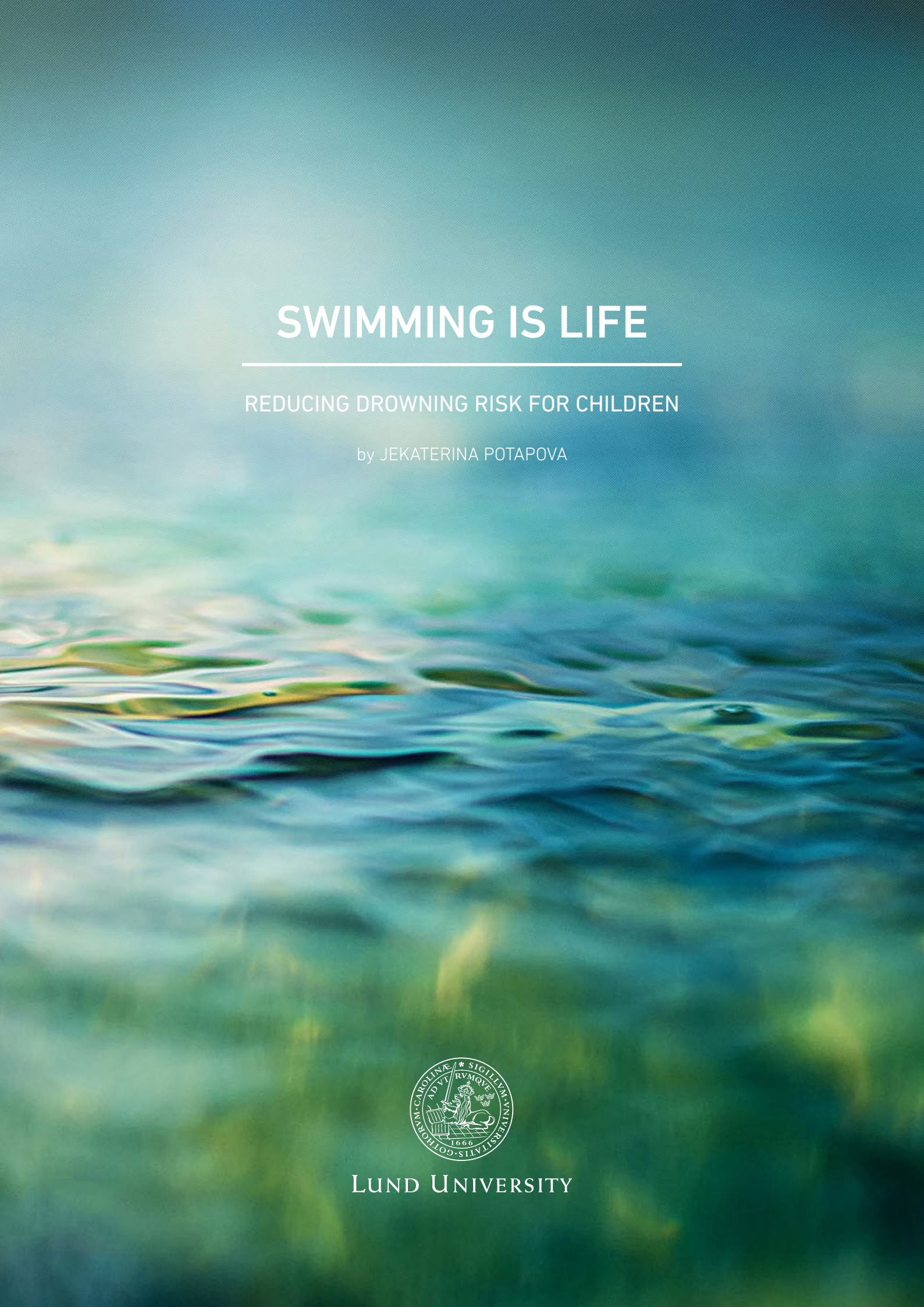

SWIMMING IS LIFE

REDUCING DROWNING RISK FOR CHILDREN

by JEKATERINA POTAPOVA

LUND UNIVERSITY

SWIMMING IS LIFE

REDUCING DROWNING RISK FOR CHILDREN

Degree Project for Master of Fine Arts in Design
Main Field of Study: Industrial Design
From Lund University, School of Industrial Design,
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ABSTRACT

Drowning is the second global leading cause of unintentional injury and death for children ages 1 to 14 years, and the fifth leading cause for people of all ages (excluding flood disasters and water transport incidents).

Why is the risk of drowning so high?

It is important to investigate: what are the reasons that create a danger, is there a main risk group, how the risk of drowning can be reduced or even prevented, what is already in use for drowning prevention, what is the level of its contribution and what role plays the ability to swim?

Research methods such as interviews, questionnaires, observations, documentary analysis and other let to explore various risk factors, the types of common activities and children's behaviour in the water, functioning of the existing swimming and buoyancy equipment and safety aids, conditions of the water settings, parents' opinions and observations and the swimming trainers' experience.

All findings lead to the discussion of what can be useful and important to take into account in order to improve the existing situation related to the safety level of the child activities in the water.

Following the discussion, the design process including ideas generation, experiments and several other methods, it created an advantage for product development.

INTRODUCTION

Background of the project

TOPIC SELECTION

I started my degree project by searching for problem areas where external help may be needed. One of them was related to unintentional accidents which can be a cause for severe injuries or even death. It can be useful to help to prevent events with sad consequences that mostly happen unexpectedly and when there is nothing to do in order to prevent them.

Taking a look at the statistics of unintentional injuries, I was surprised that drowning stays on a leading position. I was wondering why. I assume that people enjoy swimming because it is a joyful activity and a great form of exercise. So what are the reasons?

Personally, I like swimming a lot and during the summer I prefer to challenge myself to swim to the other sides of my favourite lakes. I realised that this can be a risk for me too. If something happens, what could help me? It is the same in other situations. What can help if a person gets in trouble in the water? I also have friends who can't swim, so they are at a higher risk.

Further explorations showed that the highest rate of drowning is among children. What can be helpful for those who may not even know about this danger and don't realize this aspect clearly? It is not their fault and they can't do anything before it happens. What can be done for this situation?

The experience of children's behaviour I gained by observing my little brother. I think it can bring useful insights for this topic and help me to explore the situation better.

DROWNING IS THE SECOND GLOBAL LEADING CAUSE OF UNINTENTIONAL INJURY AND DEATH FOR CHILDREN AGES 1 TO 14 YEARS,
AND THE FIFTH LEADING CAUSE FOR PEOPLE OF ALL AGES.

(excluding flood disasters and water transport incidents)

TOPIC BACKGROUND, PROBLEM DEFINITION

The selected topic for the degree project is **"SWIMMING IS LIFE"** and it is related to **reducing drowning risk for children.**

It is common for people to spend time near water settings, especially during hot summer days. Having fun in the water is an attractive and interesting activity for most of the children. Unfortunately, children are at the highest risk of unintentional drowning. By statistics, **drowning is the second global leading cause of unintentional injury and death for children ages 1 to 14 years**.

What could be the cause for this high rate of drowning incidents?

How can it be reduced?

How can a design process contribute to make the time spend in water more safe and enjoyable for children and their parents?

DEMARCATIONS

The project's topic is quite broad. That makes no sense to set limitations from the beginning. The process will be mainly oriented to explore and improve nowadays' existing situation related to safety aspects of children's activity in the water. Flood disasters and water transport incidents are not taken into account.

More detailed limitations such as user group, area of use, risk factors etc. are going to be defined during research process.

My own preference is to design a personal equipment or device for children that can help to reduce the unintentional drowning risk during swimming and playing in the water settings and make it more suitable for implementing it in real life as soon as possible. Some further research may confirm if my preferences are correct.

METHODS

A project related to this particular topic requires a deeper knowledge and understanding of the problem areas. Different research methods were used for exploration purposes and verification of my hypothesis.

Documentary analysis including literature, articles, statistics, videos etc. help to explore the background of the problem and the aspects or factors that have influence or connection to it.

Observations help to understand the existing situation as it is and discover the other factors that can be important to take into account.

Interviews and questionnaires help to explore particular areas more deeper and provide insights related to people's experience like parents' opinion and observations, children's thoughts and behaviour, swimming trainer's knowledge and experience.

Product and market analysis as well as **material and technology research** are useful in order to discover needs and useful innovations for the particular area.

Additional research methods can be chosen during a further process if knowledge in particular areas will be required.

Different **methods for analysis** will be used in order to synthesise the research and interview material, and find out the important areas for further development and possible solutions.

The design process including **brainstorming, ideas generation and analysis, sketching, mock-ups making and experiments** will be an important part of the product development process, including **product specifications, prototyping and testing**.

All of this plays an essential role for the final result of this project.

RESEARCH

Overview & Nowadays
situation analysis

UNINTENTIONAL DROWNING

THE CORE OF THE PROBLEM

Drowning is the second leading cause of unintentional injury and death for children ages of 1 to 14 years, and the fifth leading cause for people of all ages. Actually, the total number of death by drowning is much higher, but it also includes drowning deaths caused by flood disasters and water transport incidents. This, will though not be taken into account for this project.

PLACE and AGE

Based on the statistics, about half of all drownings occur in the natural water settings such as lakes, ponds, rivers, seas and oceans.

The risk of drowning in different places depends on age group: Infants (less than 1 y.o.) - in bathtubs; Children (1-5 y.o.) - in the residential swimming pools; Children (5-14 y.o.) - in the outdoor water settings.

