Play for Health

How to Design for and with Children

Fabienne Erben

A special thank you to all children, parents, childcare workers, physicians, and physical therapists.
This is your work as much as it is mine.

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Prologue

When I went back to university to study design in my late twenties, I knew I wanted to make a difference. Seeing the impact of design in healthcare firsthand, I wanted to use my bachelor thesis to contribute to a healthier future. So when Professor Edler-Golla and Professor Wagner from the University of Applied Sciences in Munich approached me about a research project on the treatment of walking disorders in children, I immediately took it on.

KORA, a low-cost orthosis, aims to train children's walking behavior using a mobile application. But how might we develop an app that empowers children to positively change their walking pattern in a fun and engaging way? What initially began as a bachelor's thesis evolved into a summary of guidelines on how to design for and with children and provided the idea for this book.

Together, we will look at the challenges in kid's healthcare, why designing for children is different compared to adults, and how it influences designers.

Challenges in Kid's Healthcare

Considering all the innovative health products and services on the market, it is surprising to find so few of them geared toward children. Why is that?

Time and Money

Children's design has been sparse in part because their target groups are smaller than adults'. For example, in Germany, 1.5 million adults suffer from inflammatory rheumatic diseases compared to 15,000 children and adolescents (RKI, 2010). And while early diagnosis and therapy are critical for further treatment of the disease, developing a specific product for children is labor-intensive and costly. While this does not seem lucrative at first, companies may likely overlook that their product can be used to treat similar symptoms from different diseases. For example, rheumatism in children often results in changing walking behavior to reduce joint pain. In this case, an orthosis provides relief and support to the joints

to restore and train walking behavior. But it can also be used to improve walking behavior caused by other health problems (e.g., a former premature baby with cerebral hemorrhages). Developing a product that serves a broader patient population increases the value of a business and the entire healthcare system.

Inaccessible Knowledge and Limited Skills

There is knowledge about children's design in academia, but it is hard to find, difficult to understand, and often not suitable for practicing designers (Feder, 2020, p. 1). You might think that we were all once children and should know all about childhood, but this is unfortunately not true. In *User Research with Kids* (which I will quote quite often, so I highly recommend you reading it), Thomas Snitker, Senior UX Research Manager at Lego, points out:

"(...) your childhood occurred in a different time period, maybe in a different place, likely with different values, certainly with different technologies available. So the context was very different. And then (...) you, the adult

researcher, grew up, learned new things, forgot about things that are no longer acceptable or relevant, so you, in essence, cannot return to your childhood self."

Moreover, the concept of childhood as something singular does not exist. It is in the nature of childhood that children are constantly evolving. They grow up, learn new things and develop new skills and preferences (Snitker, 2021, p. 10). This ever-changing behavior presents a new challenge where we as designers need to ensure that our research and testing match our users' skills and abilities. Therefore, we must not only design with children in mind, but also involve them as early as possible in the design process. Because as much as we would like to design for children, we must first admit that we are not qualified to do so (Feder, 2020, p. 2). Not only do we lack professional experience with children, we rarely interact with them on a level which allows us to understand their needs.

Reshaping the Future of Children With Walking Disabilities

“Children connect with others through movement. They engage with others and communicate with them… And they also express themselves, and their feelings.”
– Childcare Worker

There is more to walking than simply going from point A to point B. Walking motivates children to become independent—and they want to become independent! Children who have difficulties walking can experience frustration, suffer lower self-esteem, and be socially excluded in the worst cases. We have seen in the previous chapter that different factors can cause a change in the walking behavior of children. The problem with treating walking disorders is that rehabilitation therapy typically consists of repetitive exercises. This can be particularly challenging for children since they do not comprehend the lasting benefits of these exercises and may stop participating out of boredom. This makes it even more

difficult for guardians to motivate their children to do these exercises at home to achieve therapeutic benefits.

KORA, a low-cost orthosis for children with walking disabilities, has taken the first steps to solve these problems. Their 3D-printed soles have various sensors that can measure the pressure and orientation of the foot. This gives us information on how much weight the child puts on their foot and how their foot hits the ground. The goal is to develop a mobile application that redefines exercise based on this data. It will be available through the guardian's smartphone, allowing them to monitor the child's progress and share the data with medical professionals. The exercises must be engaging and interactive so that children see them as a joyful experience rather than a chore. This way, we can achieve long-term health benefits and improve their quality of life. As designers, we need to ask ourselves: how can we develop a mobile application that empowers children to positively change their walking behavior in a fun and engaging way?

(Right) The KORA Orthosis at the Hannover Messe 2018, one of the world's largest trade fairs, dedicated to the topic of industry development. (Left) Preliminary visualisation of the foot pressure.

Understanding Kid's Experience

Behavioral Design

Human-centred design relies heavily on understanding behavioral and cognitive psychology. Designers who understand how people behave create better products (Yablonski, 2020, p. 121). The Fogg Behavioral Model shows that three elements must come together consecutivly for a behavior to occur (Fogg, 2019, p. 33):

1. **Motivation:** a desire to do a specific behavior
2. **Ability:** how easy or hard a behavior is to do
3. **Prompt:** cue or trigger to do the behavior

Although this model provides a good framework to design for behavior change, we should not adopt it blindly without acknowledging the differences between children's and adults' behavior.

Kid's Experience

Motivation is the first element of any behavior. You perform a behavior not necessarily because you enjoy it but because you expect something in return or want to avoid something unpleasant (Snitker, 2021, p. 3). For example, maybe you would prefer to sleep in and watch Netflix all day, but you are motivated to work because you know you will make money. This is called extrinsic motivation.

Unlike adults, children are usually motivated by their curiosity or pleasure in the task itself. They are primarily interested in fulfilling their own inner desires and are not easily influenced by external impulses (Snitker, 2021, p. 4). This is called intrinsic motivation. Snitker aptly describes the differences between Kid's Experience and User Experience as follows:

- Kids have different needs than adults
- Kids have different goals and success criteria than adults
- Kids have other capabilities than adults
- Kids follow different user journeys than adults
- Kids express themselves differently than adults

So how can we awaken children's intrinsic motivation?

