, they have to sense it; they have to experience it. It's not something you explain.

SG: Here is where the affect comes in very importantly because many children who are 5 or 6 with autistic spectrum disorders, you'll notice that you're playing with them and they'll just drift away. Then you try to show them a toy or say, "Here, look at this part of it" and they hardly notice. But, if you increase your affect and make that more enticing and have more expectation in your voice, you draw them back in and that's where they master exactly what Serena is talking about. They begin seeing that because you have hidden the toy behind your back or in your hand, it's still there, and then you entice them with your affect and then they begin getting it and they see that the object exists in a permanent fashion, even though they can't see it at the moment. Continue on, Serena. Sorry for the interruption.

SW: No, no, that's really important. I think that here we were talking about objects, well we're the object too. Outside the field of psychology these people don't think of themselves as objects, but we actually insert ourselves into these experiences. As you just said, what we really need to do is find really motivating things that interest the child. Typically, these are the toys or the Thomas train or whatever it is that the child has attached to, and has a lot of meaning, even if it is obsessive, to be able to get these experiences searching or moving. But whether it's at age 5 or 6, or 4 or 5, or 9 or 10 – these are very crucial experiences that we have to provide for children to strengthen, if not just help these just emerge. By integrating it with our interactions and fun and playing and really knowing what the child is going to work for, we can strengthen all of these areas.

One of the things you will find, for example, children who have difficulty with conservation of space are often the children who kind of get stuck on the train tracks – they love the train tracks. I mean, how many Thomas kids do we have in the world out there? All children love train tracks. But, if you really had more of a challenge of being able to navigate it and conserve space, what is going to happen is you are going to constrict to the train tracks. It goes in a circle or some kind of fixed form, and where are




you going if you stay on the tracks? The track kind of takes over and compensates when these other abilities aren't there, and you're not driving a train to where you wanted to go because there is something you wanted to do there. You're simply going in that repetitive form.

So there are clues if you watch children's solutions to how they deal with the visual spatial world that can make you ask, "Huh, ok, well what can we do to broaden the world up?" And very similarly, many children will simply just try to avoid playing ball – it's a hard task. But we generate the affect. We don't just go directly to catch the ball and practice catching balls. But, we might play "hot potato" or "monkey in the middle" – who is going to get the ball? Do all that affect cuing and some of the excitement, and help the child succeed enough by being his partner. Being his partner helps the child succeed so that they hang in there and stay in there and enjoy it enough to keep working at it. Same kind of thing, as the child gets a little older, you'll find they love "chase" but they don't play "tag." Well, there is a big difference between playing chase and playing tag. This is, again, more of a 3-4 year old developmental task where if you want to run towards another child, you also have to be able to slow down before you reach him to touch him, but also you have to be able to shift directions if he zigzags the other way.

This relationship of objects to objects in space where two objects are moving, if it's you and the other kid or the ball or the sword and your friendly knight is fighting you if you're the big pirate, not automatically you really have to have this developmentally emerge. One of the things that you will notice, again another clue to whether there are challenges here, are often children who actually close their eyes as the ball comes towards them or they cringe as they are doing a pretend sword fight. They can go forward – they can attack you, but you try to attack them and you'll see the difference. They will really retreat or maybe give up or move to something else. This ability also relates, of course, to the ability of the child to converge and be able to focus and have their eyes work together. One of the other things we do know a lot about children who have the spectrum challenges, is they often rely on the peripheral vision and have difficulty converging and following and shifting with things that are in front of them. It is one of the factors, I believe, that contributes to some of the poor eye contact.

Here, too, we see that there are many different ways that we can support the child's development of these capacities. The more interactive it is and the more fun it is, and building that success for the child so they stay in there with you, is going to be




much more a function of your relationship and your support and the use of the affect and the affect cues, than anything else. I think you can really count on the kind of built-in nature of every child to want to run and to have fun and to move. You don't have a life if we don't move. They are moving all the time. It's how we strengthen these capacities so that they can move into the higher cognitive levels and understand what they are doing in a more mental way.