Low- and middle-income countries have higher rates of child drowning accident, but still this problem exits all over the world.

CONSEQUENCES

According to the World Health Organization, "Drowning is the process of experiencing respiratory impairment from submersion/ immersion in liquid." It is mainly related to the blockage of breathing and inhaling water instead of air

The possible outcomes of drowning are classified as death, morbidity (the development of disability or injury), and no morbidity. Other terms related to circumstances and consequences can be used to describe the drowning events (e.g.: wet vs. dry, primary vs. secondary, fatal vs. non-fatal, salt vs. fresh water drowning).

The prognosis for many drowning victims is poor. The brain does not tolerate well the lack of oxygen and the amount of potential damage depends on the time the patient spends hypoxemic in the water. Even if the brain survives, acute respiratory distress syndrome (ARDS) may cause significant short and long-term problems as the lungs try to recover from their injuries.

MAIN FACTORS and TIPS

The main factors that affect the drowning risks are lack of swimming ability (many adults and children report that they can't swim), lack of barriers to prevent unsupervised water access, lack of close supervision while swimming, location, failure to wear life jackets and others.

The most common tips to help to stay safe in the water are:

- Learn to swim. Teaching school-age children basic swimming, water safety and safe rescue skills. Formal swimming lessons can protect young children from drowning. However, the supervision is still necessary when children are in or around the water.
- Designate a responsible adult who can swim and knows CPR (Cardiopulmonary Resuscitation) to watch swimmers in or around water.
- Use the Buddy Systems and Lifeguards.
- Heed warning flags. Know the meaning of and obey the warnings represented by coloured beach flags.
- Know the terrain. Be aware of and avoid drop-offs and hidden obstacles in natural water sites.
- Avoid the rip currents. Watch for dangerous waves and signs of rip currents.
- Use life jackets when boating. Don't use air-filled or foam toys instead of life jackets. These toys are not safety devices.
- For a swimming pool at home it is useful to install four-sided fencing that completely separates the pool area from the house and the yard. Clear the pool from toys so that children will not be tempted to enter the pool area unsupervised.
- Effective policies and legislation are also important for drowning prevention.

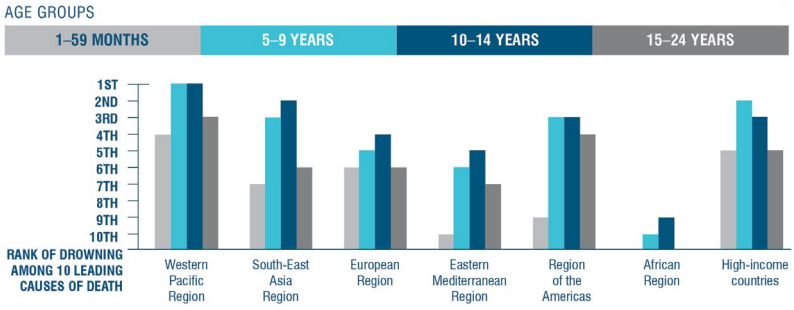
CONCLUSION

The risk of unintentional drowning for children is quite high. The lack of oxygen in the brain leads to various damages and s a consequence, drowning can still be quite dramatic even if it is not followed by death. For the younger children (0-5 y.o.) one of the main risk factors is a low level of careful supervision. For other children (5-14 y.o.) supervision also plays an important role, but there appear to be more factors such as undeveloped swimming and water safety skills etc., as the drowning occurs more often in the natural water settings.

What child danger hides in the open water settings? Why is the children's swimming ability not well developed or is developing slowly? What contribution to this problem does swimming equipment have? What role does children's behaviour and activities in the water or close to it play?

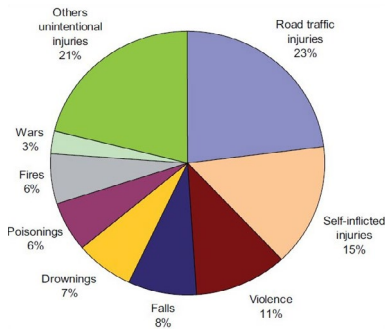
RANK OF DROWNING AMONG 10 LEADING CAUSES OF DEATH BY REGION AND AGE GROUP

Sourse: World Health Organisation, 2014



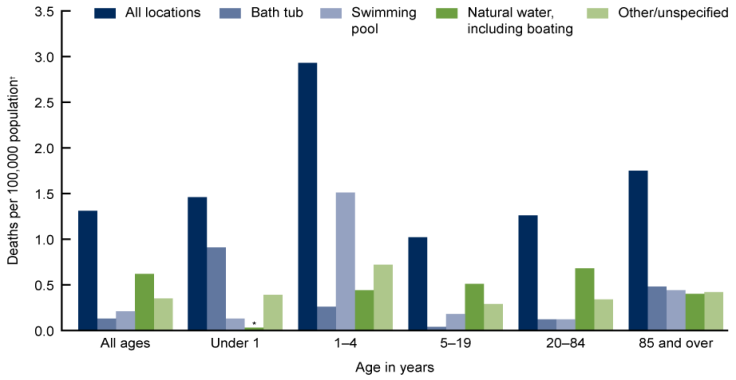
CAUSES OF INJURY DEATHS

Sourse: Global Burden of Disease, 2004



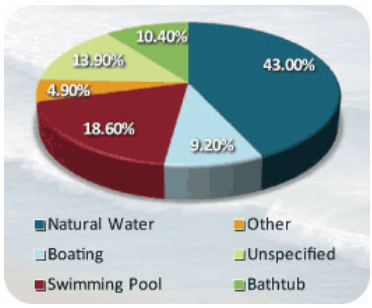
AVERAGE ANNUAL DEATH RATES FROM UNINTENTIONAL DROWNING

Sourse: CDC/NCHS, National Vital Statistics System, Mortality; Unated States, 1999-2010



