

# Field Diary of the Play Media 1: Modular robotic tiles

## Outline of the Play Media

Modular robotic tiles (the digital tiles) are a simple and intuitive play media consisting of a random number of “play tiles”, a “play control tile”, a transmitter and a random number of “gaming pieces”. In this case there were eleven active play tiles and one play control tile during the time the modular robotic tiles was available in the kindergarten.

Each play tile (The control tile also functions as a play tile, when playing a game on the tiles) consists of 8 light diodes placed in the formation of a circle that is visible under the frosted plastic surface of the play tile. A pressure sensor is placed within the outline of the circle, and it is activated by a fairly precise pressure of a certain force within the outline of the circle. The light diodes can, in principle, be any given colour, but in the available games in the kindergarten the diodes were able to change between 5 colours: red, green, blue, purple and yellow. The eight light diodes can be on or off or go out one by one around the edge of the circle, like in the game “Disco”. The modular robotic tiles communicate with the user through the use of these colour circles on the play tiles: In “Colour Race” one will have to find ones personal colour circle (e.g. red) on the plate and press down on it as it moves around on the plate 15 times in order to win, in “Disco” one will have to keep an eye on that all the light diodes on one of the play tiles turn off, the one will lose the game, in “Lunge” one will constantly have to have one leg placed within the red colour circle and step on the blue/green colour circles with the other leg and in “Simon Says” one will have to memorize a shown sequence of colour circles on certain play tiles, and hereafter step the sequence. Thereby, the colour circles are the central element of the digital tiles.

As mentioned, there is a pressure sensitive sensor within the colour circle, which is activated by the user when he places a pressure within the colour circle. The pressure sensors can be programmed to being active only when the colour circle is turned on on the play tile like in “Colour Race”, “Lunge” or “Disco” (nothing happens when stepping on tiles that are “turned off”) or being activated both when they are turned on or turned of, like in “Simon Says” (where one will have to press the correct played sequence on the deactivated tiles that lights up in the played colour if it is correct or the entire plate becomes red if one steps an incorrect sequence). The pressure sensitive sensor requires a high level of precision – if the entire pressure is not placed within the circle (e.g. if the foot is half in and half out) the sensor is thus not activated. One is therefore obliged to place the pressure precisely for the sensor to activate. On the other hand, the pressure does not have to be placed with a lot of force – a precise, light pressure with the foot is enough. On the contrary, a smaller piece of the foot can be outside the circle if one stamps hard. But precision always comes before force – if too large a piece of the foot is placed outside the tile, one can stamp as hard as one wants to, but the tile will not be activated. This demand for precision is contributory to adding a lengthy apprenticeship to the play media: The user who is able to hit the circle with most precision with the force needed, each time he steps, will have a greater chance of winning, than the person who just stamps indefatigably ahead. This became clear when 3 grown men played on the tiles, one of these were a semi-professional computer-player and therefore he had a great intuitive understanding of micro-movements and pressure precision – he was a sure winner each time!

The modular robotic tiles are shaped like identical puzzle pieces that can be placed together on all four sides. Furthermore, on each side there is a little plastic window behind which there is a

little transmitter, which is able to send information from tile to tile (so that the colour circles e.g. can be sent around the plate). Moreover, a little on/off switch with a little red light diode is placed on one of the sides, lighting up when the plate is turned on and a charging point on which a charger is attached to the tiles in order for them to recharge. The identical shape of the tiles makes it able for them to be combined in all possible ways – there are no illegal or wrong constellations. The more tiles, the more ways of construction, and it was clear during my field work that the number of tiles had a decisive influence for the play potential of the play media. When I at one point restricted the track to only 6 tiles, the play potential went down notably – not many played on the plate, and those who did, did not play very long. On the contrary, the children perceived it as if “something was wrong” with the game in this cut down version. Children as well as grown ups expressed on the other hand a clear wish on the possibility to have more than the present 12 tiles – often with a dreaming look in their eyes. Then they would be able to build lengthy labyrinths running from room to room, construct plates that filled the entire floor (and the walls), make figurative plates like horses or houses etc.

In addition to the 11 play tiles, the modular robotic tiles as a play media consists of a play control tile, a transmitter-box and a number of gaming pieces (RFID key chains). The gaming pieces are used to activate the different games. When they were located at the kindergarten the pieces 1-5 activated the game “Colour Race” with 1-5 colours, piece 7 activated the game “Lunges”, piece 8 activated the game “Disco” while piece 9 activated the game “Simon Says”. But they could also have been used in any other way (another distribution of the numbers, other present games). When the tiles are on and a plate is constructed, the preferred gaming piece is chosen (e.g. “4” for “Colour Race” with 4 colours) and hereafter transferred to the transmitter-box. The transmitter-box transmits the chosen game to the play control tile that distributes it to all the connected play tiles in the plate and the game begins.

During the period where the modular robotic tiles were placed in the kindergarten four games were available: “Colour Race” (with 1-5 colours), “Lunges”, “Disco” and “Simon Says”. “Colour Race” requires a plate that consists of at least the chosen number of colours and 2 tiles more. But the game will achieve a greater play potential with a larger plate and functioned at its best when all twelve tiles were used.

As a point of departure, each player picks a colour and it is now the player’s goal to find and step on his colour circle 15 times before the opponents do the same. The first player to find and steps on his colour circle 15 times wins the game, which can be seen as the entire plate lights up and flashes in the winning colour. This was clearly the most popular game during the period, this was the game in which the children invented most games, alternative games, alternative ways of playing the game (groups together, groups against each other, player with helper etc.), constructed playing plates, invented patterns of movement etc. “Lunges” needs a plate consisting of 3x3 or 3x4 tiles but was, however, played on a 2x3 constellation in the kindergarten without problems. Originally this game is intended to be played by one player, and it is intended to train motor function and leg musculature. The children did not know the overriding “ulterior motive” and they played it as a traditional “skill game”. The game is started by standing on one foot on one of the extreme tiles in the row that is lit-up in red (the children were not aware of this, they just stepped on random tiles on the plate until the game was initiated – and this caused no problems). After this, the player chooses how far he wishes to train by stepping on the blue lit-up tile farthest away from the foot on the red tile (the children were not aware of this either and it was thus random over how tiles the game reached as it was random which tile that was chosen as the

“range tile”). Hereafter, one must step on the illuminated tile while the other foot remains standing. Now and again the tiles turn off under the standing foot and one must step one tile in the opposite site of the plate and change leg (it was clearly a challenge for the children to play with both legs and not just change around during the game and use the same foot all the time. The children, who mastered both legs fluently and fast, gained recognition from the other children in the room). “Lunges” was always played at the same time as “Disco” as both games could be played simultaneously on several different plates by first constructing the twelve tile formation for “Disco”, breaking the plate in smaller pieces that each played “Disco” independently and then making the last six tiles “Lunges”-tiles. It was different types of children who preferred “Lunges” and “Disco”, when the games took place. The more freely playing children or smaller children preferred “Disco”, which they played in smaller concentrated episodes, while the more game-oriented or bigger children preferred “Lunges”, which they played concentrated for a longer time (a child who at first was in a playing, outreaching state and therefore played “Disco” could in the next episode be a game-oriented, concentrated state and therefore play “Lunges”). The way of playing “Lunges” also developed over time so that alternative ways of playing, games and game movements were created (e.g. more players playing “Lunges” at the same time or special rules on how to move the feet within the tiles – only playing with one leg, hop on one foot etc.). “Disco” only needs one single tile to be carried out and can be played by one or more players. Even the youngest children in the kindergarten were able to master 1-2 “Disco” tiles but as the number moved from 3 and upwards, the game became harder. The more tiles that were to be activated, the harder a game was. When the game starts all the connected “Disco” tiles light up in purple, after which the light diodes turn out one after one in a certain span of time (e.g. 1 second) independently of each tile. When the pressure sensor of a tile is activated by the player stepping on it, all the light diodes will be illuminated again and the countdown starts over again. The goal is to avoid that some of the tiles will count down to zero. If a single tile reaches zero, the game is lost and after a moment it starts over again automatically. In general, the children preferred to play “Disco” by themselves in small units on 2-3 tiles, while some players, however, worked together on a plate of 2x2 tiles. There were generally no children who were able to play “Disco” for very long time as they put all their effort into the game while they played. Instead, it was smaller explosive sequences where they really stamped ahead. “Simon Says” can have max 6 tiles in a coherent platform, but was carried out on 12 tiles without problems. None of the children in the kindergarten played “Simon Says” – they did not have the patience to understand the rules and wait until the sequence they had to remember, was shown. Instead they intuitively started to jump on the colours as soon as they appeared on the plate, which resulted in a lost game each time. If an adult with the required patience had shown some of the more experienced players how the game worked, the knowledge of the games functionality and rules could have spread among the children relatively quick. Thus 5-year old Fenja could have played the game when she was alone in the kindergarten, and have had the necessary thorough introduction to the game rules and its functionality. As mentioned, the game mission is to reproduce a sequence of colour circles. The sequence starts with only one colour circle after which more circles are added to the sequence as the player repeats the sequence correctly by pressing down on the pressure sensors on the individual tiles. Fenja could without problems repeat a sequence of 8 colour circles and after a few rounds, she would be fully capable of playing the game using the game rules and the tiles’ slightly alternative function (one would have to wait for the colour circles to disappear and

then step on “empty” tiles, almost opposite of the functions in “Colour Race”, which she was used to play).

The modular robotic tiles were laid out in a track-like pattern the first day. A little girl and a bigger boy jumped around on them while they tried to hit their own colour in the game “Colour Race”. “Who are you cheering for?” does another spectator child ask. A little later, another spectator child asks one of the younger children, if she wants to jump around on the tiles: “Do you want to play, Rosa?”, “Yes!” the girl answers and jumps up. The bigger boy shows the younger girl into the game by making her pick a colour and explain to her, how she activated the tiles: “Try stepping in the middle of them”. It can from time to time be hard to activate the tiles as it requires a fairly precise pressure within the circle. But when all the tiles lights up and flashes in the winners colour, because he or she is the first to step on 15 tiles, the triumph is unmistakable: “Yes” the winner shouts and raises the arms towards the ceiling. The children are in flow, occupied by chasing their colour and fascinated by the spectacular lights moving around the plate. It is a great victory, when the entire plate lights up in the winner’s personal colour-light.

The spectators “helps” the player all the time by stepping on the colour circles when they are in front of the spectator’s feet, but the player does not always want this “help”: “I’m helping”, “No, I do not want help!” The playing children are in constant negotiation on which colour they have, how the game is played and how the players actions in the game must be interpreted: “I’m purple!”, “No, I al purple!”, “Play!”, “Thanks for helping me Mik, ‘cause I actually red!”. The big subject of discussion is constantly and everyday: which colour am I, how do I choose colour, if the colour is the same or if it is a new and if someone is supposed to have a special colour during more than one game. The winning colour in more games in a row has status and negotiations occur in order to get that exact colour. As if it is the colour that gets the credit and not the player, when a game is won. Furthermore, purple is in general the most popular colour among the children, and some children will rather miss one game than playing with any other colour than purple. Moreover, it can be hard for the children to differ between yellow and green, which occasionally causes a problem in the midst of the game, but on the other hand also adds prestige when someone wins a game with one of “the difficult colours”. Finally, a lot of fights over colours take place during the games, as it can be hard for the children to see which colours are available and which are taken. When several children are playing on the tiles, they are much focused and physically active in the games while they are in big negotiations over colours and administration of the rules between the games.