Playing is Important

Unfortunately, as we get older, we tend to think of play as childish and a waste of time. We forget that play helped us develop all sorts of social, cognitive, and physical skills. Play gives children the freedom to be imaginative and innovative. They often find their own ways of playing with toys, sometimes entirely removed from their original purpose. As children play, they can make their own decisions and express themselves independently, free from the influence of others. Play is how children learn, experience the world and its surroundings, and interact with others (National Literacy Trust, 2017). It is not a waste of time! Therefore, the concept of play is ideal for offering movement therapy in the form of games.

There are four main play setups that give children and adults different roles. Each has its purpose and can be used in research to gather different behaviors and feedback from children (Snitker, 2021, p. 11).

Free Play

The child sets their own starting point, rules and goals for the play based on their interests. The adult observes the child during play and only intervenes when the child struggles. This promotes active play: exploring, asking *what if*, refining ideas, and being inventive.

Directed Play

The adult sets the starting point, rules and goals for the play. The child only follows. The adult encourages the child's attempts, and supports them when they have difficulty achieving the intended goal. This setup can be useful when assessing a child's ability to achieve specific goals.

Guided Play

The adult sets the starting point, some rules, and sometimes also an agreed-upon goal. The child may choose what to do and how, while the adult reacts to it. This can be useful to develop and extend children's thinking and ideas.

Games

Unlike Directed or Guided Play, a game is about following its own rules, rather than those of an adult. This can be more engaging and enjoyable, since children can feel a higher sense of autonomy. However, the child may still need assistance from an adult who understands the rules.

Since exercises have a fixed movement pattern and thus a defined goal, meaning the child needs to imitate the exercises as closely as possible; Directed Play fits the best. However, Directed Play may become uninteresting and static due to its designated nature.

To prevent movement play from becoming monotonous, designers must ensure that they engage and stimulate children's imaginations. This can be accomplished most effectively by combining it with the Games concept. We will tackle the design challenges in How to Design Playful Games for Children.

Children's Rights

Child-centred design is unthinkable without considering the D4CR guide from Designing for Children's Rights, a global nonprofit association (D4CR, 2021). Their goal is to create a new standard for business and design to support the development of products with children's ethics in mind. During development, it may not be possible to address all principles immediately, but they serve as a checklist to continuously improve the product. Several well-known entities, such as LEGO, Design School Kolding, and Art Center College of Design, have successfully adopted their ten principles.

Right Against Discrimination and for Inclusion

"I need a product that does not discriminate against characteristics such as gender, age, ability, language, ethnicity and socio-economic status."

In order to achieve inclusion, we need to understand that not all children are the same. The success of the thera-

py for children depends on how much time and skill the guardians have to practice the exercises with the children at home. This responsibility lies heavily on guardians, and unfortunately, sometimes makes it harder for the child to receive the ideal care. KORA needs to enable children of different socio-economic backgrounds to play by themselves and receive equal chances of therapy success.

Right to Development and Growth

"Encourage my curiosity, but consider my capabilities based on age and development. I need support to acquire new skills and encouragement to try self-driven challenges."

While our target group is children with walking disabilities, their different capabilities and personal progress can vary greatly. KORA should not only adapt to the child's current physical abilities but grow with them.

Right to Participate and Influence

"Help me understand my place and value in the world. You can help me do this by involving me as a contributor

(not just a consumer). I want to have experiences that are meaningful to me."

Children must be given a voice. They need to be able to test the KORA games, explain their interests, likes and dislikes, and have their wants and needs met.

Right to Protection and Safety

"Make sure your products are safe for me to use and do not assume anyone else will ensure my safety. Do not expose me to unwanted, inappropriate or illegal content. Provide me also with a model for healthy behavior. Make sure you equip my guardians with an understanding of this as well."

KORA must be safe to use, the orthosis and the games must not endanger children's health. It is important that the app reminds the guardians to create enough open space for the games to prevent the child injury while playing.

Right to Privacy

"Help me keep control over my data by giving me choices about what data to share, for what purpose and let me know how my data is used. Care about me by respecting my data."

We must protect the sensitive information we receive about the children from unauthorized access. Walking behavior outside of games and within everyday life may only be tracked with the explicit permission of the guardians as well as sharing the data with third parties such as physicians and physical therapists.

Right to Leisure and Play

"When using your product or service, consider different moods, views and contexts of play. Make it easy to set my own limits and help to develop and transform them as my understanding of the world around grows."

Not all children have the same preferences, like the same games or even have the same mood all the time. Every child is an individual that grows and develops every day.

Even though it is a big undertaking, the goal is to offer a wide variety of games to meet the needs of every child.

Right to Be Active and Social

"My well-being, social life, play, creativity, self-expression and learning can be enhanced when I collaborate and share with others. Encourage equality in your product or service by not highlighting differences that can be used in discrimination, such as number of friends or likes."

The games need to have an "I want to play that too" factor. When children with and without disabilities can and want to play the same games, it builds a common ground. It changes the child's attitude from "I play this game because I can't walk as good as my friends" to "I play a game that my friends want to play too". This further increases the motivation to play the games and creates inclusion.

Right to Information

"Label advertising clearly so I do not confuse it with other information. Transparently indicate when actions in your

product or service commit me to download content or commit to exclusive use of your product."

The app's menu must be protected by the guardian's face or touch recognition or by a PIN to prevent accidental sharing of sensitive data. The child can freely explore the rest of the interface, giving them more autonomy.

Right to Communication

"Make sure that I understand all the relevant information that has an impact on me. Consider all forms of communication (visuals, sound, etc.) and make it accessible to all. Keep in mind that age, ability, culture and language impact my understanding."

We strive to talk with children on their level so that they understand the games and game instructions and have fun. This is why we design the interface as accessible as possible so no child feels excluded, e.g., we provided both audio and visual cues in games to potentially overcome language barriers.

Right to Be Heard

"You should spend time with me when you design a product or a service that I may use. My friends, guardians, teachers, and communities also care about your product or service so include them in the process as well. We have good ideas that could help you. Also, ensure that you talk with people who are experts on my needs."

In our opinion, this is the most important principle for child-centred design, because we as designers are not able to design for children ourselves, as we lack education and professional experience. Professionals like childcare workers have a fundamental understanding of children's behavior because they have spent years learning and interacting with them, and we need to take that into account. We examine children's social contexts in the following chapter Environment and Influencers of Children.

Environment and Influencers of Children

We established that as designers, we do not have enough knowledge and experience with children. So how can we gain insight to develop a child-centred mindset? By interviewing experts!