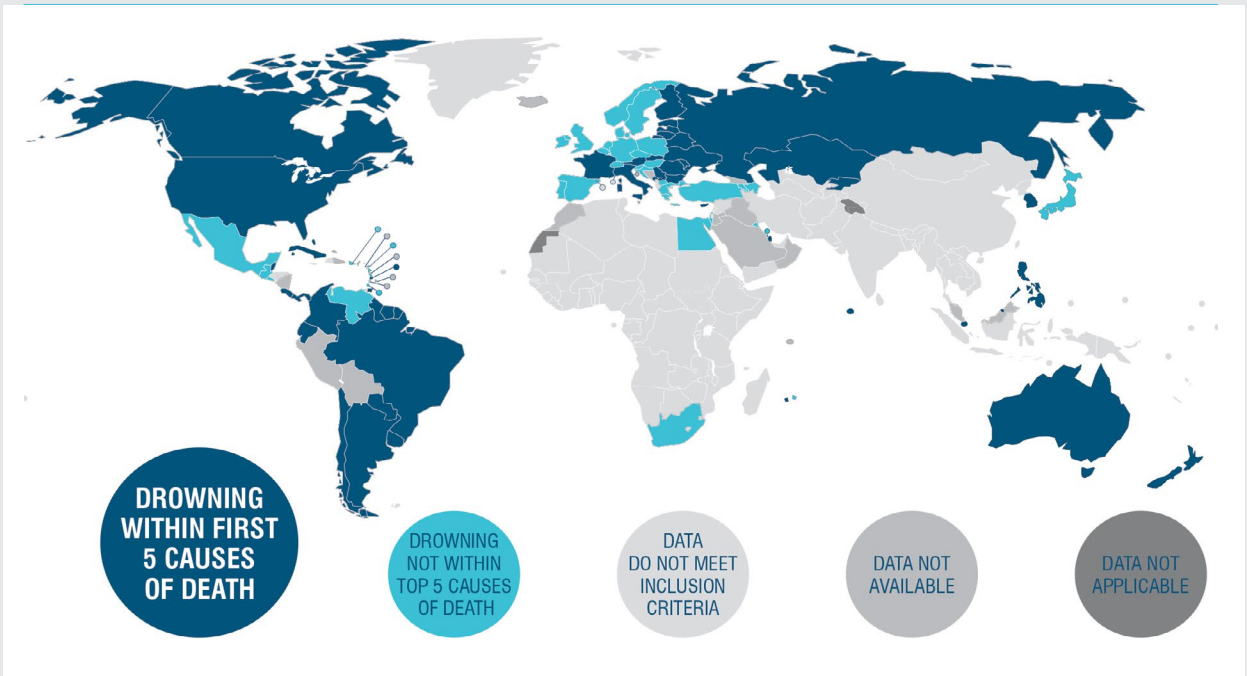
ALL UNINTENTIONAL DROWNING

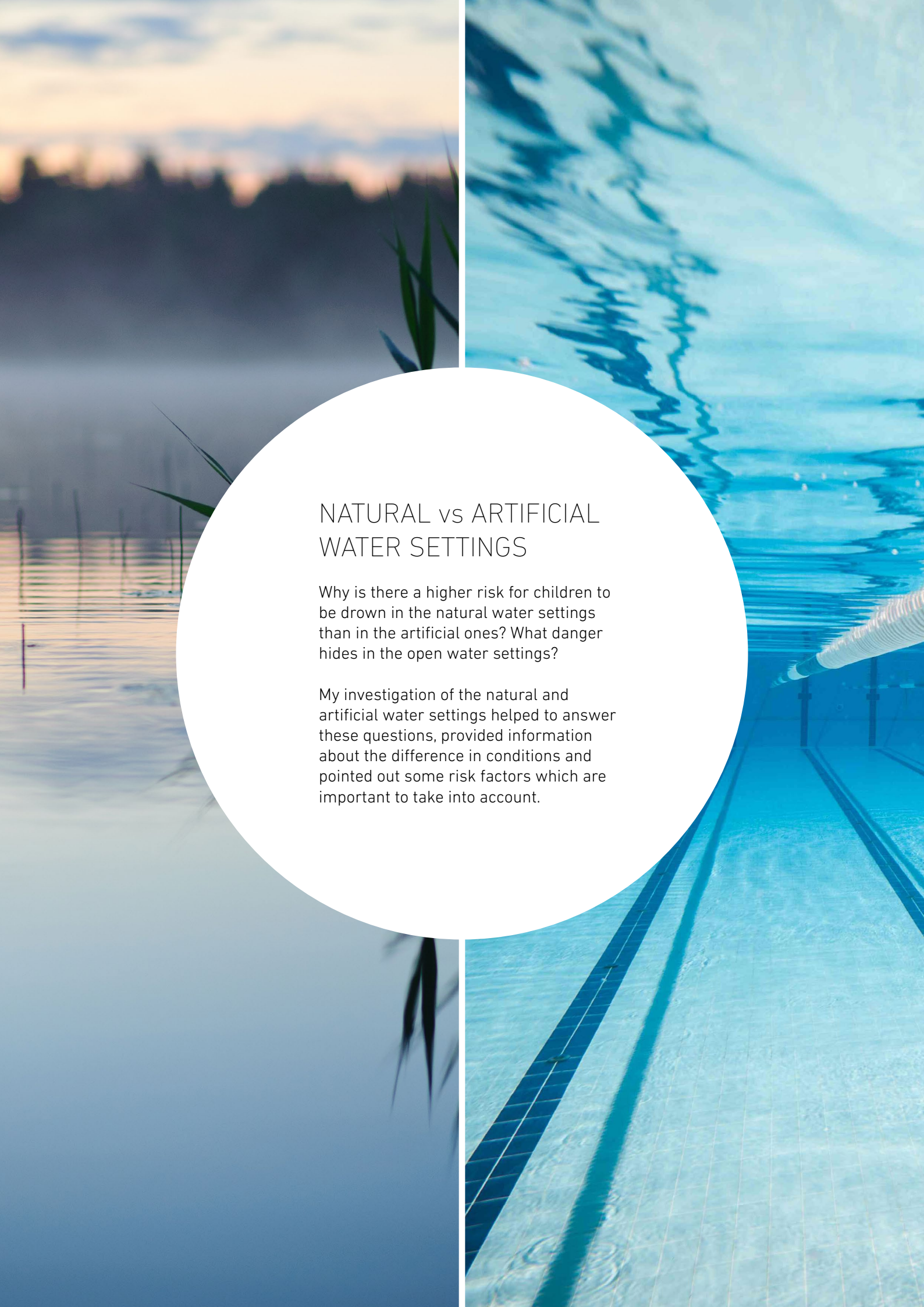
Sourse: Centers for Disease Control and Prevention, 2007



DROWNING AS A LEADING CAUSES OF DEATH AMONG 1-14 YEAR OLDS, SELECTED COUNTRIES

Sourse: World Health Organisation, 2014





NATURAL vs ARTIFICIAL WATER SETTINGS

Why is there a higher risk for children to be drown in the natural water settings than in the artificial ones? What danger hides in the open water settings?

My investigation of the natural and artificial water settings helped to answer these questions, provided information about the difference in conditions and pointed out some risk factors which are important to take into account.

	NATURAL Lake, pond (still) River (stream) Sea (still, waves) Ocean (waves)	ARTIFICIAL Swimming pool - indoor Swimming pool - outdoor Aquaparks Bathtube
Water quality	• Water may contain pathogens. • Risk of swimming in polluted water.	• Clean water, use of chlorine, etc.
Water transparency	• Risks of turbid water: difficulties to guess the depth of the water and to see some possible obstacles.	• Transparent water, visibility of the depth.
Water temperature	• The water temperature can vary depending of the place.	• The water temperature is regulated and generally is maintained at a tolerable level conducive to swimming.
Water behaviour	• Water currents may be a risk. (streams, waves, etc.)	• Still water.
Depth	• The transition from un-deep to deep water may occur very sudden.	• The transition from an un-deep to a deep water is visible. Existence of marks, information.
Possibility to hold to smth. (pause or teaching process)	• No facilities to hold to something.	• Walls to hold for pause or training activity. Option of taking a break on the side if you feel too tired.
Equipment, toys, clothes. etc.	• Inflatable equipment, toys which are easy to bring with you. • Swimming with clothes: for avoiding sunburn or religious purposes. • Sometimes safety devices such as buoyancy aids, are available for public.	• Variety of inflatable, foam equipment and toys can be used. Different ones suitable for different types of trainings. Some equipment can be borrowed at the swimming pool.
Conditions for learning to swim	• Parental help in learning swimming is needed. • Swimming equipment does not provide a right body position and the feeling of floatation.	• Good conditions for learning to swim: variety of equipment, still transparent water, walls to hold on to, swimming trainers. More parents are tend to spend time in water with children and can teach them. • Greater control, which results in a bigger focus on your swimming rather than on surroundings.
Involvement of others (supervision, teaching, lifeguard)	• Low level of supervision. On the popular beaches there are lifeguards. • Parents don't follow their children all the time, but do like to spend time with them. • Older children don't like a lot of supervision.	• Safe environment supervised by trained lifeguards in case of emergency and trainers.
Visibility of person / crowdedness	• Wide water settings make it difficult to supervise a person in the water, especially when it is crowded, like during a summer time. It can be even difficult to find the sitting place of your family / friends after spending a longer time in the water.	• Limited water setting, easy to supervise, better visibility.

SWIMMING ABILITY OF CHILDREN

Why is the swimming ability of children usually not well developed or developing slowly? Can the reason be that young children are not fully developed for swimming or floating? Is it possible to teach a child to swim in early age and will it be beneficial?

SWIMMING

Swimming is an excellent full-body exercise that promotes endurance, muscle growth and a healthy cardiovascular system. It is a great exercising for people of all ages.

SWIMMING AND CHILDREN'S HEALTH

Swimming is an attractive and interesting activity for most of children. It is also good for their health:

- Swimming is a very **beneficial form of exercise**, which builds coordination (it works the large muscles of the body honing in on gross motor skills).
- It is being proved that as a child's body is stimulated through exercise such as swimming, the mind is also stimulated causing further **brain development and an increase in intelligence**.
- Swimming also **contributes for the improvement of the speech, brain development and works multiple areas of the brain through combined movement** such as a kicking of arms and legs together.
- Swimming also **reduces stress**, increases mood-boosting chemicals in the brain and allows the muscles to contract and relax which **increases blood flow to the brain providing nourishment**.
- As a baby develops mobility functions, breathing will become deeper, more regular, and more mature. This enhanced respiration helps the **baby** to be able to make sounds, which **improves communication and overall language development.***

INFANTS AND SWIMMING

Infant swimming is the phenomenon of human babies and toddlers controlling their breath and moving themselves through water. Infants will naturally close their lungs underwater and are able to survive immersion in water for short periods of time. Infants can also be given swimming lessons, but this is primarily done to reduce the risk of drowning. Human babies demonstrate an innate swimming or diving reflex from birth until the age of approximately six months.** Traditionally, swimming lessons started at the age of four years or later, as children under four were not considered developmentally ready.*** However, swimming lessons for infants became more common.

SWIMMING PRACTICE

Nowadays we can find a lot of videos on the internet where infants and toddlers show a great skills of diving and floating, that is usually known as a swim safe rescue skills. Swimming ability can be more developed in pre-school and school-age children. Also some very basic swimming lessons for young children are available on the internet for free.

CONCLUSION

Research around children swimming ability showed that children are able to learn to float and swim in early age. At the same time swimming has beneficial effect on health and brain development, especially for growing child.

The question is raised again:
Why is the swimming ability of the young children, especially at the school-age, usually not so well developed or is developing slowly?

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* "How to Teach your Baby to Swim-From Birth to Age Six" by Douglas Doman.
** "Bradycardic response during submersion in infant swimming" by E. Goksor, L. Rosengren, G. Wennergren; 2002.
*** "Swimming Programs for Infants and Toddlers" by American Academy of Pediatrics, Committee on Sports Medicine and Fitness and Committee on Injury, Violence, and Poison Prevention; 2000.