Between 3 and 4, as I said, children are beginning to integrate time and space. That's where you have to move to catch the ball if it goes in a different direction. It's the timing of it and the spatial dimensions of the environment, and therefore, you figure out where the ball is going to go and how you are going to intercept it. Time and space together begin to evolve and this prepares children, then, to move to the next level, which is where they can now anticipate multiple senses of direction. They can turn around and see different things happening very quickly. Certainly, playing soccer is a perfect example, or really any kind of ball game where you really have to be able to deal with a moving target and move yourself and take time and speed into the relationship as you do that.

So, as children begin to deal with the spatial dimensions of the environment, they integrate the temporal or the time components of the environment. This is where sports become important, riding your bike and not crashing becomes important – where you're pacing the timing and the speed, this is where children will love to run and chase fireflies or catch butterflies where you take into account the distance and the swinging of the net. But, time and space obviously usually work together. With this foundation in place with the conservation of space, we can move on to the conservation of other factors that then become part of reasoning.


So let me now move to the next component which we have called "visual logical reasoning." What we mean here, is when you apply logic and reasoning to understand what you see in the world, and it comes together – you know, visual logical reasoning or visual spatial reasoning comes in together with verbal reasoning. It's part of what we call intelligence. If you look at most developmental and IQ tests, there is always going to be a visual spatial or what's called a performance component to the test that taps into these abilities. It's very important for mathematical thinking, and certainly science as you move on. But, it's all predicated on having object permanence. Unless you know that objects are permanent – they remain the same whether you look at it or not, whether they are located in your range of vision or not – it's very hard to become



logical. You have to be able to retain the object in your mind as a mental act, so to speak, in order to think logically. You have to keep thinking about it, and then you have to start living it in your own mind.


SG: Let me add one thing. Think about it this way in terms of logic permanence. If you do not see the world outside you - the world of trees, plants, houses, and people as permanent, as something that exists regardless of whether you close your eyes or open your eyes, then everything is simply part of your imagination if you think that it is. But, once things exist outside you that are there all the time, that establishes a reality – an external reality; a reality that is outside yourself. If you didn't have that, everything would be part of your own thoughts – you think it and therefore it is. Now, we see that in many people who don't have what we call "reality testing" or don't have a good grasp of reality – they wish it to be the case and therefore it is the case. You see a child who makes up a story and says "I caught a 50 pound fish" and then tells it to their friends, and they act as though it is real. Now, some children are just out-and-out fibbing, and other children are confusing the "wish" – "I wish I caught a fish" – with the reality of having the fish. But, that ability for reality testing versus living in a make-believe world, starts with this ability that Serena is talking about, to realize that there is an external reality out there that is separate from what you think inside your own mind, that has permanence and stability to it. I'm sorry, Serena, go ahead.

SW: Yes, no, that's obviously a very important point and I just want to add that it is a developmental process. Establishing reality testing really is a process that occurs from about 3-7, where saying so doesn't make it so, which is the way we put it verbally. It starts at around 3 because that is when we do start understanding object permanence. It is, of course, the foundation of dealing with reality. It is a process and it does take time. If when we look at symbolic development, it is very clear to see this unfolding, and we'll actually come to this when we get to the representational thinking, but as they move from using the real thing to using the miniature of the real thing to a symbol of the real thing – that helps them move in their own minds of being able to just think and visualize the real thing. That, actually, is the foundation for visual logical reasoning as well, because what is the foundation? The first few years of life, how do children learn? They learn through their actions. They learn through their movements. They learn through their hands-on doing. They are learning way before they have words to think. You don't need words to think. This is where the visual spatial world is primary, in fact.