To find your experts for qualitative research, you need to find out who the key influencers of children are. To get a broad picture of children's behavior, interviewing childcare workers is essential because they, along with guardians, spend the most time with children and have intensive knowledge about children's behavior.

When it comes to our target group of children with walking disabilities, you might first think of physicians. This is actually a fallacy because the physical therapists are the ones who accompany the children through the treatments, sometimes even for years. Below, we summarize the insights from the qualitative research.

Movement Means Independence

Children experience their environment through movement. It motivates them to become independent, communicate with others, and stand up for themselves. When children have trouble walking or moving, they can quickly become frustrated. They have difficulty learning to assert themselves, are more likely to attract negative attention, and need more care from adults. For example, a child who has difficulty walking may have their toy taken away more easily by other children who can. Being independent means being able to get the toy back.

Observation is Key

To notice anything about a child, you must first look closely and observe. How does the child perform specific motor movements? What do the movement transitions look like? Does the child's movement behavior change from week to week? Childcare workers know how the child moves in everyday life and notice changes more quickly than doctors who might only see the child every few weeks or months.

Partnering with Guardians is Crucial

It is essential to show guardians that we all want what's best for their child. Caring for your child's health in today's society is not easy because everybody is quick to judge every decision. This can make guardians feel uneasy talking about their parenting style, leading to miscommunication and, in the worst case, worse care for their child's health. For example, guardians are often overwhelmed with the complex medical information after their child's diagnosis and may have trouble understanding it at all. It is important to reassure them that we support and guide them through their child's therapy with information that is easy to digest.

Gender Norms Still Influence Our Behavior

Unfortunately, behavioral abnormalities may still be justified by gender norms. For example, guardians may dismiss their son's slow development compared to their daughter's because "girls develop faster than boys". As designers we need to reflect and be aware of our own biases, so we do not pass them on through our designs.

Different Walking Patterns Offer Variety

Games should not only focus on one movement pattern, but offer a varied set, e.g., toe-tapping, jumping, balancing, as this trains different muscle groups. We will go into more detail in the following chapter How to Design *for* Children.

Games are Fun

You should strive to turn everything into a game. For example, a common exercise to train legs is a squat. This may not be very engaging for a child, as they may not understand the extrinsic motivation to care for their health. But if you playfully frame the same movement, like putting away groceries in a shopping store, it will stimulate the child's imagination, targeting their intrinsic motivation.

Fun Outweighs Therapy

Games take away the negative association children may have with therapy. The games do not have to and should

not replace a therapy session; it is more important that the children have fun and want to play the game again and again. This keeps them motivated to continue the playful exercises, which in return has a therapeutic effect.

Communicate with Children on Their Level

When communicating with children, it can help to paint a picture for them. Compare these two phrases: “Pull your shoulders back and stand up straight” versus “Make yourself tall and walk like a queen”. The latter makes it neurologically much easier for children to visualize to imitate the movement. For our games, we will also use animal-like movements to make them easier to follow, e.g., “How does a frog hop?”.

Consider All Users’ Needs

Besides our main target group, children, we should not overlook other users of the KORA app. It can be helpful for doctors and physical therapists to have insight into the data, e.g., how often did the child play (motivation), and is

the child's walking behavior getting better? And if not, what needs to be improved (foot pressure points or orientation)? Guardians who obtain the KORA product for their children need to be convinced of its benefits. Not only that, but they serve as an intermediary between the service and the main user, the children. Therefore, we need to keep the needs of all user groups in mind to improve the usefulness of KORA.

From Insights to Action

Narrow Down Your Target Group

“From 3 to 6 years old, you have to motivate children differently. For example, the little ones don’t understand games like ’the floor is lava’ yet.”
– Physical Therapist

Designing for a 12-year-old is different than designing for a 3-year-old. Besides the different cognitive and motor skills, they also differ greatly in their interests. And even though it is desirable to design the games for all ages, this range is too broad to offer the best possible fun and therapeutic effect for all. So how do we decide what age group to design for?

By the time a walking disorder is properly diagnosed, children are usually 2.5 to 3 years old. Early treatment is essential to influence the children’s well-being positively. But at this age, complex exercises and the understanding of

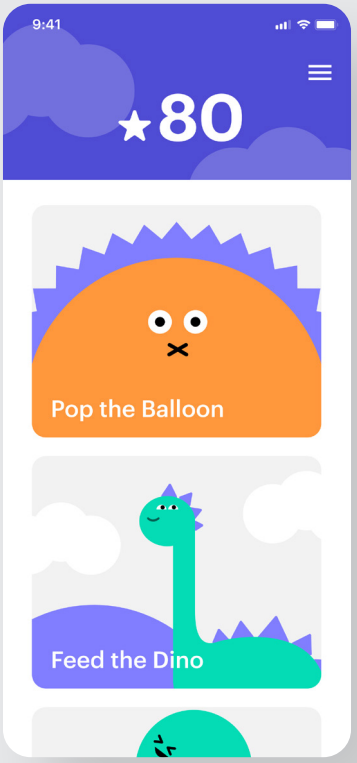
why they should do them are too difficult for children to understand. Since we see the most benefit of the KORA games here, we have decided to narrow down the target group to children aged 3-6. Although we will always have to consider different motor and cognitive abilities, the spectrum is far smaller. More levels of difficulties can be added to further increase the target group's age as they might wish for more complex games.

Games Should Target Different Movements

"What's important is that you bring different walking patterns into games. The more variety you have in the exercises, the more you train the neurological system and the sensory system."
– Physical Therapist

Children with abnormal walking behavior use different compensatory patterns, depending on the cause of illness and source of pain. For example, a child with knock knees will show different compensation patterns than a child with a foot deformity. Different compensation patterns require

different treatment of muscles, which is why KORA games will use different walking patterns (e.g., jumping, toe walking, heel striking) and pace changes (e.g., running, walking).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Pop the Balloon
Feed the Dino

How to Design Playful Games *for* Children

When you design for and with children, you have to speak to them on their level. This means not only how to address children verbally or in writing, but all communication with children. The following will give you a some insights into our concepts of play that involve holistic communication with children.