When I entered the kindergarten in the morning the second day, the plate was already laid out and the game was running. The teachers had themselves and in cooperation with the children been able to lay out a plate and start “Colour Race” without anything else than a short introduction from me the day before. There are now 7 children in the room. Two bigger girls and a younger boy play concentrated on the plate. The younger boy plays more cautiously at his own pace, while he moves around on the plate chasing a green colour. The two bigger girls fly around the track and around the boy in the chase of the purple and the blue circles. The other children sit around and look at the lit-up tiles and the players jumping around the track: “Who do you think will win?” one of the spectators asks, and when the track lights up in the winners colour the spectators exclaims: “Great!” and claps their hands. One of the spectators stands up and offers help to the younger boy in the fight against the two bigger girls: “Are you green?”, “yes”, “Shall I

win for you?”, “Yes”, “Look! He wins for me!”, the young boy says and a bigger, a little more aggressive boy enters the game in cooperation with the younger boy against the two girls. The children plays and now and then they will have to take off a shirt or their socks in order not to get too hot. When the children have played “Colour Race” focused for an hour, they wish to play a mix of “Disco” and “Lunges”. Even though there is only one “play control tile”, the plate can be split up in more games at the same time. If all 12 tiles at first are activated in a “Disco” game, the plate can hereafter be split up into small “Disco” games that are spread out in the room, while the remaining tiles (incl. the “play control tile”) can be started in a game of “Lunges” or “Disco”. In this way, there can be many games going on at the same time, even though there is only one “play control tile”. The plate is coded and split up and the flashing tiles are now spread out in the room. Firstly, a single child plays “Lunges” in the traditional way, but just a little later, four boys cooperate in playing the game with their own self-invented rules. The 4 boys stand around the four tiles of the plate and they each have their tile which they step on when the colour circle hits their tile. Meanwhile, the “Disco” tiles are spread around the room and they are flashing. 4 children are lying in the pillows as they watch the flashing lights. A little later the boys who played their self-invented “Lunges” game disappear and a bigger girl stands up and starts to play “Lunges” very concentrated and according to the rules. A boy enters and stands on the two connected “Disco”-tiles, but steps down again a few seconds later: “No, I cannot do it anymore! My feet hurt!”

Later a boy, who has not played on the tiles before, looks into the room, stares at them and says: “That is too easy! I think it is too easy!”. A bigger boy decodes this expression as insecurity towards the tiles and the digital games and shown him how the modular robotic tiles function and shows him the game rules for “Disco” and “Lunges”, after which he sits down again. The big girl stops playing “Lunges” and disappears in order to play something else in another room. Again, a bigger boy looks into the room and sees that “Lunges” is available, he plays for a few minutes and hereafter he disappears again. Finally, the “insecure” boy is alone in the room. When he has made sure that he is alone in the room, he slowly approaches the “Lunges” plate. He looks around on the plate and steps up. He tries different things on the plate. I am sitting in the corner and concentrate on my notepad. When he has tried stepping on the plate for a while, I slowly tell him how the tiles work and what that he will have to have a foot in a red tile all the time. Then he goes ahead and tries the game. When he has played successfully for a while, he wishes to try the “Disco” tiles and he now moves in a flow between “Disco” and “Lunges” tiles. An older girl enters the room but the “insecure” boy is now so sure of the game that he continues playing on the “Disco” tiles. The older girl starts to play “Lunges” She plays in a humming, troublemaker-like, swirling way, while the boy plays in a stamping, aggressive, constant manner.

A little later, all of the tiles are connected for a new game of “Colour Race”. It takes a while and a couple of attempts to make all the tiles, so that colours do not disappear during the game. The children did not perceive the disappearing colours as faults in the game, but the have instead made their own conclusions and rules concerning the mysterious failures: “That is because you will have to step 15 times **before** the colour disappears!”. We succeeded in building the track where all colours were present all the time. 3 experienced “tile stompers” entered the room and just a moment later they move around in a wild flow on the track. They move around super fast and chaotic. But they are good at not jumping into each other, even though they are in a collective turmoil. A little later all the big children are called into the rooms for pre-school activities, and two younger boys, who have been sitting in the pillows looking at the older children’s turmoil-game,

stand up and jumps around the plate together. They are obviously good friends who want to play together on the plate by themselves (several times during the field work they approach the plate together, when it is available and they leave again, when other children arrives). They are equally good at the game and they take turns at winning. They are obviously beginners and practice the typical beginner technique, when it comes to movements on the plate: They move around the plate until they stand on their colour, then they stand with their legs together and take aim, bend their knees and raises their arms and shoulders in order to jump on the coloured tile with max force. Hereafter, they turn around, bend their knees and jumps off the plate again with legs together, and walk around the plate until they stand next to the next coloured tile. Both children are in their own world. It is obviously something that they each are together in. A little later they have become more experienced and instead of jumping off the plate each time, they jump from tile to tile – however, they take aim first, then they bend their knees and raises their arms, then they jump up in the air and onto the tile and then they land at full force and legs together. When the plate lights up in purple, they both raise their arms at the same time: “Yah! We won!”. Even if one is red and the other one is purple, they are “together against each other in the game”.

It was a constant fact during all days that the children played on the tiles (only exception is a couple of small breaks), and the games are fairly divided between the sexes, all ages, all temperaments and all player types. All the constellations play the game and are absorbed by it – in their individual way. Often a group of children sit in the pillows and watch the players, cheer them one, talks and has a good time, wait until it is their turn to play a special game, or that certain players will leave or enter so that they can avoid/be able to play with them. They can appear as involved spectators who steps on the tiles next to their feet, when certain colours appear in order to be a part of the game or help a certain player. From time to time, the spectators help a player to find the colour if the player has lost his or her concentration, is young or a new player: “Hey, there is purple!”.

When I arrive at day 2, 8 players are playing “Colour Race” at the same time. Chaos reined in the little room and on the surface it just looked like a big turmoil-like mess of fighting and struggling bodies. But the children quickly form groups within which they distribute around the plate and steps on the group’s colour, when it occurs in “their section”. The children have built the plate themselves and started the game. Two small girls want to join the game too and enter the fight: “I am green, I am green!”, “No, I am green!”, “I am purple”, “I am blue”. A younger boy joins the others and starts to jump in and out on the red circles while he drones: “And there! And there! And there!”, each time he lands on a red circle. 2 smaller boys sit and watch the game, waiting for a “tunnel” occurs between the struggling children. When the tunnel occurs go running and jumping over the plate and back again which makes the playing girls react: “It is not funny, when you run back and forth!” One of the 2 playing girls starts to glide and slip on the plate by accident because she wears smooth stockings, but that movement is quickly integrated into the game and the two girls start to glide around the plate on purpose while they squeal with delight. After a while they leave the room with the remark: “We are also going to do gymnastics tomorrow!” After a while one of the girls enters the room again: “I just need to go the gymnasium again!”.

Later, two children jump around in a wild jump through the air in the chase of each their colour. But they hit each other in the air. It clearly hurts, but they do not have time to cry – they are too busy playing. The two children play each their colour and compete against each other, but

suddenly the game changes character. Suddenly they start playing the same colour instead of each their colour and a new game occurs: The important thing is to be the first to find and strike the colour and being the one to step on the last colour and make the entire plate light up. The still compete against each other, but cooperates on finding and stepping on the same colour.

A very little girl has silently entered the plate. She plays in her own little world without noticing the other players on the plate. It is her against the green circles on the plate. She looks for it and points her finger at the plate: "Where is the green one? Where is the green one?" She finds it and points at it: "Green, there!" And she moves towards the tile, stands close to the colour circle, puts her legs together, jumps up and lands on the tile with a large force.

When I arrive at the kindergarten on the 3<sup>rd</sup> day, the children and a teacher have tried to assemble a track and start a game, but they could not make it work. Together we construct the track again, start all tiles over, starts the play control tile over and attach the "gaming piece" to the "transmitter". "Colour Race" starts, the children starts to play and it works 100 % and without failures over the next hours.

One of the older girls, who have played a lot, plays on the plate with a younger girl and younger boy. She is fast and good at it, and the two younger children cannot keep up with her. She wins all the time. The young girl is clearly frustrated about it – she does not have a chance. She tries the best she can, but still she cannot keep up: "The game does not work!", she claims – obviously frustrated and she stops. After a while she tries again, but still she loses. The she tries another tactic: "I want to be purple now". Purple is the older girl's colour and thus the winning colour. The older girl allows the younger girl to play the colour, but that does not change things either. Finally, the younger girl gives up and disappears with the young boy, as none of her explanations and seems to work (there is something wrong with the game + it is always purple that wins). The big girl stays in the middle of the plate, reaches out with one leg and stomps through the game. She is placed centrally and she is able to reach the entire plate with her foot. The two younger children moves from tile to tile, and jumps through the game which is much slower, much more uneconomic and hard. When the two younger children have left, the older girl is the only one in the room: "Nobody wants to play because I win all the time!". Now that she is alone, she tries to experiment with different strategies: She puffs around on the plate without lifting her feet from the tiles. She crawls around on the plate and presses with her hands and knees. She squats and jumps like a frog from tile to tile. Once in a while she sits herself in the pillows while she waits for other players to come: "Some times I need to have a break". A little later she stands up and starts playing again. She keeps playing "Colour Race" even though she is alone in the room. Every time she has played a game through, she throws herself onto the pillows, but soon after she stands up and plays again. The coloured lights calls on her so much that she continues: "I am practicing".

A little later a bigger girl enters the room, this girl has game experience too. They start playing together: "I have practices yesterday and today", the girl says, while she jumps on the tiles. "I become better and better because I practice", the other girls says. The girls pant and stomps around on the plate: "Yeah, I am purple!", "I am red!". They play and play and play: "Yeaaaaah!!", "You are not allowed to scream!", "Purple wins all the time!", "I am purple!", "No, I said it first!", "Mikkel, do you want to play?", "Yes", "Mikkel, what colour do you want to be?", "Louise, stop, we first have to say who we want to be!". Another older girl joins the game. The all play fast and concentrated, while the young boy (Mikkel) watches the game from a distance. Once in a while he cautiously enters the plate, steps on his colour and steps down again. The first two girls compete

to have the colour purple. The desire to play this exact colour is so big that the girl who does not get the colour sits down and looks at the other girl playing with the purple colour. They would rather sit one game over than play with any other colour. After a short while, the desire to play against each other becomes too big and they start to play again "red versus purple": "It is confusing", one of the girls says, while they struggle against each other – very focused.

When I enter the room a little later, three older boys are playing a violent game of "Colour Race". The struggle, pushes and fight; "It is not **funny!** I said that I was blue first!", "But I am blue all the time", "Mick, you ate teasing me!", "Stop, you are not allowed to hang on to me". The game is obviously a battle of winning the game, certain colours, power positions and location on the plate. Meanwhile, some of the girls sit in the pillows and watch the struggling boys, while they comment on their playing style: "I don't want to play when there are so many boys!", "It is not funny when you yell "Ka-ching!", my ears are going to hurt!" But the boys ignore the girls and continue their struggle. Later it changes, as one of the boys plays alone and suddenly changes playing style and gets the attention of the spectators: "Look at what I am doing!", "You are stepping on many different colours. Let's see who wins!", "Yes, let's see who wins!". The boy plays alone on the plate and steps on all the colours in his reach. Later he leaves the room, and the boys in the pillows say: "Yes! Now I can play!", "Yes, one is never able to beat Hans-Christian!". "No, that's right – I am so fast!", says the boy as he looks into the room again. He had not left the room after all, which makes one of the girls say: "I don't want to play before they go home". But the boy starts playing all over again and a couple joins the game: "Hey, watch out! I cannot find my colour!", "Yes, you'll have to look down all the time!", "It is called 15 race!", "You'll have to be quick, and you will also have to jump high!", "And you'll have to hurry to find the colour". The unsatisfied girl becomes impatient and throws a pillow on the plate: "You are ruining the game!", "I only want to, when everybody goes home! Then I have it all to myself. I don't want to play with anybody, I just want to have fun!", the girl retorts. Almost none of the children (except the most skilled children) want to play for long with the skilled boy, because they do not have a chance of winning. And it is not fun to have no chances at winning. Unless, like some of the children, one is on the plate for other reasons (e.g. practice, to jump around for fun, to play freely, to learn the rules of the game or the functions or something else).