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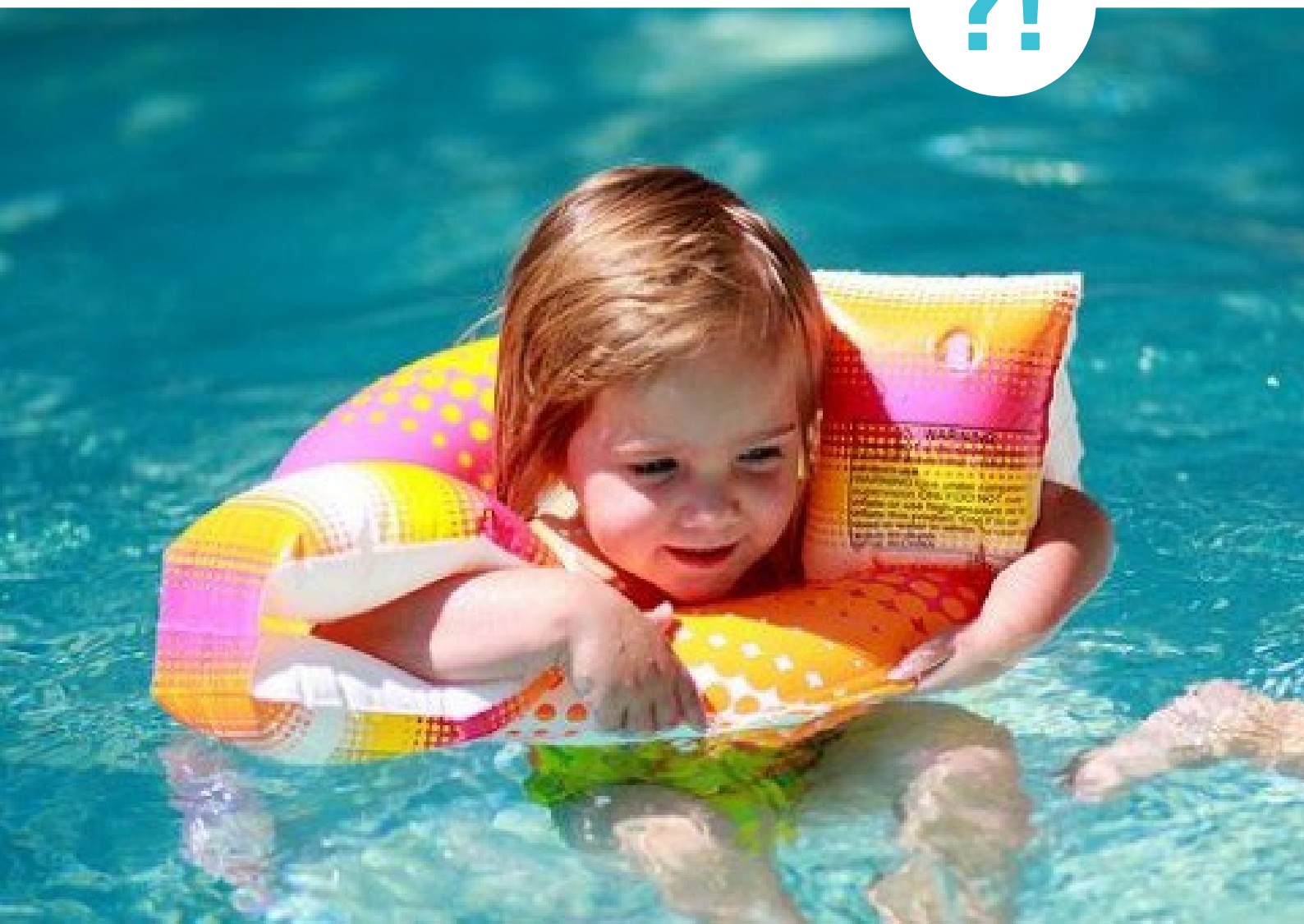


EXISTING EQUIPMENT

What contribution to reducing drowning risks for children does swimming equipment have? How does it help children to learn to float or to swim? What type of swimming equipment exist on the market and how is it developing?

In order to understand the functionality of different water equipment for children and it's contribution to the reduction of the drowning risk, variety of swimming equipment, water safety aids, water safety systems, concepts, swimming suits and other related products were analysed. *More detailed description of each product is provided in the appendices of this report.*

ANALYSIS and OBSERVATIONS

Water safety aids keep the body float and are used in urgent situations. They are available in different shapes for the different needs. They are not used for the ordinary children activities in the water.

Air-filled or foam toys and equipments are not safety devices like a life-jacket. Each of them has its own disadvantages. Nevertheless, these are most common equipments that are used worldwide while children spend time in the water.

Swimming equipment, that is common to use to keep the child float, provides floatation, which is mostly in a **vertical position. That is the opposite** for swimming, which is usually done in a horizontal position. Even if it lets the child to float in a horizontal way, it usually restricts learning to swim by providing **support in the incorrect body area, which leads to incorrect body position.**

Wearing swimming equipment **hampers or restricts the ability to move in the water**, so **children refuse to wear** them.

In order to teach swimming, the **smooth transition between swimming with support and swimming without support is required.** Depending on the type of the exercise or activity in the water, support for different body areas is needed. Some foam equipment is good and suitable for learning to swim.

Wearing swimming equipment at all time makes the **children become dependent of them** (e.g.: armbands). It does not let the child to feel how it is to float and swim by himself/herself that leads to fear and insecurity for the child to stay in the water without this equipment. As a result, swimming ability is not developing.

OTHER EQUIPMENT

There also exist some other types of equipment for preventing a drowning event. For example wristband for a child: when it is submerged in water, it sends signals to the main device worn by a supervisor. Wearable swimming neckband helps parents to supervise their child by monitoring his/her activity. Another option is wearing a headband, connected to parents smartphone, which keeps a track of how long the child stays submerged and sends out alerts if it takes too long time. There is also system implemented in the equipped pond that requires each swimmer to wear a headband, which sends out a signal when it is submerged longer than 20 seconds. The signal triggers warning lights posted along the waterfront in beginning flashing yellow, and after 30 seconds, the alert turns red and a siren starts going on, alerting the lifeguards when someone is in danger.

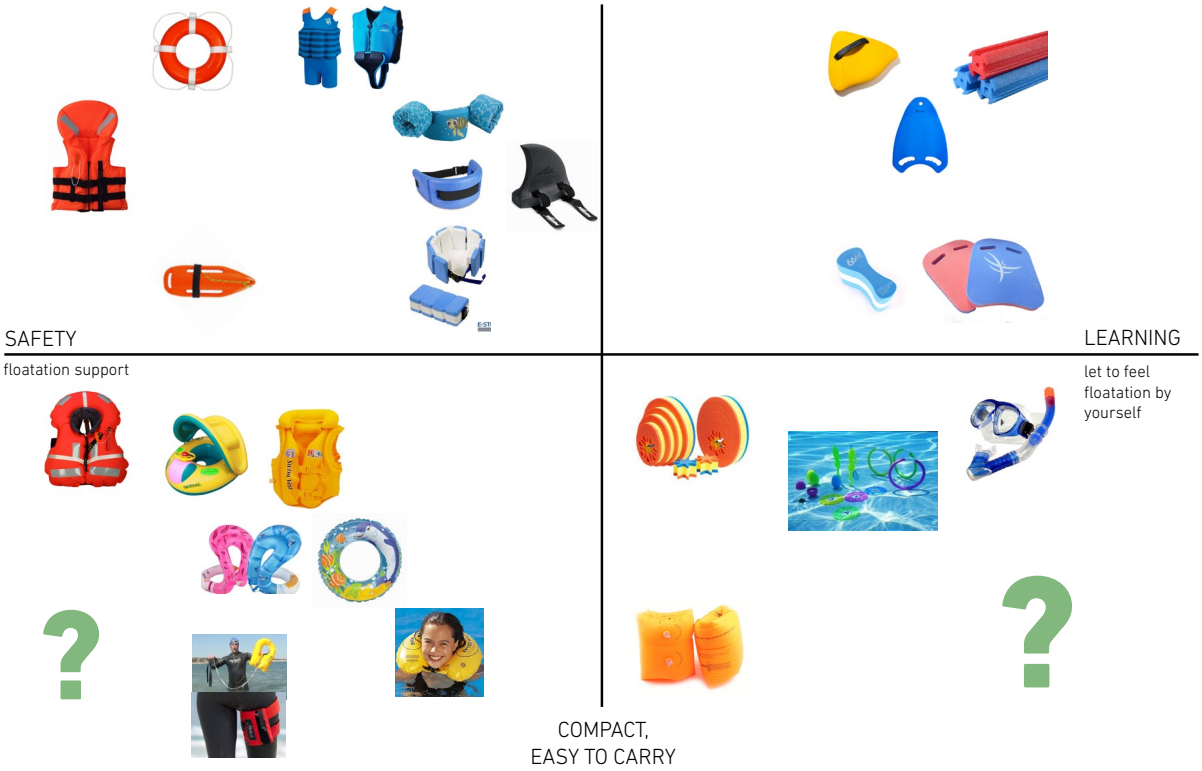
It is very pricey to equip ponds or lakes with this particular equipment. What about sea beaches where in the summer there is a lot of people? How is it possible to make this system available for more people with different social-economical state?