Game Methodology

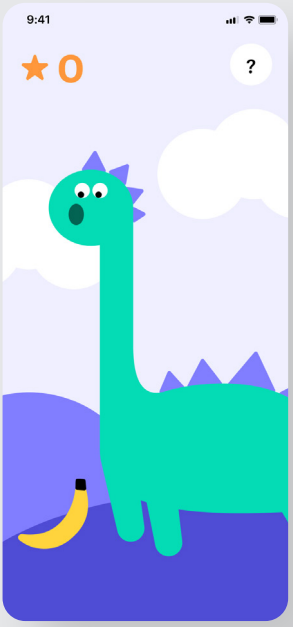
To test our insights from the previous chapter together with children, six different games are designed incorporating multiple walking patterns. The games consist of a starting point (dinosaur wants the banana), a goal (feed the dinosaur the banana), and the desired movement on how to achieve the goal (sit down like a frog to pick up the banana, then make yourself as big as possible to feed the dinosaur).

Game Design

Since it is a mobile application, the limited space on the interface has to be used mainly for gameplay, while other elements, such as possible achievement points, are secondary. The design is colorful, simplified, and therefore age-appropriate. It strongly highlights the main characters so that their actions and reactions are easy to follow. This also helps to design future games, as the design can be easily replicated.

Tutorials and Rules

Children must first understand the game's rules to play, have fun and achieve the best therapeutic effect. For this purpose, we created Olaf, the friendly KORA mascot, who guides children through the tutorials and explains the rules and movements. Olaf demonstrates the movements visually so the children can imitate them regardless of their language skills. Combined with auditory instructions, this strengthens children's understanding and motivation. The written explanations give guardians an additional way to understand the rules in case they need to help their child.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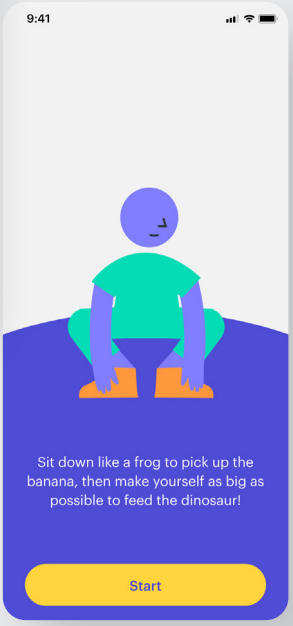
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Sit down like a frog to pick up the banana, then make yourself as big as possible to feed the dinosaur!
Start


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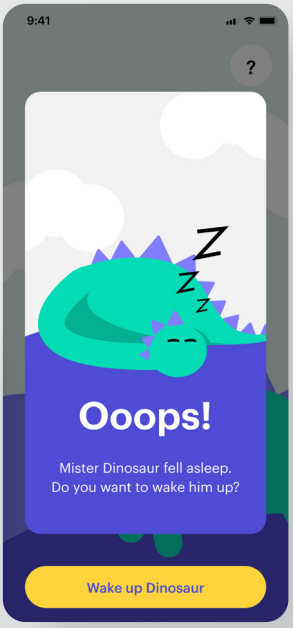
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Z
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Ooops!
Mister Dinosaur fell asleep.
Do you want to wake him up?
Wake up Dinosaur

Character Design

Different character designs provide variety for children's preferences. Facial features such as eyes and mouth allow the characters to make facial expressions that the child can recognize and visually indicate when they have done something correctly (e.g., the character is smiling, so I did something right). Animal characters provide an opportunity because children have a natural fascination for them and they can imitate their movement behavior very well.

Game Errors

Even though connection errors with the insoles should be avoided during a game, they cannot be completely ruled out. Under no circumstances, however, should the child feel that it is their fault. To avoid frustration, the child must be given an explanation on their level. Instead of a default error message that a child cannot understand and requires the assistance of a guardian, we should use an explanation relevant to the game and fun for the child (e.g., the dinosaur fell asleep during play).

Sound Design

Sound design gives children auditory feedback so they can focus on their movements and know when they are doing them correctly, and get points. Positive affirmations, like “Well done!”, “Almost there!”, “You can do it!” but also well-known sounds that accompany the characters (e.g., a dinosaur munching on a banana) encourage the child and motivate them to follow along.

Praise, Points and Achievements

A game should not just end. Children need acknowledgment about what they have achieved and positive encouragement to continue playing. Usual gamification aspects like points and badge achievements may offer a good way to motivate continuous playing. Still, we need to remember that they are extrinsic motivators and stand second in line to intrinsic motivators, which means, if the game itself is not fun for the child to play, points and achievements lose their impact after a while. Interviewees also shared this in qualitative research; sticker booklets with rewards were initially motivating but lost their impact because children did not enjoy the exercises and felt no lasting improvement

in their health. Therefore, we focus primarily on intrinsic motivation but give the option to expand the concepts with points and achievements.

We describe all our games in detail in the Appendix.

How to Design Playful Games *with* Children

We know theoretically how to design for children and even developed games based on our research. However, the reality can be quite different. How do we know whether children will actually like our product? Let's return to the 10th principle of the Designing for Children's Right Guide: The Right to Be Heard. To find out what children like or dislike about our games, we need to let them play and give them a voice. Only then can we design the games together with them.

Limitations and Challenges in Qualitative Testing with Children

Testing concepts early in the product development cycle saves time and money and ensures success by finding user friction before they are implemented. Depending on the complexity of the product, this often means testing prototypes instead of a functioning product. We will, therefore, manually control the prototype's flow by

observing the child's correct movements. This will allow us to test the key interactions of the games.

Testing your target user is crucial. However, finding them can be difficult. Especially with vulnerable user groups like young children with disabilities, you will have to find guardians who consent to testing. Unfortunately, we could not find guardians who felt comfortable with the participation of their walking-impaired child. Instead, we decided to test the games with non-disabled children. While this is not ideal, it helps us determine if children, in general, understand how the games are played and if they enjoy them. However, when evaluating, we must keep in mind that physical aspects may not occur in the same way in children with a walking disability, such as endurance during strenuous games.

Get to Know the Child

If possible, carry out the tests in the child's familiar environment to increase their confidence and reduce anxiety (Feder, 2020, p. 137). If you take children out of their comfort zone, it will be more difficult for them to engage in the testing because they will first have to get used to the new

and foreign surroundings. Don't jump right into the testing; spend some time with the child so they can get to know you. Not all children are fearless and directly open to new people, sometimes, they can take some time to warm up. Take the time to respond to the child's interests and needs, for example, you can ask them to show you their room or favorite toy to break the ice.