A little later the players switch places and now it is a new group of players on the plate, among these the unsatisfied girls from previously. Things are hectic on the plate and the bodies stumble around each other: "But, But, But, I cannot find green", "Why are you cheering on me? Is it because I am fast?", "I am helping you, Louise?", "No, nobody must help me!", "It is not fun, when somebody helps!". Later, the group gets tired of playing and instead of leaving the plate to somebody else, they ask me to reconstruct the plate in "Disco" and "Lunges", so they can keep on playing: "We would like to try something else now, it is more fun".

Later again, 3 boys sit on the plate and stamps on the plate with their feet, jumps like frogs around the colours, hits them with their hands and presses down on them with their knees. It is free play – just for fun, they toss around, talk and have fun: "I become dizzy because I walk in circles all the time!", "You are not allowed to touch the red tiles!". At one point the 3 children crawls around the plate and presses on the tiles with their knees. They stand up and play around with each other. They press on all the colours in their reach while they laugh. Later they stumble out of the room – on to other games.

2 small boys jumps on the nearest colours and names them as they jump: "Green", "Purple", "Green", "Red", "Blue", "Purple".



2 bigger boys fight to keep each other away from the green colour, and to get to step on it themselves.

2 bigger girls try to get the purple colour up in a specific corner tile by stepping on it around the plate until it appears in the desired tile. They move the other colours away from the corner tile if they are there. When the purple colour shows up in the corner tile, they take turns crawling up on a high footstool that they have brought into the room, and which stands a little away. The girl who's turn it is crawls onto the footstool, takes aim and jumps from the footstool out in the room and down on the purple tile. After this they start over in their pursuit to move the purple colour into the corner tile, and then it is the other girls turn to jump.

Some children seek the plate, when nobody else is there and leaves if somebody else enters the plate/the room. Others seek the room with others and leave if they are alone in the room/on the plate. Others seek the room in the company of certain persons whom they wish to play with (alone on the plate). Others leave the room/plate if "undesired" persons enter the plate, if there are too many on the plate, if people of the wrong sex/age are on the plate or some other reasons. In this way, the children can "keep an eye on the plate" for a longer time and wait until the right situation and the desired constellation occurs.

Here, at the 3<sup>rd</sup> day, the room is not as intensively active as the other days and the concentrated games seems to be replaced by more loose games, free play, experiments, alternative rules and movements etc. Once in a while the plate and the room is empty (like every other room/activities in the kindergarten), but suddenly one or more children enter and starts playing immediately for a while.

2 younger girls sit and wait for their turn. Some of the older children play on the plate and the 2 young girls wait to get the plate to themselves, so they are able to play without the older ones interfering and take over the game. It is too hard for the older children not to "help" when the younger ones are on the plate, both when the older ones are on the plate too and when they are spectators. It is too slow and cosy for the older players, who are not able to stop interfering and give a helping hand.

At last the two younger girls get the opportunity to play by themselves on the plate, and they step up full of excitement. They have a really good time by puffing around on the plate chasing each their colour and they both yell: "I won" and lift their arms in the air together, when the plate flashes. "Next time it is my turn to win", one of the girls says, and they cooperate to find the colours and remember the rules.

Later again a group consisting of 4 boys play on the plate. The boys toss around and presses wildly on all the colours, they push each other, make fighting noises and the entire group yell triumphantly when the plate lights up: "Ones neck hurts when looking down on the colours so much", "We are actually all the colours", "I am blue", "No we are all blue! You are allowed to step on all the colours!". It is just a fantastic, chaotic and wild game.

In the afternoon on the third day, the tiles are moved out of the room and into the shared room after the children have eaten their fruit. Contrary to the small, closed room in which the tiles have been so far, the tiles are now in a big open room that functions as a central traffic area for the children's movement around the indoor areas. Here, children are always present playing computer, on their way from one room to another, in the sofa, around the tables or doing something else. The tiles are laid out and "Colour Race" is activated, immediately children on the

tiles in different roles: Hopping like frogs, dancing mice, stomping trolls, sneak thieves, skating princesses etc.

Two small girls enter the shared room dressed as beautiful princesses with pretty princess-shoes. They trip up on the plate and trips around it with cautious steps while they lift their dresses. They play along and chase their colours without being able to see clearly because of the dresses or move right because of the shoes. They move a little, lift the dresses up and looks down to see which tiles they are standing on and then they trips on. One princess potters about and onto her colour, stands on the tile and turns around and makes a curtsy from side to side until the tile activates and the colour turns off. Then she moves on in the pursuit of the next colour circle, where she stands and swings the hips from side to side again: "I am dancing! I am Sleeping Beauty", she claims proudly. The princess wants to be purple, it is a hard colour to get to be and keep, when one is little and a novice. But she shuffles on to the purple circle, stands cautiously on it with a foot on each side of the circle and lets the dress fall down. Now the colour is hidden under the dress, and at the same time a spectacular light floats out under the dress. She stands cautiously and turns from side to side with the purple colour flowing under her dress. It is obvious to see that now she feels like a real princess.

At this 3<sup>rd</sup> day it becomes visible that the children who have played a lot have moved from novice to experienced: They have acquired an automatic recognition of the colours, they have learned techniques to quickly scan the plate, they have perfection in activating the sensors and they have economized their patterns of movement – they know rules, functions and strategy on their backbones. At the same time they have developed a lot of alternative game rules, free forms of play, new games and new player types. They have trained different typical patterns of movement: a movement pattern when they play to win, another when they experiment and practice and a third pattern of movement for free play. The patterns of movement can easily change back and forth during the period of play on the plate so that what starts as practice for a child suddenly changes into competition, and then turn into play and creativity etc. Furthermore, the patterns of movement changes from game to game and from situation to situation. Often there is a general change on the plate between free play and serious competition, between practice and playing to win, between being in intense activity and moving around more relaxed and recreational. In addition the applied way of playing on the plate can also change: First "Colour Race" is played traditionally. Then a game is played in which everybody can step on all colours, then there is play on the plate (crawling, sitting and jumping like frogs), then there is cooperation in teams, then there is a struggle to get the same colour, then there is a struggle on each "side of the arena" on keeping the colours away: "We are both purple, we have each our side", "This is your side and this is my side", "Now I will step the purple over to your side", and then the children play "tour" on the plate where a group of children walks around on the plate (as if it was a railway track) in a row after each other and each stamp on all the colours that occur at their feet: "Now we'll have to run at them all, and then we are going to see which colour that will win". They walk around and around and around, while they shuffle over the colours that appear at their feet, when other shuffling "train wagons" have send them forward on the plate.

When most of the children were picked up, Selma at 1½ enters the kindergarten. She immediately joins the game and intuitively she gets the main idea of the game: To step on the coloured tiles. She steps onto the plate and starts shuffling around it. She is not yet sure enough of her legs to lift her one foot and stamp on the sensors, but that is not necessary. She quickly finds out that she can activate them by shuffling over them. At first she activates all the tiles that she

passes and shouts with joy when the older children shout with joy, crawls when the older children crawls, runs when they run and stands on the tiles when they stand on the tiles. But it does not take too many directions from my side before she is able to stick to the game rules: I point out her colour and she walks over it. Hereafter, I show her where the colour has moved to and she goes there. Now she does not step on all the tiles she passes anymore but heads determined for the specific colour. Thus she is able to play "Colour Race" with one single colour as she moves determined towards the coloured tiles and determined after the specific colour.

The day is over and the tiles are separated and put back in the charger in two stacks. The tiles have been used the entire day.

On the 5<sup>th</sup> day the children have become familiar with and used to the tiles. For the first time the tiles are not laid out as the first thing when I arrive at the Kindergarten. The children are used to their presence. They are now an integral part of the kindergarten's equipment and do no longer have a special status. I make the tiles ready in a small separate and somewhat isolated room, but no children immediately looks into the room. It becomes clear that being visual and the location are important parameters. The children cannot see that the modular robotic tiles are ready for play and the must thus actively seek the tiles to see if they are ready and available. Contrary to the shared room that is a room with much passage with 5 doors, it is the central room of the kindergarten and a place dedicated to other activities than the tiles (e.g. computer games, playing catch, relaxing in the sofas and balance games on chairs), so the tile room is characterized by being a well-defined room with 1 door, by being a secluded and a place dedicated to one activity. However, this does not have any effect on the use of a play media. "The romp room" is e.g. identical to the tile room, but almost constantly children are playing in it and it is described as the "best room" of the kindergarten. In the tile room, children are also playing most of the time, which could indicate that the tile room is just as good as the romp room. On the 5<sup>th</sup> day the room and the tiles have changed status: from being special to being ordinary – a play media that the children can use on and off when they wish to do so.

I put up a small compact version of "Colour Race" consisting of only 6 tiles and 4 colours. For the first time, not all 12 tiles were active – and that the children obviously found strange: The more tiles, the better! But they start to play on it anyway. The children can stand still and reach the entire plate, and that makes the character of the game change from longer games with a high level of physical activity to fast games with less movement. The children do not move around on the small compact plate, but stand around it and moves around it. They step in with one foot, steps on the colour and steps out again. In opposition to the big plate on which they moved around on it while they struggled against each other.

The small children stand ready, take aim, prepare the body and the jump, jumps as high as they can into the air with their entire body and down on the colour with their legs together. Also if they are only moving one tile forward. It is very hard, uneconomic, slow but fun.

When there are only a few children present, they move around the plate while they play; when many children are present they move on top of the plate while they play. There are children who prefer to walk around on the plate and children who prefer to walk around the plate.

2 young boys are having a blast in the room; "You cannot touch there 'cause there is lava on it!" (red tiles), "And this is where you are supposed to sleep!" (green tiles).

5 children transform the tile room to a romp room. They romp around the pillows and mattresses next to the game plate. Once in a while they roll onto the plate, rummage around,

crawl back again. Some jump in on the tiles, jumps around like crazy on all the colours and throw themselves back in the pillows.

The children have been back on the tiles the entire morning. There is no adult supervision in the secluded room (just like in the romp room), which means that the older children sometimes uses their height and stoutness to take over the plate. The younger children are pressed out – more or less on purpose. The wild children sometimes take over the game as well and scare the quiet children away. Power struggles also take place between the children who want to play the game and the children who want to play on the plate. Like the more experienced children constantly win over those with less experience and thereby make them give up playing. Furthermore, there is also the presence of spectators who interferes in the game, game spoilers who on purpose obstruct the game, girls who do not want to play with boys, boys who do not want to play with girls and many other positions. But even though all these conflicting positions are in the same room at different times, it is rather rare that an adult needs to interfere. The children controls it themselves, but the children who are good at pushing (the older, the experienced, wild) naturally win over more free space and playtime on the plate than the children who are less pushy (the young ones, beginners, quiet).

There is a good combination of relaxing/romp pillows and tiles in the room and games that start in the pillows can move out on the tiles. At one point 3 girls, playing “baby game”, moves out on the tiles and now it is suddenly 3 babies that alternately crawls and plays on the tiles and sleeps on them (each time a game is over, they take a nap): “I am baby”, “Yes, come on, we are babies now!”, “What about sleeping on the tiles?”, “The colour you are sleeping on is your colour in the game”, “This baby does not know how to play the game”, “I am green, I lie here”, “Now we sleep!”, “Then tomorrow we can play again”. The 3 girls crawl, lie down and slams their hands on the plate. They are babies who crawls the game and sleeps on their colour, each time they have accomplished a game. They are using the colour circle as a pillow.

“Colour Race” with more players drags the children into a turmoil-like game, collective coalition and continuous forth-and-back, un-and-out movements. It can be hard to see anything or be on the plate, when so many players are on it at the same time, but that is exactly what some of the children are drawn to. But even if they often stand in each others way, bump into each other, accidently steps on each others tiles or pushes (a little) to each other, it often does not matter – it is a part of the game. Other kids on the other hand seek more quiet games and waits patiently until the more wild children get tired. Generally there is a great accept of other players and the fact that they may step on somebody’s colour during the game, but there is a clear accept/rejection of spectators who steps on player’s tiles: There is a clear demarcation between wanted/unwanted help and player accidents during the game when it comes to stepping on the tiles. And not only the present player can reject/accept help from spectators, the other players can as well reject/accept help for other players benefit. Regardless of age and sex, it is hard to play when one is in a game against others and children become all sweaty and leave the room from time to time, with wet hair and out of breath.