So, first comes action knowledge. That comes from doing. This is what we call the sensory motor period. All of you who have heard us speak before, you have heard how much we put emphasis on the sensory motor knowledge; on really being able to master your body, movement, climbing, jumping, and catching, because that is where knowledge begins. It begins through this action knowledge and that leads into another action knowledge, until the child actually is able to think it and not have to actually do it.

SG: Let me just add one more point, Serena, about the action knowledge. The first actions the child takes are not what Piaget thought, who really developed the concept of sensory motor knowledge, like a little 8 month old pulling a string to ring a bell and realizing that when they pull the string it rings the bell and when they don't pull the string the bell doesn't ring, and when someone cuts the string and it's not tied to the bell, it doesn't ring. But, it actually occurs much earlier. The first actions the child takes, is the actions of their emotions; the actions of their affects. That is why in the DIR Model, we put emotions at center stage. When the child smiles and mommy smiles back, when the child frowns and mommy frowns back, we are having cause-and-effect action-to-action, but it is affective or emotional actions – the smile begetting the smile, the frown begetting the frown. So the first actions are really our emotions. There is a good reason for this. Way before the child can control his hand movements enough pull the string, the child can control their emotions enough to smile, or enough to frown, or enough to cry in one tone of voice versus another tone of voice. So, the first system the child can really communicate with, is through their emotions or through their affects. That establishes what Piaget called, “Action Knowledge,” but what we call “Affective” or “Emotional Knowledge.” It is the back-and-forth signaling with your emotions or affects that establishes the foundation for what Piaget called “Sensory Motor Knowledge” or “Sensory Motor Actions.” So I just wanted to emphasize that the beginning of this process, an implicit in what Piaget called sensory motor knowledge, and what Serena is talking about, is the knowledge of emotions or affects. So, for example, from the time the child is 15 months old, the child is not only signaling with their emotions, they are tying together many different emotional interactions such as a smile, a smirk, a vocal “do this for me” tone of voice with pointing or reaching so they get their mommy or daddy to get them to the shelf to reach for the toy that they want. This is maybe 20 or 30 back-and-forth interactions with affect and with related sensory motor patterns to solve a problem. This is very complex sensory motor knowledge that leads the way to, eventually, being able to picture these action patterns before you actually do it. So eventually, the child can do exactly what you are saying. He doesn't actually have to




carry or experiment with taking mommy by the hand to find the toy, the child can actually picture taking mommy by the hand to find the toy. Then, if by this point the child has words, the child can use that picture to say, “Mommy, walk over to the shelf and reach up and get that toy for me, please.” The child can only say that, or solve that problem, because they have that picture, and that picture is only there because that child, as Serena is pointing out, has done it a million times through their actions, but really through their emotional interactions. Ok, I’m sorry Serena...

SW: No, not at all, absolutely. In fact you’re again just highlighting how important it is that it not only is the beginning and the first part of experience, but it’s also how we mediate the development of all the other cognitive and language and academic processes. We use those affect-based interactions, which really are the first cues – just looking at a recently born baby, it’s just amazing to me just how much of that is there. Always, as the baby can communicate their response or their need or their reaction to their caregiver, to their parent, to really be able to get this cause-and-effect going. It’s really amazing. That becomes the main vehicle or the main mediator for the visual spatial learning and all the other kinds of learning that we have, which is why you all probably know by now, when we think in terms of thinking, we think in terms of emotional thinking.

I am really just highlighting the hierarchy of just this particular component. As I said earlier, the hierarchy of visual thinking does occur mostly between 3-7, following the object permanence which evolves and develops following so many of those interactive experiences. If you want to go get something, you have to know where mommy is, and mommy is there whether you see her or not, even if you have to go search for her. It takes the conservation of knowing that things are there in your mind and it helps you be able to think something rather than have to actually do it.