Identify What You Want to Know

Decide beforehand what you want to learn so you know what to focus on during the testing. If possible, and only with the guardians' consent, you may want to record the tests so that you can focus on the interaction with the child and evaluate it later. To evaluate the games, we used the following criteria:

- **Comprehension**
  Does the child understand the movement shown in the tutorial? Can they reproduce it? Do they need help?

- **Endurance**
  How long is the child physically able do the exercise?
  At what point is it too strenuous?

- **Motivation (Passive Rating)**
  How often wants the child to play the game?
  How long is the game intrinsically motivating?

- **Evaluation (Active Rating)**
  How many candies would the child give the game?
  (5 candies best, 1 candy worst)

Allow the Child to Be the Expert

If you're testing with kids, prepare for the fact that nothing might go as planned. Kids may not care about your schedule or expectations, making their input all the more valuable. Let them be the experts (Feder, 2020, p. 137).

We tested the games on four children aged 4-9 years, split equally between girls and boys, in a familiar environment, such as their own home or grandparents' house. They were played in a different order so that the results would not

be affected by the child's loss of concentration or energy level. Based on the criteria defined, we have summarized our findings as follows:

Motivation Can Trump Attention Span

No 4-year-old is like a 9-year-old, and even within their own age group, not all children are the same. So how can we find common ground among these differences? Generally, older children had a higher attention span and were more likely to play all six games, while the younger ones stopped after three. However, when younger children really liked a game, they were motivated to play it with no end in sight.

If it's Too Easy, it's Boring

Although all the children understood and imitated the tutorials, the older children understood them much faster and were able to replicate them more accurately. Older children got bored quickly if the required movements were too easy as their development is more advanced, e.g., it was easier for them to keep their balance. Therefore, they wanted to move on to the next game.

Children Favor Fast Movements
All children preferred games with fast and intense movements over slow movements, e.g., jumping over sneaking.

Children Can't Say Exactly Why They Like or Don't Like a Game, They Just Know (Yes, Even Without Playing It)
Children have trouble explaining why a game is fun or not. They just know it. If they are neutral to a game or indifferent, they don't express it unless they absolutely hate or love it. Then they voice their opinion loud and clear. Children did not even need to play the games to form an opinion. From the moment they saw the first screen and the characters, they knew if they wanted to play or not.

Focus on How Children Express Themselves Rather Than on What They Say (Passive Rating Trumps Active Rating)
When the children were asked if they liked a game, they always answered "Yes", although they displayed different behavior when they clearly preferred a game over another. During the evaluation, where children were able to rate the game with candies, most of them gave more than their behavior suggested was fun. Therefore, it is more important to pay attention to a child's facial expression and body language while playing the game. Children have their own way of showing excitement and having fun, e.g., one child

clenched their hands and even trembled with excitement.

Children Might Need Time to Open Up

Some children quickly warm up to a new person; others need more time. One child chose to wait and first watch their sibling play. After some time, the child reached out and wanted to play as well.

Children Need to See the Impact of Their Actions

Children immediately imitated the movements shown by the character Olaf in the tutorials but did not know why they should do them. As the tutorial interface did not show how their movement affected the gameplay, they had difficulty connecting their actions to it. They only realized once the game started.

Children Prefer Familiar Characters Over Inanimate Objects

Games featuring animals and familiar animate objects were significantly more popular than inanimate objects, regardless of facial characteristics. For example, games with dinosaurs or balloons were more popular than rectangles, although all had facial features.

Children Make Their Own Games

Children change rules so they can make the games their own. For example, one game involved sneaking up on a sleeping cat so as not to wake it. Instead, the children loved the frightened face of the awakened cat so much that they ran towards it, screaming “Roar!” to scare it. One child even created their own game during play, explaining that they want an elephant character that gets bigger every time they stomp with their feet.

The Influence of Child-Centred Design

Designing for children cannot be learned; it has to be experienced. By spending time with children, designers can put themselves in a child's perspective and see how they perceive and engage the world around them. Only then can we make design decisions relevant to the children who use our product or service (Feder, 2020, p. 143).

To conclude our journey through child-centred design, we've highlighted the key influences on our product and designers to empower anyone to design for children, regardless of what they're designing.

Influence on the Product

Make the First Impression Count
Children decide in a very short time based on the information they have whether they want to play a game or not. This is why a game's first screen must immediately entice the child to play it, e.g., by showing loved characters, such

as animals or fun interactions.

Offer a Wide Variety of Games and Familiar Characters

Playing the same game over and over, no matter how fun, eventually becomes monotonous and boring. It is even trickier when the number of games is limited from the beginning, and the existing games do not appeal to the child for various reasons, such as physical ability or personal preference. We, therefore, need to develop more games with different rules, characters, and goals.

Create Complexities (Level Design)

Regardless of age and physical ability, children learn how games work and master them very quickly. To keep them interesting and challenging, it is useful to design different levels of complexity. This also means that you don't have to create countless new games but can achieve fun based on new challenges in the same game.

Show the Effect of a Movement in the Tutorials

So far, the tutorials have focused on the required movements shown by our character Olaf. This made the movements easier for children to understand and replicate, but it was unclear how it affected the game. Children understood the effect only after the game had already started.

We need to consider how a preview in the tutorial screen could be combined with the required movements without compromising their replicability.

Influence on Designers

Designer as an Active Part of the Testing

Usually, in qualitative testing, we as designers have to watch our body language and reactions so that users tell us their true, unfiltered feelings about the product, not what they think we want to hear. However, for children, this can be perceived as passive and disinterested, making it even less fun for them to play with you and participate in the testing. Therefore, it is necessary to actively and fully engage with the child in the tests.

The Child Must Get to Know the Designer

Put yourself in the child's position; a person you have never seen before approaches you and wants to play with you. Would you? Probably not. If you want children to open up and show you their true feelings, they need to know you first. Don't jump right into the testing; try talking to them and ask them about their favorite game or toy. If they are too shy, have a conversation with the guardians, so the

child can see that they are comfortable with you.

Designers Must Get to Know the Child

Not only does the child need to get to know you first, but you need to get to know the child. Not all children are the same, behave the same or show their feelings in the same way. As a designer, it is good to know the different behavior patterns so you interpret them correctly.

Embrace that Nothing Goes as Planned

As designers, we are usually prepared for different user experiences and feedback, and they are rarely a total surprise. And even though you can try to learn about children the same way you learn about other user groups and think you are prepared, you are not. Children are a wildcard and rarely fulfill your expectations. They will surprise you and might even frustrate you. Embrace the surprises and be comfortable with the fact that not everything is as you would expect it to be (Feder, 2020, p. 143).