A younger girl by the name Annika is in a flow playing “Colour Race” and plays focused on the plate, regardless of other children’s presence or not. She has lost her breath so much that she almost cannot breathe and her hair is all wet. But each time a game is accomplished, she yells: “I am purple!” and starts over again. When the other players are on the plate, she yells: “Next time I am purple, I will hold the colour”, and if she cannot find it immediately, she says: “Argh! I cannot

see!". Annika practices alone and plays a lot through all the days. She is a little, slight girl with glasses. She has become very good at the game, she is fast, steps through the game very precisely and only with one foot, and she keeps control of the plate at all times. In the game, she is fearless and enters games with the bigger and wilder boys unabashed. I ask her how she has become so good at the game and she promptly answers: "That is because I have practiced!".

"Colour Race with one or more quiet players" makes the children enter into creative play, dancing swirls, cooperating game sessions and collected play around a shared theme. One day, when most of the children are picked up by their parents, 3 younger boys play in a wonderful harmony on the plate; they have room around them and space to play a war game. They jump in the air and down on the tiles with both legs at full force: "Hi-jahr!", "Jaaaaah!", "Hu-mah!", "Dahr!", "Yes, I won", "Ti-harh!", "Yah-Dah!" is heard from the room, while they jump around and makes fight-noises when the jump on the lights. An adult looks in: "Is it hard?", "Yes!", "Yes it is", "My hair is all wet!", "Watch out, watch out!", the boys utter. "Colour Race" is without comparison the most popular game, whether playing alone or together, against each other or in cooperation. Furthermore, the game has a clear advantage: It can easily be played by more players at the same time in their individual games, where a winner is named often, when the entire plate lights up. Hereafter the players continue their pursuit for their individual colour. The winner can exult for a few seconds, before the game starts over, and the players engage in their own pursuit. The player can also play alone in a number of different ways, like a boy who is alone in the room and yells: "I play both colours at the same time!". He tries to reach both the blue and the green colour at the same time using both his legs on the plate: "I play with two colours!". He steps his way around the plate and is excited to see which one of his colours that will win.

"Lunges" is a game for one single player and the winner enters a concentrated flow in which the goal is to constantly have one foot on the red ring, while the other foot steps on green/blue tiles. The older children can easily understand and play the game once they have received instructions. But it requires that an adult takes the time to explain the logic of the game to them, as the children's logic says "jump on everything that flashes". Subsequently, the children are able to explain the rules and functionalities to other and smaller children. Just like they are able to develop the game and incorporate more players at the same time.

"Disco" can be played by more people at the same time, cooperating on keeping the plate going or alone. 2 children plays on a 2x2 track, on which they stand opposite to each other with one foot on each tile, changing the weight from one leg to the other to keep the tiles illuminated: "Run, Victor!". "Disco" is a very easy game to understand for both the youngest and the older children, even if it requires concentration and persistence to keep the game going. One will not have to stand still for very long or place the foot outside the sensor very many times, before the game is lost. It is very easy, but physically hard for the children, as the children stamp on. They can only go for 1-2 minutes before they are tired. But it is fair to assume that over time they will learn to move more economic and strategically, in order to keep more tiles going for a longer span of time. By cooperation, they may be able to keep an entire plate running. When I brought the tiles home with me, 2 grown men cooperated on playing "Disco", and they could easily keep 10 tiles going for a long time by cooperating and moving economic/strategically.

“Simon Says” is too difficult for a group of kindergarten children. They are too impatient to get instructions for the game and they cannot wait until the sequence they will have to remember is finished before they start stepping on the modular robotic tiles. They cannot help but following their intuition and starts jumping the sequence, **while** it is played. The urge to jump on the flashing tile is too big and the desire to look attentively and memorize is too little. However, 5-year old Fenja could play the game when we brought the modular robotic tiles home and there was the right atmosphere and privacy to instruct carefully and sticking to the rules, until the function and the game rules were learned. Then she was completely aware of the game and practiced focused for ½ hour.

### **Typical game actions:**

Boys make fighting noises when they play, the girls squeal with delight when they win.

Two bigger and experienced boys play focused. One chooses a new colour all the time while the other stays with one colour through the game.

A girl dances on the game plate while she plays. She swirls around herself on the coloured circle and onto the next circle while she hums to herself.

Another girl jumps around on the plate, stamps like in a hopscotch diagram. She jumps hard from colour circle to colour circle, turns around and finds the next colour circle and jumps on it. It looks like a child jumping in a very messy hopscotch diagram.

Play by turning the tiles on and of.

Play by starting the game and the gaming pieces

Play by taking the tiles off and putting them back on

Play by re-building the track

Play by changing games

Crawling on the plate

Running on the plate

Jumping on the plate

Playing games on the plate

Play with light on the plate

Jumping like frogs on the plate

Pressing with knees on the plate

Spectator steps on the plate

Spectators pointing colours out on the plate

Sitting down and looking on the plate

Jumping in and out of the plate

Jumping with legs together

Jumping on one leg

Stepping out with legs wide apart

Jumping in long and short jumps

Walking around and stopping on the colour circle

Running on the plate

Swirling on the plate

Stomping on the plate

Puffing around on the plate

Stepping with the tip of the foot on the plate  
Gliding around on the plate  
Sneaking on to the plate  
Pushing each other on the plate  
Dancing on the plate  
Lie on the plate  
Turning around on the plate  
Reach out on the plate with one leg  
Sitting on the plate  
Hitting the plate with ones hands  
Sleeping on the plate  
Crawling up on something and jump down on the plate  
Struggling on the plate  
Throwing things onto/over the plate  
Stepping on the plate with one foot and then stepping out again

## Typical games

Colour-game: What is my colour, what is yours? Do you want to trade colours? Which colour is the best? Which rules apply for a certain colour (e.g. being the first calling the name of the colour)?

Counting-game: How many times to find ones colour in order to win? Is it the same number each time or have others (accidentally) stepped on some as they went along?

Struggling-games: Struggle on the plate saying fighting noises, push, turmoil, expressions

Dancing-game: swirling, humming, being graceful and ballet-like, tripping, small jumps, stepping with the toes.

Competition: Competition on who will first step on all of the colour circles and make the plate light up in ones winner-colour. Here speed, overview, concentration, strategy, economic movements and precision.

Cooperation: Playing together in teams with a certain colour, stepping on all the colours and see who will win. Who has found the colour first?

Free play: Tumbling, crawling, romping and being silly. Move in a silly manner, sleeping on the tiles, playing house on the tiles, stepping ahead on all the colours, playing with colours, playing with tiles.

Struggle between the spectators/players: Who will get to the colour first?

Jump from a pile of pillows/a chair and onto the plate, throwing things at or directly on the plate.

One person sitting on the plate, and then the others must "pay money" before he spreads his legs/moves his bottom to make way to ones colour.

## Typical game language:

"I am purple!"

"I'm with you, Mia!"

"I am red", "I am purple", "I am blue"

"I'm helping you, Christian!"

"How did it go?", "Fine, I am just too sweaty"

"I am green! It is me who is green!"

Dad: "Now it is time to go home!", children: "Ha ha, we are just jumping!"  
 "It is just like the plate is turning, 'cause I'm all dizzy!"  
 "I'm all sweaty"  
 "Wow, you become hot when doing this!"  
 "My legs hurt!"  
 "Hurry up, Willum, before he wins!"  
 "The two of us are green, and me and Mikkel wins!"  
 "We are all purple!"  
 "Hey! You were on my side!"  
 "Now the two of us are purple!"  
 "It is not funny when somebody plays together!"  
 "I don't want to play with somebody today; I just want to play with this!"  
 "We want to build a horse" (about motive track-building)  
 "Come on, we'll leave!", "No, I want to see this!"  
 "You cannot cheer!", "Yes I can!"  
 "You must choose a colour first!", "Ok, blue!"  
 "I won over myself!"  
 "I'm just playing against myself"  
 "Jump! Jump! You'll have to step in the middle!"  
 "Now I need to have a break, before my hair gets all wet!" (Child 3 years old)  
 "But we have a rule that we can only walk in this game, because my foot hurts if I run, and then I will lose all the time, and that is not funny!" (Child 5 years old)  
 "We only want one colour", "We'll have to be red team", "Yes, the two of us are red team", "We take turns jumping", "We'll have to take a quick nap, before we play again!" (two children 3 years old)

## Observations of play media: Modular robotic tiles

### Patters of use:

- **Which play media do the children use?**

Modular robotic tiles, footstool, pillows and cushions, action figures, weapons

- **Which play media works?**

All

- **Which play media does not work?**

None

### Actual use: The correlation between body, room and artefact:

- How do the play media affect the user? How is artefact a player in the game?

The digital tiles have an immediate attractive force on both the wild and the quiet children with their support of both relaxing and outreaching activities. The modular robotic tiles and the room invites to movement of the body as well as to relaxation of the body: The light in the tiles, the pillows in the room, track building and choice of games seems to be just as central players in the



wild games and highly active competitions, as central players in relaxing feel-good-games and competitions with low activity. The modular robotic tiles can however easily seem frightening on younger and quieter children, if the bigger and wilder children are engaged in highly active tumbling-games or competitions on them, just like it can be hard for the older children, if the young or quiet children are engaged in low-intensity feel-good-games or competitions. It is a challenge to incorporate groupings with opposite interests in the room at the same time. Thus, the modular robotic tiles are as play-zones designed for one specific play-form at the time: Wild tumbling/struggling games, quiet light/dancing games (or playing house or children's games), highly active competitions between the older children or low-intensity games between the younger children, cooperating feel-good competitions or opposing struggling competitions, playing by the rules or experimenting with the play media etc., even if a number of mixed constellations can occur (e.g. highly active competitions between older children, where groups cooperate internally and work against each other while they play by the rules). But the modular robotic tiles are, regardless of age, temperament, level of experience and type, a central part of the children's play during the time the tiles were available in the kindergarten (and a play media which dragged the children to it during the "indoor time"): This is where the wilder children can close the door to the room and compete aggressively and at high speed against each other on the tiles, struggle against the tiles and make loud fighting noises, stamp and jump like crazy on the tiles, push each other in the struggle of the colours on the tiles and throw themselves from the pillows and onto the tiles and out again without adults hushing at them or interfering. This is where the quieter children can close the door to the room and compete at low intensity and with respect for each other, play with the light on the tiles, dance and puff around on the tiles, play house or animal games and lie in the pillows/on the tiles and have a good time, cuddle and watch the lights, without being disturbed by adults from outside or activities. This is where the older children can compete and struggle seriously against each other; develop social competences through negotiation on game rules, social game rules, player behaviour, opposition/cooperation, development of bodily competences through jumps, precision stepping, running, pushing, rotation etc. And it is here they train apprenticeship through strategy, economizing, overview, concentration, precision and fastness, and hereafter guide the younger children and less experienced, play creatively and experiment with light, game and track (building) and invent own games, rules and queue agreements. These is where the younger children can learn colours, game rules and functions and compete against the plate or each other at their own pace, develop social and bodily competences, imagine a play situation, play a storyline, find-the-colour-games, jumping games etc.

Consequently, the modular robotic tiles do several opposing things to the user: They create movement of the body with their demand for physical activity through the presence of the digital games, which invite a high level of activity, their colours, which invite the user to step and jump on them, the pillows/the plate on which they can struggle, the bodies playing side by side that causes turmoil and physical contact/struggle and the free playing space that invites the players to dance, stomp, struggle, run, jump like frogs and physical bodily actions of all sorts. They create calmness in the body through the presence of the digital games and their innate possibility to play them at the players own pace ("Colour Race", "Lunges" and "Simon Says" can all be played in a slow, meditating pace), their colours, which invites to be walked, stepped, danced or slept on (the sensors are (for the most) sensitive to a slow walk of a 1½-year old child), the pillows/plate in which the children can lie, crawl or have a good time in, the bodies playing simultaneously that

creates talk, cooperation and cuddling and the free playing space, that invites the children into creative track-building, play with colours, play on the floor, play on the plate and relaxing play of all sorts. These opposing effects on the player are possible due to the closed, well-defined room in which it is possible to make noise without disturbing other zones and have a peaceful situation without being disturbed from other zones, due to the modular robotic tiles' ability to be intended for both physical expressions (jumping, stomping, running, pushing, throwing oneself etc.) and physical relaxation (lie down, sit, crawl, cuddle, puff etc). The tiles thus changes between support of the wild, physical play and the quiet, recreational play, and often the level of activity between the children present floats between these two extremes: Suddenly there is a wild game going on the tiles, where 8 children struggle to get to the colours as fast as possible in order to win the game while they yell, pushes, runs, stamps and jumps, for then, at the next moment to lie down on the tiles using the lights as pillows and talk and cuddle, to suddenly say: "Now it is morning!", and stand up for another game of high intensity.