Let’s go through that a little more slowly, step-by-step, and think about what happens. We actually just talked about year one, and in a more specific way, you could discover how children are learning this when the child takes the action and touches daddy’s nose and he goes, “beep, beep.” The wonderful affect part is, “Wow, look what I did! I can do this and this is the result of my action!” Or, similarly, if the baby picks up a rattle and shakes it, they realize what they can do and then they try it again. What the child here is doing is their action, whether it is the touching daddy’s nose or smiling or crying, helps them get what they want, but they aren’t quite thinking it yet. By the second year of life, you really can see how children now kind of know. He knows what



to do and he thinks it before he does it. This is when you begin to see children planning, whether they have a strategy to reach a toy that they want to get, or get you to reach the toy for them, whether they are thinking “ok, which piece is going to fit in here?” even if they do some trial and error, you can really see a child thinking just before they act or as they act. Their actions become less arbitrary, less trial and error, and then they look to rotate or just check or look before they actually just put it in the exact, right location. But to be able to do that, you have to have kind of an image of the shape. You have to be able to kind of see it and have this visualized image of it, and you keep it in your mind so then you can go from what is in your mind, directly to the action you want to take. Many children who are having challenges with auditory processing become amazingly adept at doing some of this. These are kids who could do 30-40 piece puzzles by the time they reach year two. Also, we know they can do this before they are actually talking so it’s another indication of this visual spatial thinking. What tends to happen in our culture, particularly when the words begin to take over, and we don’t always appreciate how much is happening in this other way.

What are some of the early ways we see children really thinking? It could be when they can stack those blocks, or even better when they imitate the blocks you’ve stacked and use the same sequence of colors or use the same sequence of shapes. Another way we begin to see children showing more of this kind of thinking is when they know what is the same and what is not the same, because then they have to have an image of both so they can compare them in their minds. It’s a very important ability. You make much better choices if you know which object you really want, and it may not be the same. It can also trigger a lot of tensions when it doesn’t work.


This is when children begin to be able to find multiple attributes or find all the big red squares, and then can look at a bunch of blocks and find all the big red ones. Then, for contrast, then maybe find all the small red ones. The more attributes they can use, again the more complex thinking that they are showing. But what really is probably one of the most critical things that begins to happen between 2-3 years of age is one-to-one correspondence. It’s where you really see every parent kind of practicing, “One, two, three…” and putting their finger on the object or the child is pointing to the different objects. In all the first tries, you’ll often see the child keeps counting, but they can’t actually keep their finger on it. They can do the rote part, but they don’t actually have the visual spatial part. The number it is, is the number they count, rather than the number that they can actually see. But then children get better and better at this



because it is a developmental process to be able not to skip or miss or forget what it is you're looking at and trying to count because you are so caught up in the rote counting of it.

This is also a wonderful time, between 2 and 3, where children are figuring out size and shape. The little kid who enjoys putting on the baby doll's boots or shoes, or in contrast, mommy's or daddy's shoes, are just thrilled walking around in these shoes. Again, it is the emotional part that counts because they don't care if the shoes are too big. You put on mommy's high heels or daddy's shoes, and who are you? It's a wonderful opportunity, it doesn't last too long, as many of you may already know, until the child kind of fits into their own shoes. Often this is where you see children not realizing something won't fit. Here too, we don't ever want to jump the gun and tell them it's too big or too small. Let them find out. Let them try again. Let them try to squeeze it in. But it is through this experience that they will begin to get some of these new experiences and understandings of size or shape or fit or rotation or affiliation when there is a sequence of sizes to make something work right. As the children can play these games and solve practical problems at home in this way, it shows them making this huge transition to representational thinking, the thing that drives it again and again is the affect, the desire, or the objection. But here again we see how powerful the thinking is fueled by the emotion and the desire to enjoy or get what they would like.