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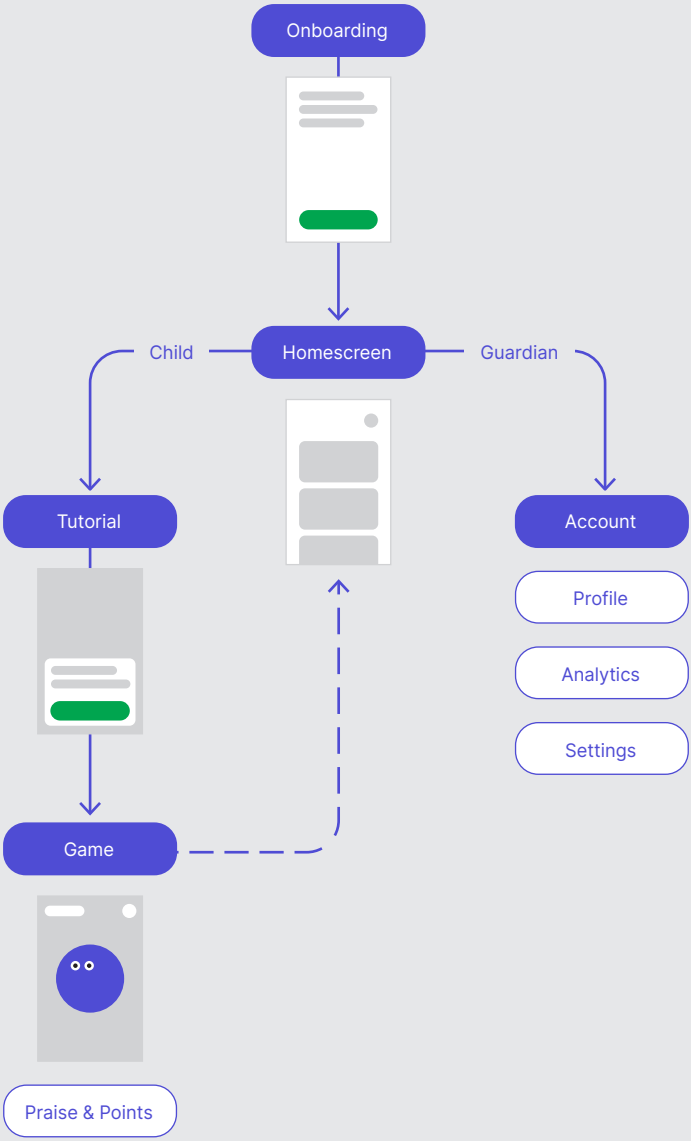
Appendix

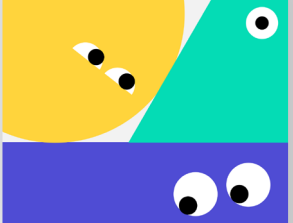

Onboarding
Child
Homescreen
Guardian
Tutorial
Account
Profile
Analytics
Settings
Game
Praise & Points

Information Architecture

With the Information Architecture, we can plan the information hierarchy, meaning where and how the user consumes our information. Since part of our app is aimed at children, and the other part at guardians, we need to keep two completely different user groups in mind. The Homescreen, Tutorials, and Games must be designed to be simple and easy to understand so that children can use them independently, meaning without assistance from an adult. The Onboarding and Account areas are intended for guardians and, therefore, may have a higher level of complexity.

Verify email

Already a member? Sign in.

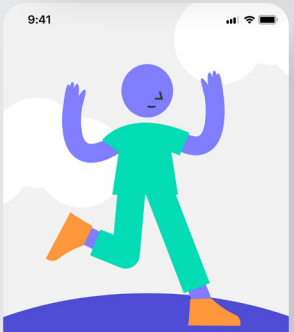


Fits everyone

Our insoles are custom-made to accurately capture your child's movements.

Next

9:41

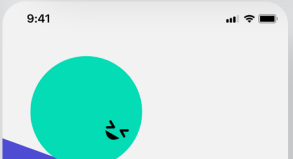


Play for health

With KORA, your child can playfully improve their walking behavior.

Next

9:41



Therapy that's fun

With our mini-games, your child will have the most fun while achieving the best results.

Get Started

9:41

Sign up

Name

Email

Onboarding

KORA’s Onboarding is primarily for guardians, who serve as an intermediary between the app and the child. Therefore, it must explain the app’s benefits directly and in a simple way.

I'd rather not say

Do you want KORA to track your child's walking behavior throughout the day?

Yes

No

Complete

9:41

Let's get to know each other

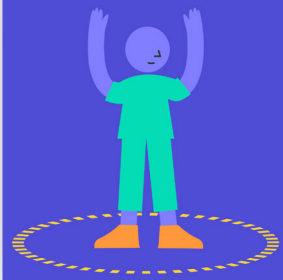
To know what games fit your child best, we would like to ask you a few questions.

Don't worry. All data is stored on your device without access by third parties.

Continue

Skip

9:41



Let's calibrate

Make sure your child has a lot of space to move around.

Start Calibration

Skip

9:41

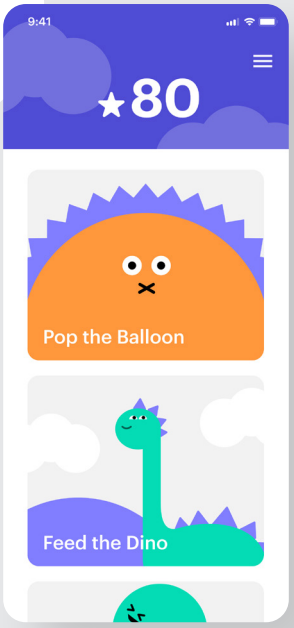
Searching insoles

Questions and Calibration

Guardians can answer questions regarding their child's health, which will then help recommend them suitable games. The guardians then connect and calibrate their child's insoles so the system correctly detects the movements. As Calibration requires the child's participation, our target user switches from the guardian to the child. Therefore to make the calibrations more engaging, they are designed as games.