The modular robotic tiles was a central player in the games of the older and younger, the wild and the quiet, the beginners, experienced and super-users (a level which almost none of the children reached during the short period of time the tiles were present): They were central players in the games of the smaller children by virtue of its immediate invitation to play with the colours and tiles, its intuitive game design in "Colour Race" and "Disco", that meant that even the smallest children can enter the older children's games by having their own colours or tiles. They are a central player in the games of the older children by virtue of their double challenge in game-based apprentice games and creative socializing games, their invitation to physical/psychological challenge and relaxation, their game design that to a large extent brings the possibility to do apprenticeship and training and show of their cognitive/physical skills. They are a central player in the beginners games by their physical and cognitive design: They can train skills in jumping high/far, hit precisely, move quickly, be focused, scan and have an overview (of the plate), recognize and find colours, learn game rules, learn to struggle and master turmoil etc. And they are a central player in the experienced and super-users' games by virtue of their physical and cognitive design: Here they can practice physical and cognitive game actions, master specific games, master the struggle of the plate, master physical and cognitive navigation in situations of turmoil, invent tricks, new rules and ways to play etc. The digital tiles quickly got a group of "regulars" (who spend the most time on the tiles during the time they were available in the kindergarten), a large group of "camp followers" (who jumps in on the on-going games or who watches), a group of "apprentices" (who practice on being a part of the games of the older/more skilled children), a group of "creative children" (who uses the tiles in all sorts of possible and impossible ways in addition to using them as intended), a group of "tumblers" (who played around on the tiles) and a group of "curious children" (who once in a while looked into the room to see who was there and what they were doing). All these different groups occupied the play media without problems, and often different groups were present at the same time along with mixed groups (e.g. a "tumbler" who stumbled around on the tiles while he "creatively" played war with another one and against a colour on the plate, as he "learned" the game and the functions of the tiles).

Crucial to the digital tiles attractive force is the presence of the coloured lights, the open games and the secluded space – it is with a closed door that one really can shout and engage in ones personal game: "I am a baby", "Yes, come on, we are babies now!", "Should we sleep on the tiles?". At the same time the colourful illuminated circles has a powerful attractive force on the

children, whether they play or not – they cannot help but stepping on the tiles or looking at them, when they are in the room. If they are lying in the pillows, they stand up with short intervals and step on a couple of tiles, before they continue their undertakings. Or they lie on the colours, crawls on them, looks at them, adds value to them (which colour do you cheer for? Which colour is the best?) or dances on them. They are irresistible whether they flashing count down, like in “Disco” , move around on the plate like in “Colour Race” or occur in a structured game like in “Lunges”. Decisive for the colour circles’ and the players’ continuous attractive force is however the possibility to change between being a part of a targeted game activity on the plate, where the lights are used as player markers or action markers and interact in free creative/experimenting activities on the plate, where the lights/players can be used as a background carpet for play activities (lie in the pillows, look at the flashing lights or play with action figures in the room, a game that once in a while moves up on the plate), like a remedy in play activities (dance light/floor for dance competitions or slide for glide/falling games) or as main player in play activities (coloured lights that symbolizes lava, grass, water, jump on all the colours or playing house, where the tiles are the house and the lights are pillows, food etc.) Generally speaking, it is also crucial that there are other children in the play zone as the digital tiles are best suited in an interaction with other children in play, but they can however easily occur as a single player in the children’s game, and often children were playing there alone, either because they were waiting for other children to show up, needed a breathing space or decidedly went to the tiles, when the other children were not there. The players also contributed to the level of interplay with the other children or as single player: “Lunges” were best suited for single player (even though the children invented game variants for more players), “Disco” were just as good for a single player as a game with more players (depending on how big the “Disco” plate was), while “Colour Race” first and foremost was suited for interaction with other children (even if the children once in a while played alone on their own, but that was mainly when they waited for other children to join or to “practice”, as they called it). Like the Tumbler, the room is also a secluded, closed room, and therefore there are often requests for collective play in the tile room: “Who wants to play on the tiles?”, or two or more children had agreed to play in the tile room or went to see the group engaged in another game (war, action figures, secret agents, free play) which they continued in the room. The modular robotic tiles reach their full play potential when a small group is present (3-6) of which not all need to engage in typical play activities, but can without problems be spectators. The group may, on the other hand, not be too big as that can complicate the play on the plate and in the small secluded room. At one point there were thus 8 children playing on the plate, which created a great turmoil and physical chaos, and that caused two children to withdraw from the game – too many children on the plate may be claustrophobic, frustrating and tight. In addition, through the presence of the colourful light, open games and changeable structure (like building blocks) the digital tiles receive status as central players in the children’s games through their support of a long range of different activities at the same place, that can occur at the same time. This open structure towards the use was clearly contributing to the children’s continued use of the play media.

Concrete, the tiles *does something* to the user: The lights and the games sets the player in motion: dancing, stomping, frog-jumping, crawling, lying or running around on the tiles and the lights, more bodies moving at the same time on the plate and in between other bodies; the tiles invites the user to assemble and disassemble, lift the heavy tiles, struggle to get them back together and

break them apart and cooperate with other users to rebuild a track. Thus, the user must try to master the entire influence of the modular robotic tiles on the body for nothing to go wrong so that a game is lost, not getting out of balance, hit others (or be hit by others), be scared off, lose ones breath or step on a wrong spot.

- **How does it push the user into motion (figurative/concrete)? Does the media automatically set the body in motion?**

The modular robotic tiles push the children into movement in a number of different ways, figuratively and directly speaking. The modular robotic tiles and the room push the children in various ways figuratively speaking: First of all the secluded space pushes the children and their curiosity to see if the tiles are occupied or available or to see what kind of game/play the children on the tiles were a part of (and if they outside the room can catch something like flashing lights through the windows, squeals, laughter, yells or screams from the children). Secondly, the modular robotic tiles push the children into motion by the use of light. The tiles light up in different ways (continued or flashing) and in different colours (red, green, blue, purple and yellow) that “call” for interaction and request the children to step on them. The tiles express a striking and constant invitation for the children to start an interaction with the tiles (e.g. in cooperation with other children). Light is used in this way to make the children aware of the presence of the tiles and the games that are ready for use (“Disco’s” flashing tiles that counts down and encourages the children to step on them before they reach “zero”, in “Lunges” the constant red and blue/green colour circles, that encourages the children to stand with a leg on each colour and play the game, and “Colour Race”, which with its different colours invites the children to chose a colour and chase it around the plate)- In this way light is used to attract the children into the play-zone and push them into active play. Thirdly, the tiles pushes the children into play as the tiles automatically sets the body in motion by the light and the players on the plate, who activates a range of physically outreaching activities: Digital games that require physical movement, dancing games, war games and experiments with light and sensors related to the children’s movements (jumps, stomps, tip-toeing, swirling, crawling etc.), physical body contact between those present on the plate (pushing each other, hugging each other, slipping by each other, stamping on tiles between each others legs) and free play on the plate and in the room (tumbling, dancing, rolling, crawling, jumping over etc) (Please, also look in the above).

The modular robotic tiles also push the children towards the children in a direct sense and in a number of different ways: First of all, through the presence of games the digital tiles expresses a concrete demand for the children to be active in their use of the play media. If one wishes to play a game on the tiles, it is necessary to be active, if one has to follow the game and the game rules. In “Disco” one must constantly move ones feet to “pump” the flashing tiles up in order not to make them count down to zero and thereby lose the game, and in “Colour Race” one must constantly move around in the pursuit of ones personal colour – as fast as possible on order to win over ones opponents (ore one self). Secondly, the tiles are used to maintain the children’s play: The lights encourage the children to move, keep them in the game/playing, leads them through the game and around the track. When a game of “Lunges” starts, the plate lights up, and the game starts when the player steps onto the plate. Then the blue/green colour circle starts to move around the small plate, and the player must now catch it with one leg while the other leg is kept

on a red circle. The light calls for being stepped on and caught, but it escapes all the time, thus the player is kept in a constant pursuit. The lights thus push the user into the game and into movement by attracting the user's attention and by calling for physical interaction. Thirdly, the puzzle-like character of the modular robotic tiles, where the plate is constructed by single "pieces", which can be combined in all possible ways, directly affects the children – already before the game starts: At first the plate must be built. The individual construction where everything is possible as long as everything is attached, pushes the children's desire for construction and makes them move around and lift the heavy tiles (to disassemble them), which makes them sweat. It requires physical activity when the plate is going to be assembled or disassembled, it is creatively rewarding – the children get a sense of constructing their own game, when they construct their own track.

Hereafter, the modular robotic tiles automatically move the body. It is their most obvious quality, and it is the aim of their design: To make the body move by pushing it, figuratively and literally speaking. This push consists of the physical activity that it is to assemble one's own plate, before the game starts, by catching and attracting the children's attention through light, when the plate is active and by putting forward a demand for the children being active. Furthermore, it is just as crucial that the tiles push the children's creativity, desire of construction and desire to develop – the decisive factor is to differ from other digital play media like the Spider, Icon Nova, SmartUS, Pixeline and Kaj and Andrea-computer games and to resemble the possibilities in e.g. Plus Plus, vehicles, Flexi Trax etc. The children's time on the tiles is thus fairly equal distributed between playing a game on the tiles according to the rules and play by the many rules exceeding the existing rules; playing in teams against each other, cooperating on catching one colour, imagining the red colour to be lava, playing babies sleeping on each their colour, experimenting by pressing down on the colours in various ways; knees, head, hands, making a long body train around the that puffs around on all the colours, struggling on the plate, dancing on the plate, building a horse with the tiles and playing on it, building a long slim track on which one can run back and forth, building a cross-track where the game is to go to the corners or build a small compact track on which the player must be able to reach all tiles from the middle.

But the modular robotic tiles do not (like the Spider and SmartUS) make the body move by providing pushes of energy, resistance or disorientation. The digital tiles do of course not literally push the body, but push it in a figurative and direct sense by e.g. putting up a demand of movement from the user. There are no elements of the tiles that contribute energy/resistance through e.g. speed or incline, offer a balance push through e.g. swing, rotation or instability, or offer a push of disorientation through e.g. the deprivation of certain senses or bodily control that pushes the body out in a searching or dizzy state. Anyway, the digital media creates a physical push *in cooperation* with the user. When the user swirls around on the plate and in between each other, pushing each other, turning around etc. it creates physical conditions in the user's body that to a large extent resembles the physical pushes of e.g. a rollercoaster or a swing can create. Thus, one may argue that the tiles create movement in cooperation with the user in "Colour Race" as the user must move as fast as possible around the track in order to win over the others. The user must therefore work to get as much speed as possible while he must control his speed if he wants to hit the colour circles as he moves ahead and not to get hurt. In cooperation with the user, the tiles create a push of balance in "Lunges" and "Colour Race" as the user continuously must turn and swirl to find the new circle. The user must consequently turn around several times in a row and as fast as possible, if he wants to hit the tile without losing his balance or get dizzy or avoid

getting hurt (many players stated that they were dizzy during the game). Furthermore, the game can, in cooperation with more players at the same time, create a balance push as the other players push or nudge the player's body or the player is in danger of losing his balance when he moves in and out between the other players. It is fair to say that the tiles in cooperation with more players at the same time creates a push of disorientation in "Colour Race" as the simultaneously playing players blinds the sight on the plate, which makes it hard for the individual player to see or navigate, takes up the space on the plate to such an extent that the player must fumble and twist to get to the colour or the turmoil-like disorientation that may occur when one is not able to see, cannot get through because of the other players' bodies and cannot reach the colour because all the moving legs are blocking the way.