When children move into year 3 and 4, then there is again, a whole host of expansion of their visual spatial thinking. Earlier they might stack one block, but now they can build a complex railroad track or road system where it goes to the right, to the left, over tunnels, under bridges, and they are now beginning to think multi-spatially. So it's to the left, right, forward, back, up, down, and they are now able to copy much more complex designs that are not all one color or one shape. They are able to organize the scenario that they want to set up the scene they want to play in, whether it is a dollhouse or laying out a big blanket and making a jungle, or setting up the traps for the dinosaurs to corner so that T-Rex doesn't eat Brachiosaurus. This is where now we actually see children using space in a much more complex way. They begin to see the parts and the whole. So by the time the child reaches 4, they usually have one-to-one correspondence down and they remember the amounts – it isn't just a lot or a little. They know exactly how much is here and how much is there and they usually want to make sure they have the part they are entitled to. This is where children begin to sort




out, “Ok, you take this car and I’ll take that car, you take this car and I’ll take that car.” They are beginning to learn to do equal sets and break things into two or three parts, depending on how many buddies they are playing with. It is the start of conservation of number and space or size and mass. It is just the beginning of this. It is where the child might have two pieces of clay and they look exactly the same, but if you cut one in half and take the other half and cut it into five different balls and you ask the child which one has more, well guess what they will say? They will look at the number and say, “Five must be more than one” even though the bigger ball, which they just saw you divide is still going to be less. So it’s conserve the mass, conserve the amount you are dealing with, or conserve the amount of who has more chocolate milk. It all depends on what size glass you pour it into. Here is a cognitive developmental step and it begins to occur between 4 and 5, and then moves into the 5th and 6th years before children actually can retain or conserve the element that we are talking about, and really figure out whether things are the same or not the same.

Prior to age 4 and 5, very often the child will think that something looks like more because it is in a taller, skinnier beaker, is more, versus a big, fat, little glass. But they are not. That is beginning to show you children are making that transition that they still believe what they see more than what they think. Then they begin to be able to integrate what we call the mental operations – what happens when you change the form of something? Does it really change or not? This is, of course, very important for later reasoning and mathematical thinking, and actually, people thinking. Does someone who acts differently one time from another time really change or not? Or, are they feeling differently for a reason, and that is the motive you have to understand to be able to deal with them and relate to them and for whatever reason you want.

So, there is a really, really close overlap between emotional thinking, visual thinking, and verbal reasoning. They are all happening at the same time. One of the things I really always value, is that many children who can’t always, you know where talking comes in later, when you see them using objects as playing or doing some of the games I have been referring to, you really realize how bright they are, and how they can figure things out. And that while we look so much for the talking, these are really the other clues we need to appreciate every child’s potential.

So let me just finish this area with what goes on between year 5, which is between ages 4 and 5 or so, where we really see a very speeding up of visual logical reasoning. So now the children have the correspondence, they have the object




permanence, they know things can change form but still be the same, and they begin to get into things like prediction. This is a wonderful time when children start to flip coins and they begin to realize what 50/50 really means as they do heads/tails and it becomes a wonderful solution for us for solving social problems. But it only works when the child is able to understand that he can predict. It may be right or it may be wrong, but there is a 50/50 chance that he is right. This is where a child will look for the bigger plate of candy rather than the small one, knowing where he can get more. This is where children can start doing comparative or analogical thinking. So if you say, “I have a small ball and here is the big ball, if I gave you the small square, what would you give me?” They would know that this is to this like that is to that and what we call analogical thinking.

Many different forms of thinking come in where the child can now do conceptual groupings, they can expand on different patterns going in different directions, this is where children have a tremendous spurt in now beginning to draw and going from two-dimensional to three-dimensional kinds of drawings which include space and perspective. This is where children can begin to manipulate numerical concepts or math in their mind. They can play war because they know which number is smaller and which one is bigger. They can begin to be very interested in music. They can recognize the sounds and the low to high pitch. It’s the age we often discover that this child has an ear for music as they can actually play out tunes that they know because they can simulate those sounds. The sense of reality – reality testing that we referred to earlier is really beginning now to kick in as they become more and more logical.