Homescreen

In the homescreen, the focus is on the games. Since the first impression matters, the preview must reveal which character the child will encounter in the game. The characters must have a friendly and engaging expression and ideally show the main interaction directly.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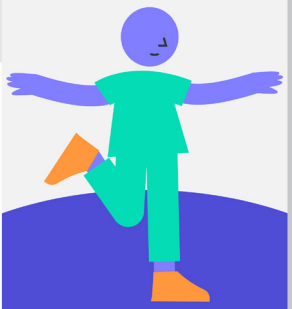
80
Pop the Balloon
Feed the Dino

Tutorials with Olaf

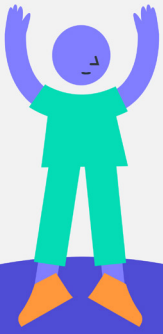
Olaf, the friendly KORA mascot, guides children through the tutorials and explains the rules and movements. Olaf demonstrates the movements visually so the children can imitate them regardless of their language skills. Combined with auditory instructions, this strengthens children's understanding and motivation. The written explanations give guardians an additional way to understand the rules in case they need to help their child.



Stand on one leg like a flamingo
to balance the brothers!

Start

9:41



Jump like a frog to make
the balloon fly higher!

Start

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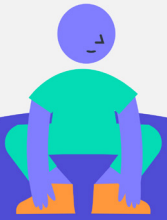


Jump like a frog to make
the balloon fly higher!

Start

Games

We have defined each game based on characteristics that help understand how a game is set up. This helps to create new game concepts with different movement combinations and complexities.

Communication
Explaining the rules at the child's level of understanding.

Motor Movements
The type of movements required by the game.

Complexity
Determined by the number of individual motor movements.

Game:
Make the Balloon Fly

Communication

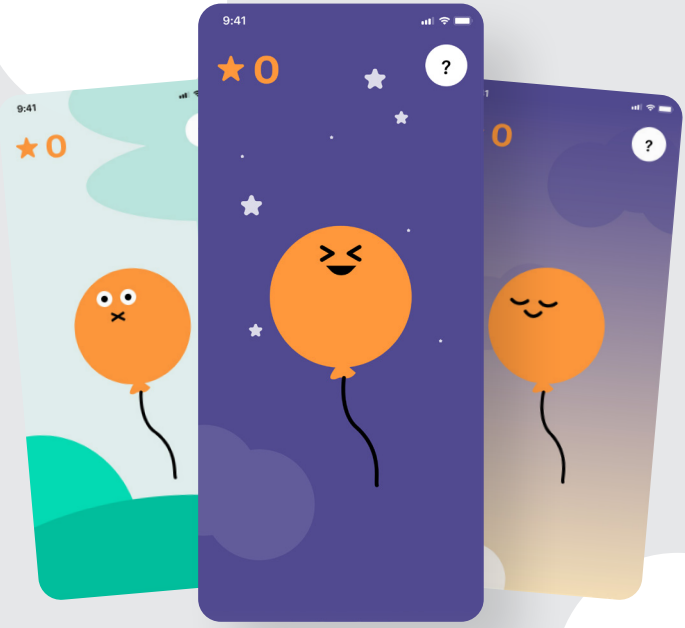
Jump like a frog to make the balloon fly higher!

Motor Movements

Jump, Stretch

Complexity

Medium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?

Game:
Feed the Dino

Communication
Sit like a frog to pick up the banana, then make yourself as big as you can to feed the dinosaur!

Motor Movements
Toestand, Squat, Balance

Complexity
High


9:41
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?
9:41
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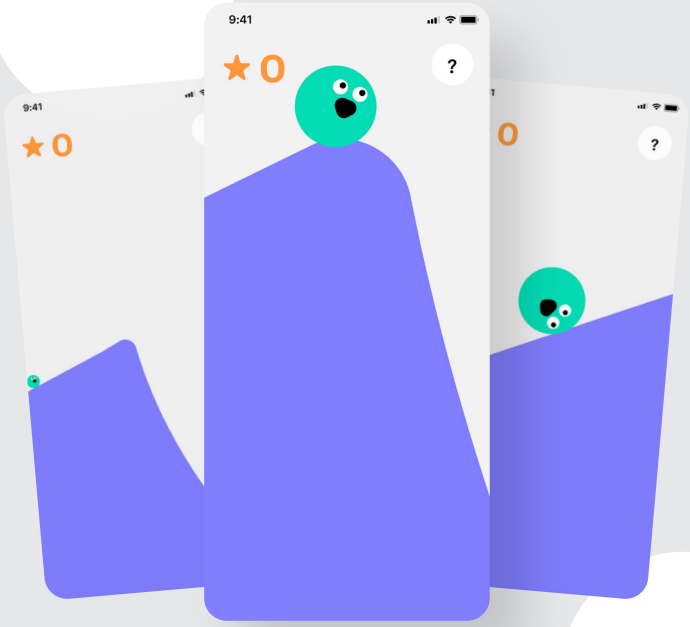
Game:
Roll it

Communication
Push a chair as hard as you can to throw the ball down the ramp!

Motor Movements
Push, Walk

Complexity
Medium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Game:
Pop the Balloon

Communication

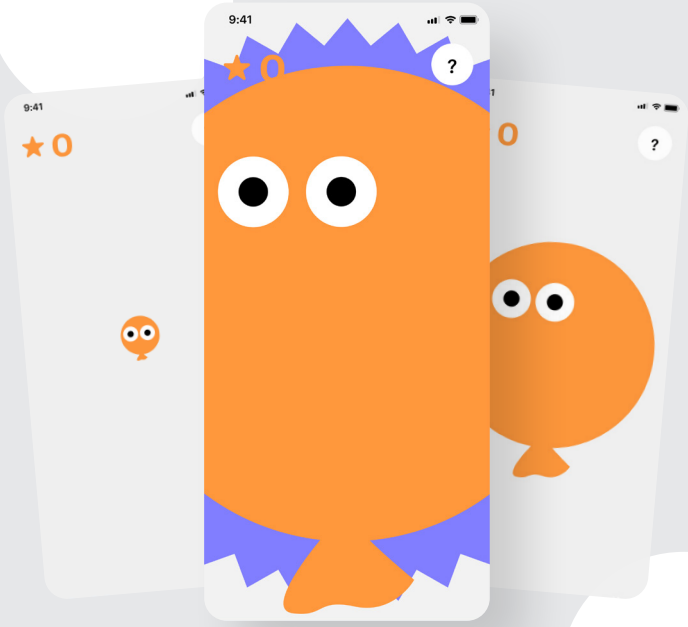
Stand like a ballerina to pop the balloon!