It is possible to push the boundaries for the abovementioned kinds of pushes, which occur in the cooperation between player and game through practice, so that the user can learn to master still growing pushes of energy, resistance and disorientation: It is possible to practice being faster and faster and at the same time keep the precision and not get dizzy and fall, one is able to practice swirling and turning at a still faster pace and for more times while the precision is kept and one will not fall or get dizzy. Moreover, it is possible to practice resisting pushes and nudges, to twist around the other players while precision and balance is maintained. And finally, one can practice and improve orientation as the precision is maintained, in this way; it is possible to improve from beginner to master by continuous practice in being able to handle still enhancing pushes.

- **How to challenge the user? Is there a combination of danger and safety?**

The modular robotic tiles do only hold a limited amount of danger and safety as media itself does not bring any physical pushes. It is thus only in cooperation with the users that the actual danger is. The user is thus rarely in danger as the digital tiles themselves do not provide pushes of energy, resistance, balance or disorientation. The users do therefore not perceive the play media as dangerous or bodily challenging in itself when it comes to physical pushes. The tiles are in themselves safe, and the great amount of safety means that the children will have to make an effort to challenge themselves or others e.g. by playing at high speed, swirl a lot, play too many on the plate to create turmoil and chaos or push each other while they play on the track. The modular robotic tiles lack physical danger but there is the presence of psychological danger. There are no elements in the tiles that push the user so far that the experience of psychological danger (I am scared) occurs. The user does not have to block the breaks towards the danger that the tiles incorporate. On the other hand, different combinations of danger may occur at different levels as soon as one or more users actively seek it or as the game or play develops in interaction between the players and the tiles. From the collective danger thus may occur physically or psychologically. The modular robotic tiles can thus hold a combination of physical danger and safety on at least 4 levels – speed, rotation, pushes, turmoil: Speed goes primarily for the individual player's speed in the game, but also the speed of the other players are moving at. Speed is how fast you move around on the tiles and it determines the potential force with which you may hit others (like when two children bumped into each other or when a child lost control over speed and hit the wall). Speed therefore constitutes the amount of danger the player is in if he loses control over speed. Rotation primarily goes for the individual player's turns and swirls in the game, and for how fast and how many times one can turn around one self and constitutes potential giddiness. The rotation consequently constitutes the amount of danger the player is in when it comes to falling as

a cause to dizziness. Pushes primarily go for the situations that occur when more players are present at the same time, and when one player pushes or nudges another player. Pushes are the force with which one is pushed/nudged by the other, and determines the player's potential lack of balance. Pushes consequently constitute the level of danger that the player may experience when it comes to falling if he is pushed so hard that he loses his balance. Turmoil goes for the situation that occurs when a group of players are present in the game and the player is chasing his colour while he tries to avoid that the others find theirs on the relatively limited plate. Turmoil is the physical outreach of the other players and how hard the struggle for the colours is, and it determines the potential danger of being hit. Turmoil thus constitutes the amount of danger the player is in when it comes to if he or the other players hit each other, trip somebody, stamp on each other on the feet etc.

The physical danger created in cooperation between players and game is contributory to the perception of psychological danger by the player: How far does the player dare to challenge the danger parameter in cooperation with the others before the sense of psychological danger (I am scared) becomes too big and the player pulls the break. The psychological danger may occur in many shapes according to the kinds of physical danger: Speed – fear of losing control/overview or bump into others, rotation – fear of becoming dizzy or lose one's balance, pushing – the fear of being pushed, losing balance/being hurt and turmoil – the fear of the number of players and the intensity in the game in order not to get hurt.

Finally, a physical and psychological danger affects the creation of a collective sense of danger at different levels: Speed, rotation, pushing, turmoil and quantity. Speed goes for the danger of losing control over speed and bump into others. Rotation is the danger of becoming dizzy, lose one's balance or fall into others or the fear that the same happens to the other players. Pushing goes for the danger that one will push too hard at others or that others will push too hard at one self. And turmoil is the danger of creating too big a turmoil that causes others to be hurt or that others do the same towards the player. And the quantity goes for the amount of people around the player on or off the plate and the danger to "hurt somebody" when it comes to speed, rotation, pushes and turmoil.

At the same time as the presence of the elements of the modular robotic tiles and their physical, psychological and collective danger there is also the presence of elements creating safety: The speed parameter can be controlled and made safer by sticking to rules regarding the speed (e.g. that the players only are allowed to walk, only allowed to move around on the plate, only allowed to be three persons on the plate at the time or something else), and the possibility to control one's own speed, avoid being in a zone where aggressive players are or withdraw from the zone, if the pace becomes too intense. The rotation parameter can be controlled and made safer if the user and the others agree on rules regarding rotations (e.g. that "now we are all turn around and become dizzy", "one will have to navigate first" or something else), and the possibility to control one's own rotation, avoid being in the zone with somebody that lacks balance or withdraw from the zone if one's own or others' balance lacks. The pushing parameter can be controlled and made safer by the user and others if they agree on rules regarding pushes (e.g. not being allowed to push, only allowed to push in certain ways or in certain situations or something else), and the possibility to control one's own pushing, avoid being in the zone with users who push a lot or withdraw from the zone if the pushing becomes too much. And the turmoil parameter can be controlled and made safer by the user and others if agreeing on rules for turmoil (e.g. only being

allowed to be a certain number of people on the plate at the time, not being allowed to step onto the plate but only move around it if many people play at the same time, splitting up into cooperating groups at each end of the plate, if many people attend the game or something else), and the possibility to control ones own contribution to the turmoil or withdraw from the zone if the turmoil gets too intense.

## **Play zones: The basic structures for the good play zone: The modular robotic tiles**

- **The good play media is placed in the good play zone**

The modular robotic tiles in combination with the secluded room as well as the open room are an example of the good play media placed in the good play zone. The modular robotic tiles and the room around them is, regardless of the nature of the room, breeding ground for a long range of different activities. This caused the tiles to become a central part of many of the children's "indoor time", regardless of age, temperament and skills. Often a group of children were in the tile room just to "hang out" and watch, for at the next moment to be a part of the ongoing play or to start their own (agreed) play. The children did not ask "Who wants to go to the tile room and play "Colour Race" (or 15 race as it was named)", they just said: "Who wants to come and play/look at the tiles?". As they were engaged in playing on the tiles, e.g. in a game of "Colour Race" and wanted to have more children join the game (e.g. because one is alone in the room) it was enough to call out in the shared room: "Hey, does anybody want to play 15 race?", but it is first when the tiles are occupied and the game is on. Due to the support of the tiles and the room of a long range of games, play and other activities, a naturally flowing and dynamic pattern occur in the children's play and level of activity: As the tiles are fairly open and flexible towards experiments, approaches, constructions and the like, the children are able to change from one game to another without a big effort (e.g. from 15 race to baby games to "step on all colours" or from a single person "Lunges" till more people engaging in the game to hopscotch diagram) and the transitions are natural and flowing and the children are in a continued play, whether they play the game by the rules, change the rules/track or relaxes (opposite to e.g. Icon Nova, Pixeline and SmartUS). E.g. the change from "Colour Race" to dance floor, to sitting down relaxing on the tiles is easy, while hitting the colour within reach with the hands and feet, play "Disco" to playing baby games on the "Disco" tiles etc. Everything in the same zone and with the same play media. And as the tiles support both the wild and quiet games, the children can interchange between being outreaching and recreational, active playing and passive observing, play together and alone, play parallel, cooperate and compete without leaving the zone or the play media. Therefore, the same group of children can stay on the tiles for hours, changing between relaxing and being active, be wild and quiet, play together and play apart, play dangerously and play without use inputs or remedies from outside.

- **What is a play zone?**



A play zone in the shape of a zone that was established around the modular robotic tiles make up a mobile zone in the indoor facilities in the kindergarten. They make up a fluid, undefined zone as the movable tiles can be disassembled and assembled at any given place. During the period of observation they however made up a fairly stable play zone as they had a fairly fixed location in the room that was known as the tile room. They were here with the exception of 2 times, where they were moved out in the shared room. The tiles have a great mobility, as they can be moved from the chargers and around in the rooms and thereby create an ad hoc defined play zone. The digital tiles are loosely rooted in the room just like they themselves are loosely rooted as play zones as they can be put together in a number of new ways to continuously create new play zones (imagine a snake-like formation twisting through the room at the same time).

- **The location of play zones?**

The play zone is the place where it is established from time to time by the users (children and adults). This means that the play zone is where the children or the adults bring the tiles and starts to play games on them and with them.

- **How do play zones occur (permanent/fluid)?**

The modular robotic tiles hold a combination of permanent and fluid qualities as a play media and as a play zone. The modular robotic tiles as play media is, as a point of departure, permanently placed in the small secluded room, where they are charged each night. This is where they are available for the children when they enter the kindergarten in the morning or if they are stowed away (e.g. from the shared room during the day). But when the tiles leave the charger, the stables or the room, it is up to the children/the adult's to establish a play zone for the media. Even if the "silent room" during the observation period was changed to a "tile room", then there was no previously established zone designed for the tiles. The modular robotic tiles are neither bound by the available electricity, buried cables, attached objects nor something else. They are in practice 100% mobile, and can be established as play zones everywhere if the space allows it. The children already know where to find the tiles, but it is not necessary the place where they want to play with them. Even if the basic structure of the tiles is fixed, then as well play media (Which game? Which plate?) as play zone (Which room?) fluid.

- **How is the play media in the room (in the pocket, in the doll house, fastened to the ground)?**

The modular robotic tiles are placed in the charger in the morning when the children arrive at the kindergarten, but they are transported to the ad hoc defined play zone by the children themselves when they wish to play with them. They are placed on the ground, put together, and turned on, the game is activated from the "gaming piece" via the transmitter and the game is on. The digital tiles are a movable play media, which is neither permanently placed nor stable in the room. The play media does not appear as an immovable construction to the user, on the contrary like something that is intended for construction, can be moved, can change character (change games) and shape (rebuild the plate). The weight of the tiles and the fact that they are relatively hard to assemble and disassemble for young children is however caused that they primitively stayed where they were intended as play zone (in the tile room and the shared room). However, the children used a lot of effort on changing the character and shape of the play media during the period of observation.

## **Emergent patterns: Finding the basic structure: The modular robotic tiles**

- **Is the play media flexible? Can the same play media be used by beginners, experienced and pros? Can younger children, older children and adults play together?**

Beginners, experienced, pros:

The modular robotic tiles are flexible as they can be used by beginners, experienced players and pros. Furthermore, beginners, experienced players and pros play at the same time with the same play media, either parallel or together. Often it was a mixture of beginners and experienced, younger and older children playing on the plate at the same time. As beginner, there are several strategies to choose from:

1. One can choose to practice one of the parts of the tiles: To practice the functions of the tiles (where to step to activate the sensor, how hard to step, how precise one must step etc.), to learn how to play one of the games (what are the rules, how to win, how the rules apply through the colour circles on the tiles etc.), to practice how to move in the best way in one of the games (practice how to step so precisely that the tile is activated each time in "Disco", practice the sense of when a tile is "running out of time" in "Disco", practice economic patterns of movement for "Disco"-games with 1,2 or 3 tiles to be able to keep it going (and keep going) on the plate etc.).
2. One can choose to observe or be a part on a game with more experienced users and through this take in or be trained in the more advanced use of the play media: One can e.g. sit in the pillows and watch the more experienced players, to learn the game rules, the functions of the tiles and the most clever way to move around in the game, one can enter into a game with the more experienced players and in cooperation with them learn how to play by the rules, the functions of the tiles or one can play alone or together with others (beginners), while more experienced players sits in the pillows and guides the users through the game rules, the functions of the tiles and the users' patterns of movement.
3. One can choose to play with and on the tiles in ways that are not accessible for all users: One can e.g. just jump around after the colour circles in free play, run around on the plate and see what happens, look at the plate and jump in on a colour circle when it appears in front of the user's feet or lie/sit on the plate and look at/play with the colours, while being a part of another game (baby game, action figures, war, have a good time etc.)