So it’s really quite remarkable how quickly this kind of thinking comes in, typically, but because it is developmental, I again want to emphasize that we all look for the age per se. Many children with challenges may take a little longer to develop these kinds of thinking capacities and others actually do it sooner relative to verbal reasoning, where you can see that they figured things out and are “street-wise” or “house-wise” and they are not only using memory, but they are using thinking to navigate and negotiate the world.

There is a big difference between visual memory and visual thinking. But of course, both are used at the same time. One of the things we run into is when a child doesn’t begin to reason and get logical, that’s when we encounter that kind of rigidity. Things have to be set up in a certain way. The kids who persist on lining things up – they are having a harder time figuring out a reason to line them up, which is why when we



play with them, we try to give it more meaning. But children who can't find something or get upset if you don't pick the same absolute direction to the park or to visit grandma, because they get so alarmed that they don't know where they are going, they don't know where you are going, or if they are really going to get to what they want to get to. This is where the memory is so valuable – we all count on that for everything, but if it doesn't get embedded with thinking, is where we really often see a lot of rigidity and constrictions.


I really have a few minutes. Should I quickly do that last thing?

SG: I think we should leave the last one for next time.

SW: It's a real precursor for a lot of academic learning.

SG: Right, so we should hold off the last category for next time, but I just wanted to summarize what you were saying, Serena, just looking at it in a slightly different way.

As Serena was talking about visual logical reasoning, she was highlighting two interrelated features of it. As she pointed out, the precursors start with our affective sensory motor knowledge, the knowledge through doing and through interacting. Then the child learns to picture these interactions and actions in their mind and planning ahead of time. Then the child learns to understand that these patterns of action actually help them form a picture of a real external world that has permanence to it. So all the actions on the world – moving the car, moving the ball, running up and hugging mommy – that's the way the child learns that there is such a thing as mommy, as a ball, as a car. In other words, it's not just by seeing it and all of a sudden it dawns on the child that this exists as a reality. It's through the seeing and the doing and investing that seeing and doing and the speaking with emotions, affect, or meaning. So as the child invests the car and the mommy and the daddy with their emotional interactions through these multiple actions and interactions, the child creates a picture of the world that feels real to them because they have an emotional involvement in it. In other words, the child who eats a hamburger and loves it, realizes that hamburgers exist. The child who never eats a hamburger may see pictures of it, but doesn't really have that same understanding of what a hamburger is, as an external reality. As a child invests these things through these actions and interactions, mediated through the affect and emotions, the child constructs this permanent picture of external reality, and as Serena was pointing out, knows that reality now exists. He knows that things exist outside themselves. But he knows it not just as an 8 month old who looks down at the floor to




see where the ball drops, but now knows it in a mental sense, in a conceptual sense, that a world exists out there. That is the basis for that reality testing, and for what Serena is calling conservation, and what Piaget called conservation. What Piaget meant by conservation, and what Harry Wachs and others who have worked with Piaget mean, is just think of “conserve” as the ability to hold on to. Just think of it in the literal sense, it’s not a technical term that will be hard to remember, but to conserve is to hold. Conservation is the act of holding, and it’s the act of holding on to something out there that is real. So, by conservation, it means we have a picture of an external reality that is real and is stable.

Then Serena was describing what you could do with that. Once you have it, now you can begin looking at relationships in it. If the truck crashes into another truck, that other truck will bounce off of it. The bigger truck will make the little truck bounce back. Well now you are seeing relationships among objects, and conservation is taking on more meaning. I can group things according to size, according to shape, according to color. That is a way of manipulating that external reality.