CONCLUSION

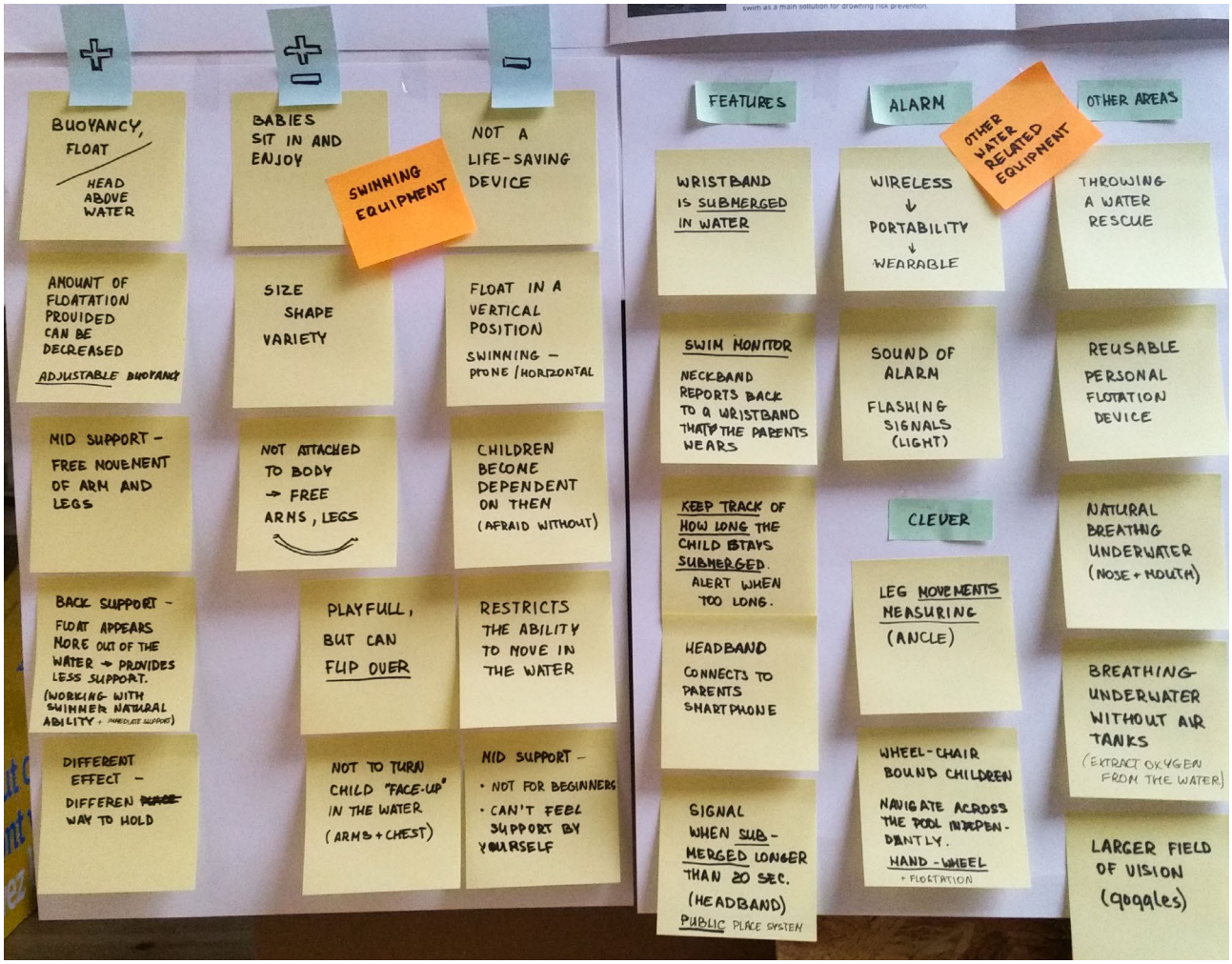
Nowadays, there is a great swimming equipment variety available on the market. Its main function is to keep the child float. Unfortunately, most of them are not suitable for children to learn to swim. There is some foam equipment that is suitable for teaching children to swim, but it is more common to use it in the swimming pool. It is common to use inflatable equipment in the natural water settings, maybe because of the low price and the compact transportability of inflatable products.

Appearing questions:
How can swimming equipment secure safety for children in the water and support him/her for learning to float and swim? Is it common to learn to swim in the swimming pools? What are the conditions for it? How can children learn to swim in natural water settings if the swimming equipment that is used is hardly suitable for learning to swim?

NEED SPACE FOR
TRANSPORTATION



COMPACT,
EASY TO CARRY



PARENTS OPINIONS AND OBSERVATIONS

In order to see the situation around the children spending time directly in the water from another perspective, I decided to talk to people who are related to it and are responsible for the children: to the parents.

In the official half-questionnaire half-interview participated 9 parents in the age 22 - 42 years old, whose children's age was 2 - 8 years. Much more people were asked some questions whose answers were taken into account as well, but were not recorded.

SUMMARY OF THE PARENTS QUESTIONNAIRE

It is common for the parents and children to spend time near the seas, lakes and rivers. Usually the selected water setting is one that is closest to living place. Swimming pools are popular too, but they are not affordable for everyone.

The common children activities are splashing, playing, jumping, diving, pouring the water and swimming.

Children of age 2 - 8 years old mostly can't float and swim. They can do it just with support. It is also common for children of older age too. Parents mostly can swim. They have learned it at the age of 8 - 11 years old or much later when became adults.

Parents agreed that it is important to learn to swim. It is good for physical strength, health, in order not to drown and it is a fun activity. Otherwise, what else to do in the water?

They also agreed that children have to be taught swimming. Parents or a swimming trainer have to describe and explain it. Parents think that the right age to start learning to swim is as early as possible.

By parents opinion, the dangers are is swallowing too much water, drowning, low supervision, depth, waves and that the child does not have a sense of danger when playing in the water.

Swimming equipment helps to keep the child over the water. Children like it. But it is still additional equipment for entertainment and is not safe. Armbands are less restricting the movement than swim jacket, which is not comfortable. Children tend to be afraid to swim without swimming equipment.

One more observation from the parents is that it is easier to learn to float when you put your face in the water, as you don't have to hold your head, but it is possible to do so just for a short time.

Questions for the parents and their answers can be found in appendices of this report.

"Children don't have a sense of danger and their care-freeness can cause problems if they don't have grown-ups watching over them."

- Marwa (age: 22), son Jacoub (2 y.o.)

"Our daughter tries to swim, but fails. We tried to teach her to swim by supporting her with the hands and slowly showing and describing her how to work with hands and feet."

- Sofia's (7 y.o.) parents

"My son will learn to swim in school in Denmark we have swimming lessons there."

- Mouna (age: 26), son Yasin (2 y.o.)

"My daughter refuses to wear the swim jacket because it is not comfortable for her and she can't move freely."

- Vitalik (age: 42), children Dasha (8 y.o.) and Elina (14 y.o.)

"I learned to swim when I was 11 years old, but I was forsed to do it. In early childhood I was put in a deep water in order to learn how to float and swim. I was affraid, so after this, I was just staying in un-deep water."

- Jelena (age: 41)

LIFE EXPERIENCE

Observations in real life situations can also bring useful insights. Because of this, I took a look at my own life experience.

I started to swim quite late and I still remember my wondering about how people can swim. Later I was participating in swimming camps and learned to swim for long distances. I know some people of different ages who can't swim and with some of them we had discussions around this topic. I also have a young brother who is 10 years old now, so I had the opportunity to observe how children spend time in the water and other related aspects.

My thinking is based on conditions in Lithuania, where I came from, and Sweden, where I am studying now. Also, studying at an international university provided me with the opportunity to talk about this topic with people from other countries.

SUMMER TIME

In northern European countries it is quite common to spend hot summer days near the lakes, seas and rivers. These are good places for BBQ, sunbathing, water activities and relaxation. In warmer countries, there is opportunity for this almost all year round. Children usually spend time with parents and play with other children in the water or close to it. There children have a broad space for their activities. Parents supervision is on a quite low level because of the broadness, their own activities and, sometimes, crowdedness.

COMMON SWIMMING EQUIPMENT

Usually children are wearing different inflatable swimming equipment. Most common are inflatable rings, armbands and vests. The main reason is to keep the child's head up the water level and float. Sometimes children find their own way to use these equipment that sometimes become dangerous, or they are refusing to wear them (e.g. running around with water-guns etc.). It is possible to buy inflatable swimming equipment in almost any place, even at some beach entrances. It is quite inexpensive and compact for transportation.

CHILDREN CAN LEARN BY THEMSELVES

It is usually difficult to describe how to learn to swim. It is common to hear: "It is like riding a bike, you have to feel it." A lot of people said it happens spontaneously and parents believe that their children can learn to swim while playing in the water with other children. But still children usually have a floatation equipment on them.

HOW PARENTS TEACH TO SWIM

Parents also try to teach children by themselves, but most of them do not know how to do it. It is common to show the legs and arms movements and let the child repeat them while the parents provide with support to a middle body part.
A more dangerous method is to put the child directly in a deeper water. There is a belief that the child will keep himself/herself floating due to survival instincts, but more often it ends with the result that the child becomes afraid of swimming instead.

SWIMMING POOLS

Parents tend to prefer the bringing children to swimming pools. Unfortunately, swimming pools are not found in all the residential areas. Beside, it is also costly.

EDUCATIONAL SYSTEM

In more developed countries, learning to swim is a part of education for primary school-age children. I think it is quite effective. At the same time there are more other countries that do not have this kind of system. *See appendices.*

SOCIAL ASPECT

Low swimming skills can have a negative effect related to the social aspect, which can also be visible through the ages. Children who can't swim can have difficulties to play with children who are good at swimming. Adults of different age, who did not learn to swim before, prefer not to show it and small part of them decide to take swimming lessons. As a result, the risk of drowning is higher for these adults and also for their children.

CONCLUSION

It can be beneficial:
- to let the parents to help their children to learn to swim while they are spending joyful time together, but it is important to provide the parents with the right information about the process;
- provide the learning to swim opportunity even for the families that have low financial resources;
- reduce the social aspect problem caused by having no developed swimming skills.

CHILDREN'S ACTIVITIES

behaviour in the water

- Floating
- Swimming
- Diving
- Splashing
- Pouring
- Playing with inflatable toys
- Using foam things
- Sitting in un-deep water
- Running
- ...

INTERVIEW WITH A SWIMMING TRAINER

In order to get a better overview of the situation in the swimming pool and a basic knowledge of teaching and learning process of the children swimming, it was useful to have an interview with a swimming trainer.

Natalija Zareckaja - the swimming trainer at Lithuanian Children and Youth Centre in Vilnius, Lithuania. She has 47 years of experience as a children swimming trainer and she gladly agreed to share her knowledge with me.