As a beginner, the focus is primarily on the introduction to the activity: What it means to play on the tiles (understand the game rules, the functions of the tiles and the game actions of the users). Here it is the action itself "to manoeuvre around the tiles" that is in focus. On the other hand, to play on a big "Disco" game plate, play "Colour Race" with experienced/super-users, navigate without problems around the plate in turmoil or coordinated change between game or play or between different sets of game rules internally in the group can be difficult/dangerous to the beginner.

As an experienced player there are several available strategies as well.

1. One can train skills in order to become a super-user of specific part elements of the digital tiles: One can e.g. become a master of "Colour Race", "Lunges" or "Disco", one can practice getting to know the functions of the tiles on the back bone (know exactly hard to step, where to place the press in the colour circle and how the colour circles move in the present game), one can

practice to get to know the rules of the games on the back bone (know exactly which rules apply in the present game, put down a solid winner tactic, knowing the symbolism of the colour circles in the game – counting down in “Disco”, change leg in “Lunges”, move around on the plate in “Colour Race”) or optimize ones movement on the plate (practice by stepping precisely within the circle, moving fast and maintain the overview, using as little effort as possible)

2. One can practice being able to do all part elements of the modular robotic tiles: One can e.g. play all the available games on the tiles, practice knowing the tile functions and the game rules and optimize ones movements in the game.

3. One can practice doing advanced techniques on the tiles: Stepping on the tiles by only reaching out with the foot and step lightly in “Colour Race” instead of jumping from circle to circle, practice on mastering 4 tiles in a game of “Disco” by moving the legs systematically and precisely around the plate, practice playing “Lunges” quickly and precise with both legs, knowing exactly when to change legs and change without problems between playing with the left and right leg.

4. One can practice to play on the tiles with even greater “danger” while keeping the level of safety through the exercise: Being able to master greater and greater turmoil by knowing the typical patterns of movement and actions of the other players to avoid getting hurt, learn to master greater and greater pushes through foreseeing where the push comes from, prepare and resist it to avoid falling or optimize ones movements in order to move more and more dangerously in the game (higher speed, faster rotations, more pushes etc.) without getting hurt.

5. One can learn how to expand the game in the “game repertoires”, where self-invented games are incorporated in the play zone, and the being able to change between game activities and play activities or mixtures of these (e.g. change between playing baby games and “Colour Race”, playing “Colour Race” while somebody plays war games against the colour circles, change between playing “Lunges” alone after the rules and together and share the colours)

6. One can practice extending the game repertoires by opening up for other elements of the digital tiles: The experiment, creativity and configuration: One can e.g. start to experiment with different ways of stepping on the colour circles, one can have a creative approach to the game by swirling each time one steps on a colour in “Colour Race” or one can disassemble the track and construct new.

As an experienced player, one is able to extend the activity by using the modular robotic tiles in a certain *manner*, e.g. I saw different children who each had their “specialty”: One was a master of swirling around and dancing on the tiles. One mastered being efficiency and strategy in “Colour Race”, one group were masters of keeping many “Disco” tiles running, one group were masters in inventing games and combine games and play and one was a master of building figurative tracks (a horse, a labyrinth, a racing track). Thus an expansion of the activity took place and the children developed skills that made it possible for them to handle the tiles by themselves and to handle the tiles in certain ways.

Being a master of the game, one can still practice a wider range or a better detail level.

1. One can practice in mastering all the modular robotic tiles and their part elements and thereby become “master of the tiles”.

2. One can practice in inventing and doing tile tricks, tile games or brand new ways of playing: One can e.g. do a tile trick where the player is placed in the middle of a square-shaped plate of “Colour Race” and then turn around on one leg while stepping fast at the colour circles with the other foot as one rotates, one can invent specific tile games like “Frog jumping”, “dancing games”

or “war games”, or change the game and start to find partner or opponent-groups with new sets of rules (e.g. “now the two of us are purple” and are the only players on the plate or “green team against blue team” in “Colour Race” and “Now I am blue and they are green” or “you are only supposed to step with your left leg” in “Lunges”).

3. One can train coordination tricks with other experienced players or pros: e.g. study advanced jumping routes where all players jump from colour circle to colour circle like the game “the earth is poisonous” in “Colour Race”, play 8 players at the same time in coordinated turmoil in groups in “Colour Race”, or try to play “Disco” on a 12 tile plate, where the tiles and the movement patterns are divided between the players so that they float over the big plate and back again.

4. One can practice to cross the applied permit limits of the modular robotic tiles: One can e.g. do previously unseen stunts and tricks on the plate, keep a previously unseen big plate in “Disco” running, play “Lunges” with a previously unseen speed without stepping out of the red circle just once or being able to play alone and win against a previously unseen large group of opponents in “Colour Race”.

5. One can pass on ones knowledge in apprenticeship to less experienced players.

As a super-user one can handle the modular robotic tiles in certain ways and even refine the handling and the ways through adding width, level of details and the invention of new actions, ways and tricks, and through pushing the generally accepted permit limits for handling, way and play.

Young, older and adults:

Young, older and adults can play together on the modular robotic tiles as the tiles have an appeal on everybody who likes playing games, move the body, compete, play alone or together with others, play wild games or quiet games, construct, experiment or create. Seen from a challenge perspective, the tiles are constructed in such a way that they can incorporate the young child and the adult player. The users set the level from the moment they step onto the tiles. The young child can puff around on the plate and watch the colours move or react when it moves over them, the child can practice jumping on the colour circles on the plate and jump out again, it can play with the tiles, the lights and the game, it can learn rules in cooperation with older or more experienced and then start being a part of the game, or it can tumble around on the tiles in play with others and with the tiles as a background carpet or remedy in the play. All of this is a big experience for the young child.

The adult can, depending on temperament and desire to use the tiles as a parameter of competition in a wild and aggressive competition with other adults (e.g. in teams) in “Colour Race”, where pushing, tumbling and struggling is a part of the pursuit to be the one that makes the plate light up in a specific colour, take turns in a competition playing “Simon Says” in which the goal is to be the one that remembers the longest sequence, cooperate on keeping a “Disco” plate running, that keeps getting bigger and bigger or play “Lunges” with much focus, where the players take turns the moment one player does not have a foot on the red circle. One can enter into more recreational activities like sitting down and talking on the tiles with the light as a background carpet, watch others play, play “Simon Says” slowly and focused or play and experiment with lights, track building (making a slim track consisting of 12 tiles in a row, make a labyrinth track with many ends or create a big square-shaped track), rules or create ones own game on top of the ground structure (e.g. rotate twice each time one steps on a colour circle, not being allowed to move onto/out of the plate or only play “Disco” with ones left leg).

Or one can engage in activities in cooperation with younger or older children, like games where adults and children play in mixed groups and competes against each other, games where the adult has to follow a certain set of rules against the children, adults who guides, cheer, train children or adults and children having a good time by playing, experimenting, constructing and creating in the company of the children. Regardless, the activities on the digital tiles can always be so wild that even the adult can get a thrill.

The fact that the modular robotic tiles without problems encircle the young child as well as the adult is because of its broadness with regards to variation in the use of the play media. Secondly, there are a number of possibilities to play alone, in parallel groups, cooperate, compete and watch. Thirdly, the present possibilities to construct, to experiment, create and not least play freely. The fourth possibility is to build very big and very small tracks, any kind of track to make the game experience exclusive and individual. The fifth possibility is to adapt the difficulty level and danger level to any age and any exercise and the sixth possibility is to enter into a long apprenticeship in handling the modular robotic tiles.

- **Is the play media dynamic? Does it cross other functions? Do the play media allow other use; are there other layers present in the play media? Can the use of the play media be changed, refined or developed?**

The modular robotic tiles are highly dynamic. First of all, several of their functions cross: It is a play media that invites construction (disassemble and assemble, build tracks), play (the possibility to change between the different accessible games), physical activity (the sensors that one will have to move from tile to tile and step on according to the rules) and the learning perspective (learn colours, count to 15, learn left/right, memorize sequences, find out the game logic etc.). Secondly, the open use: They are breeding ground for war games, play with action figures and dolls, pillow fights, dancing games, baby games, self-invented games, gymnastics, sleeping games, cosy corner, gliding space, fights, tumbling and free relaxation. Thirdly, there are more layers of use present in the play media, as the modular robotic tiles can be used as “tumbling room”, “dancing room”, “fighting room”, “relaxation room”, “quiet room”, “learning room”, “construction room” and “exploratory”. And reason no. 4 is that the use of the digital tiles can be refined, changed and developed: The use of the modular robotic tiles can be used traditionally like e.g. “Colour Race” with 4 players who each control one colour and the users compete to be the first one to step 15 times on ones colour and make the plate light up, to being a zone of free play where dancing takes place on the plate, war games against the colours are played etc., to being a relaxation zone where people sit and talk on the plate, lie down on the plate, play with the colours etc., to being a construction zone where the plate is disassembled and assembled, try out the new construction and assemble it all over again in new ways. The modular robotic tiles can be refined through the incorporation of pillows and mattresses in order to create small cosy corners around the plate, where one can sit and watch the other players, tumble from the pillows and onto the plate and from the plate and onto the pillows etc., through incorporating disco balls, lights and music to dancing rooms where the children can dance around on the tiles to the music, or through the incorporation of action figures and weapons to make it a battle-zone on which the children can play with the figures (the colours are castles, lava or something else), struggle against each other (where one is only allowed to move on ones own colour) and against the colours (make attack noises as one jumps onto the colour). And the use of the tiles can be changed in a jiffy by changing the construction of the plate (disassemble it and assemble it in a new way), change the game

(change games through the gaming pieces), change game rules (from “Lunges” in a traditional manner to playing only with one leg or play more players on the same plate) or change status from gaming to play zone and back again (from playing “Colour Race” in a traditional manner, to playing a baby game, to dance on the tiles, to run around the plate and step on all the colours, to dance on the tiles, to playing “Colour Race” in teams etc.)

In general the modular robotic tiles are highly dynamic as a play media as

1. The modular robotic tiles express a functional openness and versatility as they are not direct a certain use.
2. The modular robotic tiles function as a brilliant play media for both physically outreaching games as the recreational and relaxing games – they are also great to sit and lie on. When direct game activities do not take place, the tiles are an open and shut place to sit down and talk, play and have a good time. On the other hand, the play zone often develops from being a recreational zone to being a zone of physical activity when there are persons in the zone. The tiles thus create an undeniably force through their structure, function, games and light in the body of those who play on the tiles. In this way the tiles change back and forth between the recreational zone and the physically outreaching activities. This versatility causes a constant play potential within the media.
3. The modular robotic tiles do not point out only active and outreaching activities, but hold the possibility of more quiet and relaxing activities. It is natural to have a break on the tiles or around them in the pillows. The media does not shut out quiet games just like they are open for recreation. The modular robotic tiles do not demand a focus on outreaching activities.
4. The modular robotic tiles offer many roles: Player, co-player, opponent, peripheral player (once in a while on the plate and out again), spectator, involved spectator (steps on the plate from time to time but is not a part of the game), group member, coach (a spectator outside the plate who helps a player e.g. to find the colour), helper (an older or more experienced player helping a younger/beginner through the game), playing (free play in the plate) etc.
5. The modular robotic tiles are able to be a single actor in the children’s play even if it has the best potential in cooperation with other children: It is possible to play all the games alone, practice, construct and experiment on ones own. This dual support affect that the modular robotic tiles are capable of maintaining an attractive force on the user, whether only one or more children play in the zone or not – they often seek the room on their own or in an independently playing group.
6. The modular robotic tiles can change, be refined or developed. This is actually the central element (except for the ability to create turmoil and free play) in the use of the play media. All the time, the children engaged in developing new games on the tiles , play and game techniques and game and play behaviour (a bigger variation), refine the existing games, techniques and behaviours (broader permit limits).