Then what we see is that the external reality really gets understood along two interrelated dimensions. Think of one dimension, which Serena was emphasizing, as the sort of logical dimension. The child begins to be able to hold onto more and more dimensions of the external reality. So the child can see that you can develop one-to-one correspondence because they see that if you count three blocks, the numbers you are giving actually match up to the size of these blocks laid out. But, they also will see that if you put the blocks up into a tower, or you lay them down on the floor like a snake, that they can be the same three blocks. That is one-to-one correspondence. The child understands that the size or the quantity stays the same, regardless of the way you position it. That is a slightly more sophisticated understanding of external reality. In other words, it’s not just that there are three blocks out there that are permanent, but that they exist regardless of the way I move them, whether I put them as a snake, or whether I put them as a tower.

Then, as Serena was saying, you might have put different balls in water. You take a big ball and break it into little balls and put it in water, then you may have one big ball and put it in water. Again, the child who has the more sophisticated understanding of this external reality, i.e., a more sophisticated sense of conservation, knows that the displacement of the water, the amount of water that will go up from having these balls in it will be the same whether they are a bunch of little balls or one big ball because the



little ones and the big one are basically the same. That is a more sophisticated understanding of volume.


So the child can get a sense of the tall glass or the little fat glass – they may have the same amount of water in them. The child begins to think multi-dimensionally and this prepares the child for understanding science and math, as Serena was pointing out.

But there is also another dimension at which the child is learning to conserve or understand his world, which you might think more of what the artist or architect can do. They can take a house and picture what it looks like from the back, the front, or the side. They can picture what it would look like tilted. They can picture what it would look like rotating it on its vertical or horizontal axis. So you can do this with children with blocks. You can have block designs and have the child copy it as you rotate the block in one dimension or another dimension. This is kind of playing little perceptual games with the external reality.

Now what is interesting is, sometimes you see great artists and great architects who are not great mathematicians or great scientists. In other words, they can't do what Einstein did, but they have this great perceptual ability to play with shapes in different spatial dimensions, and they are very creative with it. And, vice versa – you'll see great physicists and great mathematicians who are not very good architects or artists.

So obviously, the more we can help a child develop both abilities, to picture things in different creative ways, and to manipulate what they picture, and also at the same time to understand the different dimensions of what they see: its size, its shape, its volume, its weight, and as Einstein was able to do, other qualities of physical space. He understood gravity in a new way which is part of his theory of relativity. So there is no end to the conceptual ability to understand space, and we probably still don't understand it fully as we get into black holes and get into String Theory and get into all kinds of new areas of physics.

I want to summarize and say there are these two interrelated dimensions, the properties of space that we can hold onto as the brilliant scientist does, and also the ways of manipulating space in interesting and creative ways as the brilliant artist or architect does. Again, we want to help our children be strong in both, and as Serena was describing, we use elements of both in her descriptions.



Let me thank you for joining us for today, and thank Serena for such an eloquent and systematic picture of visual logical reasoning and thinking. Next week we are going to complete our series on the visual spatial world by looking at representational thought. This will be drawing, thinking, and visualizing, including the interface between language and visual spatial thinking. This is obviously very important for academic work and for schoolwork. So next week we will focus on this and also provide an overview of where we have been on visual spatial processes, and also take your questions that have been coming in. And we'll focus next week on how to build this into Floortime, and how to build this into our DIR program, and how to build this into educational programs. In other words, how can we simultaneously work with a child on visual spatial, language, motor, and sensory capacities, all as part of emotional interactions, doing routine fun Floortime activities? So that will be for next week. Then the week after, we are going to talk about a very important subject that I just want you to anticipate, because I have been getting so many questions about this both in my practice as well as through the Web-Based Radio Show, about "melt-downs" - what to do with tantrums or melt-downs. It seems as spring comes along, kids are tired of school and we get more and more melt-down questions. So we are going a whole show, following next week's show, on melt-downs.

I look forward to seeing you next week, or hearing from you next week, or enjoying your listening with us next week. Serena, thanks again.

SW: Oh, great to talk with everyone today.

SG: Great, take care. Bye everybody.