We had a conversation about the first steps for a young child towards swimming, the importance of the child not to be scared of the water and the right way of breathing. Right swimming position and feeling how it is to float by yourself appeared to be essential for the ability to swim. Danger of the existing swimming equipment and preferable equipment for teaching to swim were also discussed. It was important to observe the teaching process in the swimming pool and find out the possible dangers for the children in the water. It was useful to find out more about children's perception of swimming lessons and their understanding. The possibility to teach to swim children at the ages of 3 years old and younger and the possibility of organising lessons for adults too.

One more important area that raised additional discussions is related to the children with special needs and health problems, the benefits for them of being in the water and the possibility of developing their swimming skills.

Questions and the summary of the interview with swimming trainer can be found in appendices of this report.

"The child knows that bottom exists, but he/she has to be prepared that suddenly it can disappear. There will be nothing to stand on and to hold on."

"It is important that the learning process is interesting for the child and attracts his/her attention."

"If something happens unexpectedly, the child must not to be afraid to go under the water or dive, because the water will bring him up."

"The swimming equipments such as a swim belts do not provide the right swimming position. The child has to feel the support by himself/herself and to lay in the water like in the bed."

MAIN TIPS:

First introduction contact with the water can be to sit and splash the water with feet. The splashing water on each other can help to avoid fear of the water.

For the very young beginners it is important to put the face down in the water, open the eyes (goggles can be used) and take a look. The child must not to be afraid to do this.

The child has to learn not to bend the knees, but move with straight legs. He/she can practice it laying on the back or on the chest.

When the child learns to move the arms, in the beginning the support can be provided for both arms like with a foam float. Next, the child can have the float on one hand and move with the other one. Then to change it from one hand to another. Then the support can be reduced until not needed at all.

IDENTIFICATION

Risk factors, problematic
areas, analysis, first ideas

IDENTIFICATION

The first part of the research helped to identify different aspects, problems, needs and risk factors related to child drowning issue. Based on this, several areas were selected for further analysis, brainstorming of the first ideas and additional research.

UNEXPECTED
DEPTH CHANGES

BREATHING
UNDER WATER

NO DEPENDENCE
ON THE SWIMMING
EQUIPMENT

RIGHT BODY POSITION
+
SMOOTH TRANSITION BETWEEN
SWIMMING WITH SUPPORT TO
SWIMMING WITHOUT SUPPORT

MOVING WATER
WAVES, STREAMS,
CURRENTS

SWIMMING EQUIPMENT

SAFETY ASPECT

NO MOVEMENT RESTRICTION

CHILDREN WITH SPECIAL NEEDS

HEALTH CONDITIONS OR IMPAIRMENTS

WATER ACTIVITIES
TEACHING & LEARNING

LEARN AS EARLY AS
POSSIBLE

- INFANTS AND PARENTS
(SUPPORT EQUIPMENT)
surviving swimming lessons

- KIDS - BEGINNERS
first steps - keeping the face in the water without being afraid of it while breathing.

SWIMMING EQUIPMENTS
SAFETY WITH NO MOVEMENTS RESTRICTION

Children enjoy to spend time in the water and it is important that swimming equipment can keep the child safe. Comfortability also plays a role, especially taking into account the variety of children activities in the water. If swimming equipment restricts the child's movements and does not let to behave freely, the more the child will tend to refuse to use this equipment.

Besides, there can be explored various materials to use. For example, cork has a great buoyancy characteristics, is environmental friendly and hypo-allergenic, so it can replace existing foam products.

There are more aspects that can be related to safety and comfortability of the children's swimming equipment that are going to be discussed further.

UNEXPECTED DEPTH CHANGES
IN THE NATURAL WATER SETTINGS

The conditions in the natural water settings are not well known by people. Natural water settings are usually very broad spaces that makes it difficult to know them well, the level of the supervision is low and the turbid water and sand makes it difficult to see and be aware of the **depth level of the bottom**. Children usually don't consider a hidden danger, especially during exiting activities and playing. In my opinion, there is one more very important aspect - **the child's hight**. A place that is not deep for one can be too deep for another. The perception of depth is not developed in children, so it is common to think if a friend can stand there, then it will be good for me too.

DANGER ASPECTS

One of the common things to happen while spending time in a water setting is when the child can't reach the bottom. It usually happens unexpectedly. The child becomes scared, which leads to lose of coordination, uncontrolled movements, changing in breathing rhythm that dramatically increases the risk of drowning. It is especially dangerous for non-swimmers who can't float by themselves. It is hard to get back to the safe zone. Tiredness can also have influence. Experiencing panic can arouse the fear to swim that will lead to a higher risk of drowning.

WHAT CAN BE HELPFUL?

- DEPTH MEASURING

What if we can be aware of the depth changes? What if depth can be measured and the person's height would be taken into account too? What

if the compact portable personal devices could measure the depth and inform or alert the child about possible changes and dangers. Maybe even recognise the child's body position and location in the water, directing him/her away from the deep water levels according to his/her height. Informing the parents may also be implemented.

In order to measure particular depth areas, there were examined some possible scenarios, functionality and available technologies. Places to wear the device, signal informativeness, reaction to alert, unexpectedness aspect, underwater functioning conditions and more other aspects were taken into account too.

The aspect of playfulness can also be added by using collected information about the bottom of the water setting for a playfulness purpose (e.g.: application = play, discover, share). The game may include categories like: exploration, stay in the safe zone, points collection, receiving bonuses, sharing with friends and the possibility to play with different characters.

Technology research let to find out a principle of sonar, it's development and implementations.
For more information see appendices of this report.
Existing compact portable devices for personal fishing (which includes bottom structure scanning, fish localization detection and transmitting information to a smartphone) let to presume that this technology can be implemented for reducing of the drowning risk related to unexpected depth changes. There is a possibility to integrate this technology to the wristband, the neckband, swim float etc., but the user behaviour may create a problem related to signal transmission, that may need a further technology development.

Creating of a global depth database (e.g. "Google Elevation", related to topographical maps) is also an option, but very detailed measurements from 0 to 2 meters, from water surface to the bottom, can be a problem.

- SAFETY SWIMMING EQUIPMENT

The simplest and common way not to be affected by depth changes is to stay floating. The variety of swimming equipment is based on this principal. It is less likely for people to wear this equipment all their life and sometimes children are also refusing to wear it. What to do in this case? Developing of good swimming skills can be an option.
More detailed exploration and analysis of this area will be presented further in this report.

- EQUIPMENT FOR SWIMMING AREAS

Creating of more safety conditions in the natural water setting areas is also an option. Different equipment or systems can be created:
- special areas can be equipped with depth measuring devices and people can use this information on their personal devices;
- separating swimming areas by depth level;
- constructions that will let to hold to and have a safe rest etc.
Broader discussions will be presented further in this report.

MOVING WATER
WAVES, STREAMS, CURRENTS

Moving waters is an uncontrolled phenomenon caused by nature. It is important to be careful in these places.

Possibly, products that can create the force against river streams, products that can help to keep orientation while being under the sea wave, or products related to the face protection that help to continue seeing and breathing under the water can be helpful.

Another option is to arrange special places or separate areas where water movements will be controlled or to install constructions to hold on to and not be taken away by the stream.

BREATHING UNDER THE WATER

The loose of coordination and floatation can happen in the water unexpectedly, mostly frightening the child, which leads to the uncontrolled movements, change in breathing rhythm and submerging into the water. Providing the child with air to breath in dangerous situations under the water can reduce the risk of drowning.

Breathing under the water can also be used during the beginning of learning to float and swim. When the face is submerged into the water it is much easier to keep the body float, so breathing in the water provides more time for practicing and concentrating on the feeling of the right body position and feeling the floatation. It can also prolong the time of the playful diving that helps to train the right body movements.

At the same time, breathing under the water can have disadvantages related to learning to swim, as it is not supporting the right breathing rhythm and the way to do it.

Technology and product research helped to find out some concepts like snorkelling mask, which supports normal way of breathing (but there is a difference in breathing while swimming). Scuba mask extracts oxygen from the water and delivers breathable air directly into their wearer's lungs. Another related one is the "aquaman crystal" which is a crystalline material that can bind and store oxygen in high concentrations. The stored oxygen can be released again when it is needed by gently heating the material or subjecting it to low oxygen pressures (the material can draw oxygen from the water as from the air).
For more information see appendices of this report.

Breathing under the water is an interesting and a bit fantastic idea that can result in a concept development. As it was stated from the beginning, I prefer to focus on a more real product. Also I can see some disadvantages related to the right breathing during swimming and importance of swimming without equipment, so there is no strong reasons for me to continue working on this area.

CONDITIONS FOR THE WATER ACTIVITIES

NATURAL WATER SETTINGS

This theme is mainly related to planning of this type area and improving conditions of the public natural water settings. It can contain man-made structures on the bottom, separating swimming and non-swimming areas, creating zones for different purposes (e.g.: depth level, learning zone, fast swimming zone, water playground, etc.), equipping area with special constructions (for holding, resting, learning swimming, playing, etc.), implementing of the control system that can increase the level of supervision of each person on particular territory, provide useful information, and place with swimming equipment for different purposes.

The difficulties are that it is a large system with many different parts and aspects, which requires development in different areas. It is also costly to implement all the things and it is closer to impossibility to install that system in every natural water setting. As a result, I see it as not a very efficient way to reduce the drowning risk.