- **Is the play media interactive? Is it possible for the player to interact with the play media physically and virtually?**

The modular robotic tiles are an interactive play media as they incorporate digital games on puzzle-like plates to make it possible for the user to interact physically and virtually with the media. It is not only *possible* to interact with the modular tiles; the tiles *demand* interaction on a physical and virtual level in order for the players to use them successfully: Without movement around the tiles and physical touches on the tiles’ “input devices”, the pressure sensitive sensors,

it is not possible to play the games on the modular robotic tiles. The user is demanded to continuously be active and give input to the “game control tile” via physical actions on the pressure sensors, which transform the game actions in the present game on the digital tiles. The tiles react to the user’s input by delivering an output via the illuminated colour circles on the tiles so that the user once again must react by moving around the tiles and give physical inputs to “the game control tile” via the sensors. The user and the digital tiles therefore enter into a mutual cycle of interaction where physical inputs are replaced by a digital output all the time. This loop of physical input, which the “game control tile” reacts to through a digital output, is the very essence of the modular robotic tiles.

The modular robotic tiles are like the Spider and computer games an interactive media by nature. But the modular robotic times stands out, like the spider, from computer games in 2 central areas: First of all, the play media demands the user to be active using the entire body (and not only the hands like in computer games), as he must run, jump, swirl etc., while he steps on the pressure sensitive sensors in the colour circles. Secondly, the modular robotic tiles do not hold, unlike the computer game, a division between keyboard/mouse as the input devices and the screen as the output device – here the input and output device are identical. Instead of offering the user a virtual screen based room of possibilities in which the user’s physical actions are transformed into virtual actions in a virtual universe, the entire game plate functions as input and output device. Not like an output device that offers the user a virtual universe, but as a bodily-sensuous output device that offers the user a physical mentality in which the user senses colour circles that flashes, light up, move around on the plate or counts down, and where the user moves around in the pursuit of the colour circles. Thus, we are not speaking of a virtual universe but of a physical mentality, which one interacts with in a physical and challenging way.

- **Is the play media mobile? Can the play media be moved around? Can it be put up and packed down relatively fast?**

The modular robotic tiles are mobile, and they can be moved around, put up and packed down within a short amount of time. They are, as play media, not a permanent part of the room; they can, on the other hand, be perceived as changeable and mobile.

- **Does the play media have a low entering? Does the play media have an immediate utility value, so that the beginner can experience play immediately?**

The modular robotic tiles in themselves have a low entering and an immediate utility value, while the games require more or less introduction (fewer introductions to “Colour Race” and “Disco”, more introductions to “Lunges” and “Simon Says”). However, any user, regardless of age, practice and temperament, can experience play and games (almost) immediately. Even if some of the games, game actions and game situations require a certain age and/or experience to be performed correctly and even if certain game situations require a certain practice and /or are to be done, all the users always have the possibility to take part in the games according to their age, experience and temperament: All players can walk on the tiles and activate them (even if one does not follow the rules) just like even the youngest players and the beginners can play “Colour Race” with one colour as they intuitively will follow the colour around the plate (also even if it does not necessarily go by the rules). All players can play on the plate, play with the colours and lie down and watch the game from the pillows, just like they have the possibility to gain support from the older or more experienced users if they need it. Thus, the modular robotic tiles can be adjusted so

that all players can be participants in the game/play: the beginner or the young child can participate in certain parts of the game (stepping on the colour circles in “step on all colours”, be a part of “Colour Race” without the support from an older/more experienced user, free play on the tiles, play with other beginners/young children and cooperation on a selected colour etc.). An the beginner or a younger child can make its own games and play on the tiles (“Now we are red together, the two of us”, “we are playing a war game” or “We are jumping around on the colours”) or be a part on their own conditions in the more experienced children’s games (stand on the sideline and jump on the colour circle when it is within reach, puff around in their own pace and play their colour, while the others struggle at high pace or be guided by a more experienced player from the sideline (“the red one is there!”). An the beginner or the young child can always “say no” during the game, if the game becomes too much (withdraw from the plate if the turmoil becomes too intense, only play with quieter players, stand against the wall and only move in on the plate when there are breaks in the turmoil etc.)

In harder games, game actions and game situations it is however a benefit to have a super-user at hand, one who can introduce the beginner or the young child in the game and in how they do the game actions and how to manage the situation without getting hurt. The enhanced level of difficulty in certain games, game actions and game situations at the same time contribute to the fact that these games are prestigious among the users. A beginner, for whom the first game of “Colour Race” is won in a turmoil-like situation with many players, have the right to be triumphant and be proud, when the plate lights up in the player’s personal colour, just like a younger child, who has been able to activate the colour circles 15 times on its own without guidance or wins a game against another player, can gain applause from the other players.

- **Does the play media have a flat learning curve? Can every user, without extensive practice, advance from beginner to experienced player (fast progress + continued play)?**

The modular robotic tiles has a flat learning curve as a player relatively fast can advance from beginner to experienced player: If practicing one will learn how to master one of the tiles’ part elements like a certain game, the tiles functions (how to step, how hard and how precise), rules and winner tactics in a certain game or optimize movements (move around in a more economic manner, fast etc.). According to which element one wishes to practice intensively, it will show in one’s player style: If the approach is the functions of the tiles, one may not move optimal, but steps precisely and at the right pressure so that the tiles are activated each time one steps within a colour circle, if the approach is rules and winner tactics one may not move optimal or step precisely, but has on the other hand acquired a good knowledge of the rules and from this created a winner tactic that brings a solid possibility to win the game. If one practices one will soon be capable in all the part elements (game, functions, rules and movements), or do more advanced techniques like stepping lightly on the tiles with the tip of the foot instead of jumping from circle to circle, master 4 “Disco” tiles at once or play “Lunges” and change between left and right leg. At the same time, one gradually learns to master turmoil and pushes without withdrawing from the game, just like one is able to move at high speed, with faster rotations or a bigger overview over the plate. Finally, one can, when being capable in all part elements, start to develop one’s own “play catalogue” over alternative ways of playing on the tiles to be able to change between game and play in the zone and be able to experiment (e.g. with different ways of stepping), be creative (e.g. dance or play war games while playing the game) or construct (build different types of tracks). From the first encounter with the modular robotic tiles as a beginner until one leaves



them as an experienced player, one is able to stay playing and gradually increase the level, while practicing more advanced techniques and games, master more and more part elements, move more efficiently etc. Just like one can be the initiator of new games, keep them going or attempt to develop them in a certain direction.

However, it does take time to be “master of the modular tiles” and e.g. develop cool tricks, brand new games, coordinate longer trick routines with other experienced or pro players or exceed the general permit limits. There was thus none of the players who were able to move from experienced player to super-user during the week when the plate was available in the kindergarten. However, many users moved from beginners to experienced players over a relatively short span of time. When the tiles were packed away, a large group of children in the kindergarten had played on tiles for longer periods and therefore had become experienced players.

- **Does the play media provide a thrill? Can the thrill be controlled in order to make the child push the limits from beginner →experienced→super-user? Can the thrill be adjusted to make the experience change/be refined/developed?**

As the modular robotic tiles holds a low level of danger by the absence of different types of physical pushes (energy, resistance, balance and orientation), they are by themselves only able to create a thrill to a limited extend. The modular robotic tiles do not actually create a thrill by themselves, but can provide a thrill *in cooperation* with the users, to push the limits past the beginner state or change, refine and develop the experience of a thrill. This means that it to a high extend relies on the player to create a thrill in a game as the construction of the tiles in itself does not create the experience of a thrill, but sets the scene for the completion of the digital games. In cooperation with the user, it is however possible to create different kinds of thrills:

1. It brings a physical thrill in the body when a group of players move around the plate at a high pace. This can bring a psychological thrill – the fear of losing control over ones pace and bump into other players or trip over and a collective thrill – the fear of bumping into other players at high speed or that somebody bumps into one self at high speed. These kinds of thrill are however controllable as the player can control his own speed and always choose to step out of the game, if the feeling of speed and the others gets too intense.
2. It brings a physical thrill in the body when a player or other players rotate, swirl or make fast turns on the plate; then a centrifugal force occurs plus dizziness. The faster and the more rotations a player makes, the more balance push the player will experience and the centrifugal force and dizziness will follow. This thrill can lead to a psychological thrill – the fear of dizziness or centrifugal force becoming so big that the player will lose balance and fall or bump into something and a collective thrill – the fear of losing control and bump into other players or that other players lose control and bump into the player himself. These kinds of thrill are however controllable as the player can choose how fast he wishes to rotate and he is always able to step out of the game if the feeling of dizziness and imbalance becomes dominant.
3. It brings a physical thrill in the body when a player or other players push each other and imbalance occurs. The harder and the more pushes, the higher imbalance is created on the plate and from this, the danger of tripping and hurt oneself. This thrill can bring about a psychological thrill – the fear of being pushed so hard that one will stumble and hurt one self or being pushed so hard that it hurts and a collective thrill – to fear that the pushes will take control and that one will be pushed into other players or that other players will be pushed into oneself. These kinds of thrill

are however controllable as the player can chose if he wants to push others and allow that others push him in the game/play, just like he always can step off the plate if the pushing of one self or others become too intense.

4. It brings a physical thrill in the body when one self or other users are in a state of turmoil and struggle, nudges, stepping on each others toes, tripping etc occur. The more active and outreaching users on the plate, the greater turmoil. This thrill can lead to a psychological thrill – the fear of turmoil taking over and then losing orientation and control over the situation and then cause one to fall and a collective thrill – the fear of turmoil taking control and thus being pushed into other players, stumble, fall hit other players or something else, or that other players stumbles into one self or something else.

Finally, all these kinds of thrill are adjustable. They can be refined, changes and developed, as the modular robotic tiles are a dynamic play media, the users advance from beginners to experienced player and onwards to super-users and the play- and game catalogue can continuously be expanded. An even more, it is evident from the descriptions of the different types of thrill that they are individually adjustable.

### ***HEADLINES OF THE DAY***

Turmoil on the plate

Free play

Dancing mice, war lords, frog jumpers and babies

Cooperation and playing against each other – the central self-introduced group games

Colours creating a flow in the game and the play situation

The thousand ways of moving on the play media: Jumping, crawling, walking, dancing, stamping, hitting, rotating...

The free play, the good play: openness in the games, functions, movements and thrill through experimenting, creativity and construction

### ***FLASHES OF THE DAY***

“I am purple!”

“I’m with you, Mia!”

“I am red”, “I am purple”, “I am blue”

“I’m helping you, Christian!”

“How did it go?”, “Fine, I am just too sweaty”

“I am green! It is me who is green!”

Dad: “Now it is time to go home!”, children: “Ha ha, we are just jumping!”

“It is just like the plate is turning, ‘cause I’m all dizzy!”

“I’m all sweaty”

“Wow, you become hot when doing this!”

“My legs hurt!”

“Hurry up, Willum, before he wins!”

“The two of us are green, and me and Mikkel wins!”

“We are all purple!”

“Hey! You were on my side!”

“Now the two of us are purple!”

“It is not funny when somebody plays together!”

"I don't want to play with somebody today; I just want to play with this!"

"We want to build a horse" (about motive track-building)

"Come on, we'll leave!", "No, I want to see this!"

"You cannot cheer!", "Yes I can!"

"You must choose a colour first!", "Ok, blue!"

"I won over myself!"

"I'm just playing against myself"

"Jump! Jump! You'll have to step in the middle!"

"Now I need to have a break, before my hair gets all wet!" (Child 3 years old)

"But we have a rule that we can only walk in this game, because my foot hurts if I run, and then I will lose all the time, and that is not funny!" (Child 5 years old)

"We only want one colour", "We'll have to be red team", "Yes, the two of us are red team", "We take turns jumping", "We'll have to take a quick nap, before we play again!" (two children 3 years old).

**PICTURES OF THE DAY**