Motor Movements

Toestand, Balance

Complexity

Medium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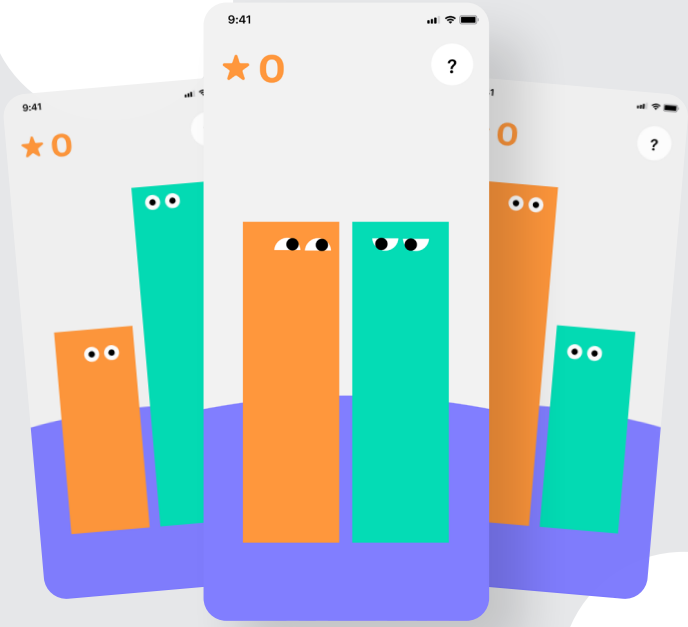
Game:
Balance the Brothers

Communication
Balance the brothers by standing on one leg like a flamingo!

Motor Movements
One-leg stand, Balance

Complexity
Medium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Game:
Don’t Wake the Cat

Communication

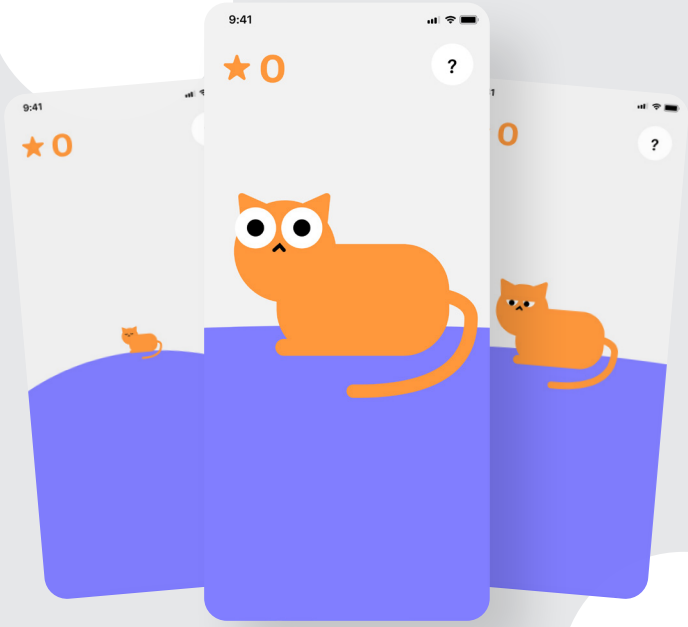
Sneak like a tiger or else you will wake the cat!

Motor Movements

Sneak

Complexity

Easy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?

Praise, Points and Achievements

Upon completing the game, the child receives positive feedback and a summary of the points earned. This leaves room for extrinsic motivators such as a badge or achievement system in the future.


9:41
?
You did it!
★1
Play again
Back to Games

9:41

Account

Profile

Sarah

Games

Analytics

Foot Load

Tracking

Play Time

Settings

9:41

Profile

Details

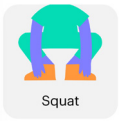
Name
Sarah

Email
sarah@gmail.com

Password
●●●●●●●●●

Movements

All



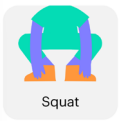
Save Game Selection

9:41

Games

Movements

All



Save Game Selection

Account

In the Account area, guardians have an overview of all their child's analytics, profile settings, and the ability to tailor their child's game choices to specific movement patterns.

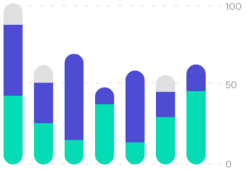
9:41

Tracking

Week 48 | Week 47 | Week 46 | Week 45

320 5 ↗
Correct steps
7 Days

812 15 ↘
Total steps
7 Days



Correct · Incorrect · Unassessable

Export

9:41

Foot Load

Week 48 | Week 47 | Week 46 | Week 45

Correct · Stressed

Export

9:41

Play Time

Week 48 | Week 47 | Week 46 | Week 45

Most Played

20x
Pop the Balloon
Toe Standing

16x
Make the Balloon fly
Squat and Jump

All

Analytics

The Analytics area provides guardians with an overview of their child's progress and playtime. With their consent, the data can be shared with doctors and physical therapists to identify progress and regression more quickly, enabling better care for their child.

Design Kit

For anyone interested in creating their own games, the design and character kits can be found at the following link:

www.fabiennerben.com/kora

Font Graphik

H1 Head

H2 Headline

H3 Headline

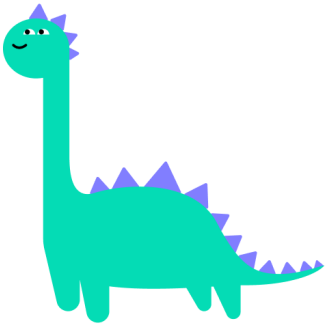
Body 1

Body 2

Colors

Background	Black	Primary
Accent	Secondary	Tertiary
Quaternary		

Dinosaur



Play for Health: How to Design for and with Children

Concept and Text
Fabienne Erben

KORA Research Project Lead
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Munich University of Applied Sciences

Mentor and Supervisor
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Munich University of Applied Sciences

Design
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First Edition
2022

Designing for Children is Different

While developing the KORA app, a mobile application that aims to playfully train children's walking behavior, we noticed that knowledge about child-centred design is not easily available.

We collaborated with interdisciplinary minds to find out why child-centred design can be difficult, how to design *for* and *with* children, and how it influences designers.

For example, why do designers need to actively participate in testings with children? Or why is it that children may dislike a game without even playing it?

Fabienne Erben was formerly a practicing graphic designer before branching out into emerging design fields such as user experience and healthcare. Since 2013 she has been designing digital products across various industries.