SUPERVISION

Supervision is very important while the child spends time in the water. It is much more easier to follow a child in the swimming pool, but it is more difficult to do it in the natural water settings because of the broadness, crowdedness and the supervision.

Depending on the situation it can be important:
- not to let the child to get to the water;
- supervise the child's behaviour while he /she is in the water;
- to find the child's location in crowded places (e,g,: beach);
- to control the movements during learning to swim.

To increase supervision level it can be useful:
- to have a wearable device on the child that will be wireless and connected to parent's device. It is important to think about a place to wear it, possible settings (sensitivity levels of the sensors and location determination, easy to understand information for the child and for the parents, interface, type of the alarm, signal transmission, possibility of talking and hearing between parents and child). Already existing tracking child location devices can be used as a background. *For more information see appendices of this report.*
- to increase the parent's interest in following their child's' behaviour, which can be done on a distance or while spending time with the child in the water by having a common activity.
- to increase the visibility of the child in the water and in the crowd. Personalisation of the object can be an option.

SWIMWEAR

What if swimwear can contribute to preventing drowning risk? It can also provide a floatation support (with possibility of changing the amount of the support provided), or have a life safety function (to provide a support just when it is needed).

There are already on the market swimsuits and swimvests with removable foam blocks, that keep the child float, but it seems that they may hamper child's' movements and they are not compact for taking them with you.

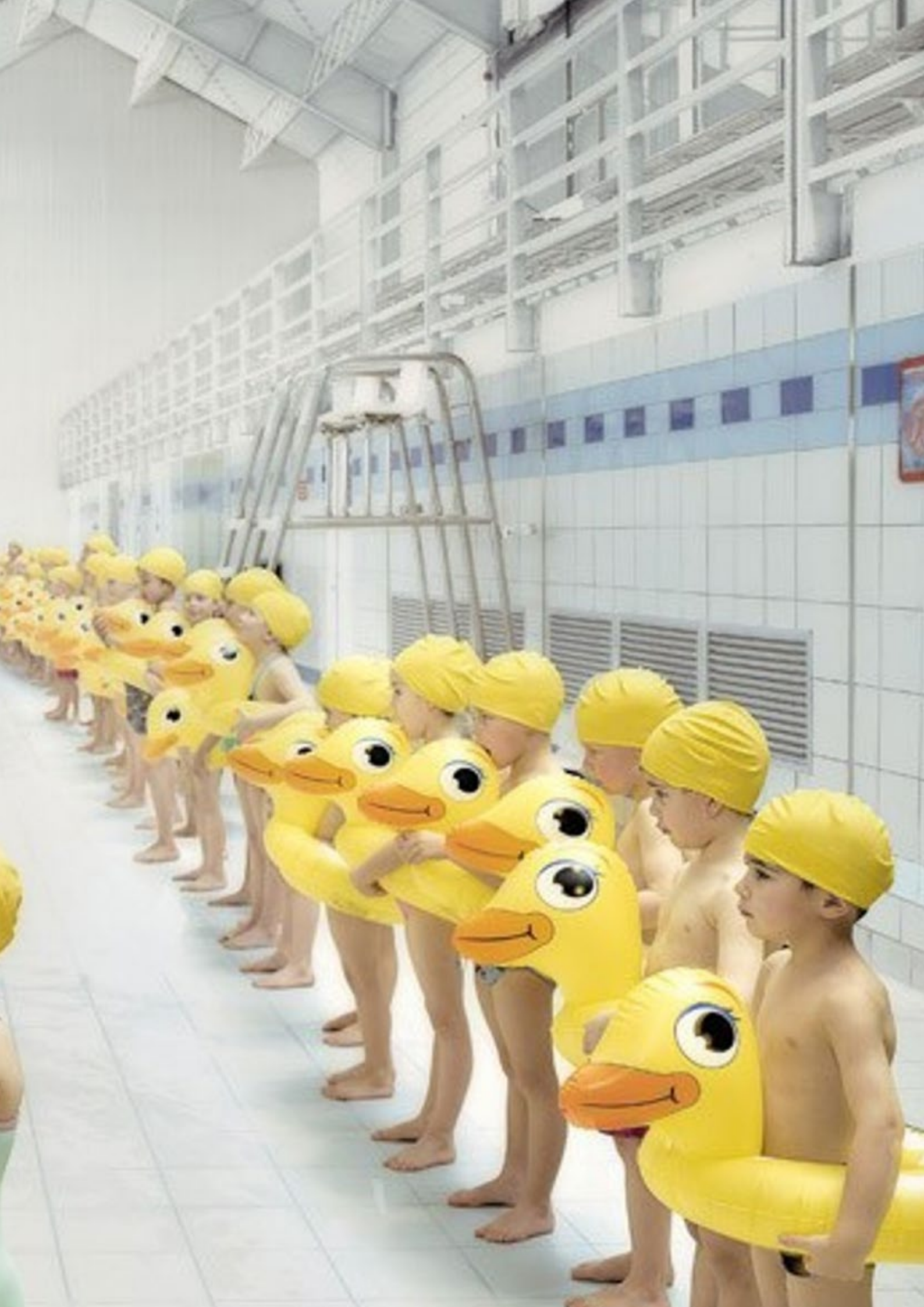
Sometimes people are swimming with clothes on and the reasons for this are for protection from the sunburn or religious aspects. In countries with colder climate water temperature in outdoor water settings can create a limitations for swimming. There can be a close relation between the swimwear and these two factors.

Swimwear research showed that there exists a variety of swimwear fabrics for different purposes: high-tech fabrics (increase the swimmer's glide through the water), thermocules (a microencapsulated phase change materials that are incorporated into fabrics and fibres for absorbing, storing, and releasing excess heat), wetsuits made from neoprene (offer a total sun block as well as protection from cooler water or the wind while on the beach) and swimwear that keeps the person dry,made from a material that is impossible to get wet. There is already in the development stage a concept of wireless smart suit that allows monitoring of the individual biometric data, such as heart rate, movement and temperature of the body and the water temperature.
For more information see appendices of this report.

There is a possibility to look for an additional function for the children's swimwear.

TEACHING & LEARNING

The research and analysis of the existing situation and swimming equipment for children let me wonder about children's swimming ability, conditions for learning to swim and the teaching process. It was found out that drowning risk can be reduced by teaching the children basic swimming and water safety skills. Based on that, there were identified some aspects that can be important to take into account.



INSTRUCTIONS FOR PARENTS

Usually parents have not enough knowledge about how to teach their child to float and swim, how to start, what equipment to use, how to explain. It can be useful to provide the parents with this information and let them to teach their child by themselves, but also to spend a nice time together.

The options can be:
- the device providing instructions for parents and cartoons for children which can be used when being in the water. It can be a wearable device or a part of the swimming equipment that can be used in the teaching process;
- something that creates a playful learning process;
- providing beginners with confidence in the water. It can be related to immersing face into the water, breathing and diving;
- a mobile application with swimming instructions and knowledge sharing;
- control of the child's body movements by taking measurements and giving individual advices.

THE CHILD HAS TO LISTEN AND THE PARENTS HAVE TO BE HEARD BY THE CHILD.

An wearable device's function related to improving communication between the child and the parent can be an option.

LEARN TO SWIM AS EARLY AS POSSIBLE

Babies' activities in the water is a completely different process than for other children.
For INFANTS AND PARENTS a special support equipment can be helpful in order to give more freedom of movement for parents and keep the child safe. For KIDS - BEGINNERS the first steps like immersing face into the water and not being afraid of it, and breathing process can be important. Surviving swimming lessons can also be an option. Playfulness created by diving toys can be helpful for swimming movements practice and provide more confidence in the water.

THE CHILD LEARNS BY HIMSELF OR TOGETHER WITH SOME FRIENDS

There is an option for the child to learn to swim while playing it the water with friends. A playful process and exciting activities can rise an interest for it. It can work for a bit older children, but if you are concentrating on teaching children to swim in early age, this learning method will have no sense for the younger ones.

Swimming toy can have a combination of playfulness and learning. Aspects as activity instructions, keeping the right body position, no dependence on the toy and safety can be taken into account too.

Different ways to use swimming equipment can create a possibility for different types of exercising or activity.

Transformation or combination of various parts of the product can also be used. It can help to make swimming equipment still useful and interesting even when the child already learned how to swim.

Diving for children is also an option. It is one of the parts for the learning to swim process. In a swimming pool, the variety of special toys is used for it, but in the natural water settings there are very low visibility conditions. The use of light or other options can increase visibility of the toy. Wearable wristband can help to find the toy at the bottom. After some time the toy can rise up if not found. The toy should be easy to recognise, easy to grab and easy to hold several of them at the same time. Moving water can take the toy to a deeper place which can be dangerous. It can be a game for children to find the toy and be like a spy following the radar information on the wristband. It can also help to find a way to the place were the parents are staying (duo to crowdedness or distance from the water).

NO DEPENDENCE ON THE SWIMMING EQUIPMENT

It is important to have a RIGHT BODY POSITION while swimming and floating, otherwise it is impossible to do this. The child has to feel how it is to float by himself/herself and learn to keep the right body position.

A SMOOTH TRANSITION between swimming with support to swimming without support is important. The dependence on the swimming equipment has to be prevented. It can be done step by step that the child will not be scared and afraid to swim without equipment. In order to learn to swim, the swimming equipment finally has to be left out. Swimming equipment for different types of exercise can be an option.

MOVING WATER

It can be beneficial to learn to swim in natural water settings, since here the water behaviour is different from the swimming pool's. Sometimes children are afraid to swim in the moving water even if they can swim in a swimming pool.

CONTROL OF BODY MOVEMENTS

(swimsuit, smart textile, armband, etc.)

Nowadays, different health tracking devices became quite popular. Same principal can be used for making swimming teaching process more efficient. Collecting data related to breathing, legs and arms movements, body position and receiving information analysis can help to make useful advices personally for each swimmer. That can improve the learning process and be useful, especially, for people with special needs.

CHILDREN WITH SPECIAL NEEDS

HEALTH CONDITIONS OR IMPAIRMENTS

WATER ACTIVITIES / TEACHING & LEARNING

Depending on the health conditions a special type of water activities, safety equipment and teaching process can be required.

There are different types of the limitations related to:

1. Physical disability (e.g. limitations to dexterity or mobility);

2. Sensory impairment (e.g. visual, hearing);

3. Mental health difficulties;

4. Chronic illness (e.g. asthma, epilepsy, diabetes);

5. Medical conditions, which may cause pain or other symptoms that affect studies (e.g. side effects of treatment, poor attention span, poor concentration), Aspergers Syndrome/Autism Spectrum Disorder;

6. Specific learning difficulties (e.g. dyslexia, dyspraxia);

7. Any other condition which has a significant effect on the ability to study.

In order to develop a product for one of these categories a deep and detailed knowledge in this area and additional research is needed.

Since I am concentrating on the global problem of the high children drowning risk, it has more sense to concentrate on an ordinary child group facing the problem of the drowning risk more often.




TOPIC IN DETAIL

Selection of the area & Demarcations

TOPIC IN DETAIL

The analysis of the identified areas, discussions and first ideas helped to select a field for further development and narrowed down the topic. The selection was based on the possibility to provide useful contribution to the problem, develop a real product with opportunity to be implemented in the nearest future and my own interest.

SWIMMING IS LIFE

THERE IS AN OPPORTUNITY TO REDUCE DROWNING RISK FOR CHILDREN BY TEACHING THEM TO SWIM AND PROVIDE SAFETY IN NATURAL WATER SETTINGS.

USER:

CHILDREN AGE 4-14 AND THEIR PARENTS

Mainly oriented to low- and middle- income families. Based on the situation and conditions in European countries where swimming lessons are NOT a compulsory part of the educational curriculum. There can be a possibility to fulfil user's needs in other places around the world.

OVERVIEW

What could be better for children during the hot summer time than having fun in the natural water settings? Spending time in nature is also attractive and relaxing for the parents too. As a result, it is very **common to spend time close to lakes, seas etc.**, if there are suitable weather conditions.

Unfortunately, there is a **high drowning risk for children** in natural water settings. One of the main reason is the lack of swimming skills, which makes surrounding factors more dangerous than they are. Another one is supervision.

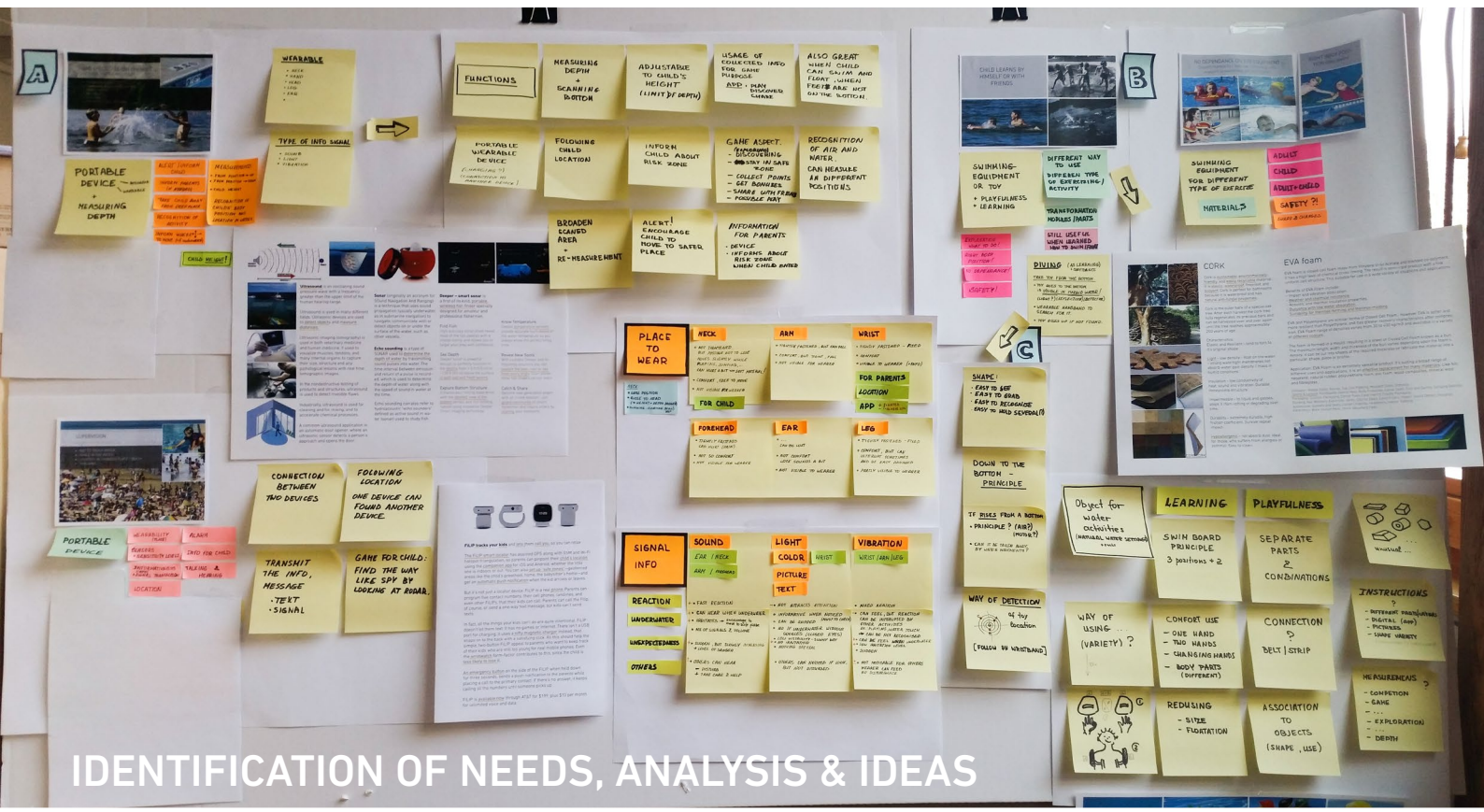
It is important to **keep the child safe and confident** in the turbid and moving water of natural water settings, which is differs from the conditions in the swimming pools. Children are mobile and curious, but don't understand the dangers of water. **Unexpected depth change** scares the child and leads to uncontrolled movements. It is also important to take **the child's height** into account, because on it depends the individual **perception of a deep place.**

Helping children to learn to swim in the natural water settings can be beneficial. Swimming itself promotes health and a brain development for the growing child. If the child learns to swim earlier he/she becomes healthier, gets more **experienced in swimming, be less limited socially** and enjoys exciting for him/her activity.

There is also a possibility for the **parents and children** to **spend more time together**, so the learning to swim process can be seen as an interesting and attractive activity for the whole family. As a result, it can help significantly to **increase the level of supervision**.

POSSIBLE RESULT

There is a need for swimming equipment for children that can keep a child safe in the water (e.g. keep the child float with the head above the water) and also support the process of learning to swim. It is important that the equipment will not hamper the child's movements, providing right body position for swimming and not raise a dependence on the equipment. The variation of swimming exercises and the way to provide the parents with knowledge for helping the child to learn to swim have to be taken into account too. Equipment transportability aspect is also relevant.



IDENTIFICATION OF NEEDS, ANALYSIS & IDEAS

DESIGN PROCESS

Product development & Experiments

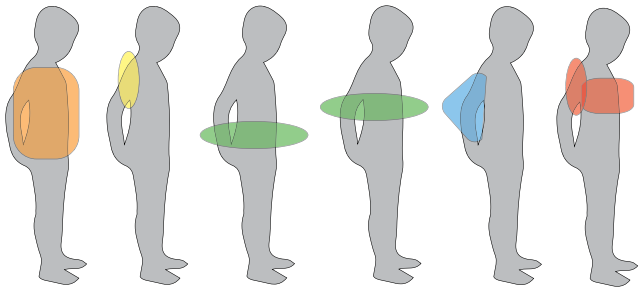
FLOATATION ANALYSIS OF THE SWIMMING EQUIPMENT

A very common and simple way to protect the child from sudden depth / drop-off is to keep the child float. It works for children of different heights.

That makes it important to take a more detailed look at the most common swimming equipments used in the natural water settings and how floatation support affects body position. For this purpose there were chosen: swim jacket, arm floats, swim ring, back float, floatation piece around the arms and chest. A swim float was selected in order to understand the body's position during learning to swim and the possible variations of its usage.

This analysis had shown a possibility to develop swimming equipment for the upper part of the back and shoulders area. Placed on the upper body part, the equipment has minimum interference for different movements, so the child can run around freely. It can help to keep the child's head above the water if sudden depth changes occur. The more skilled a child becomes in swimming, the more the equipment rises above the water, providing less and less floatation support.

POSITION OF THE SWIMMING EQUIPMENT WHILE STANDING:



CATEGORIES OF EXISTING SWIMMING EQUIPMENT AND AIDS:

SAFETY

FOAM

INFLATABLE

PLASTIC

BREATHING

TEACHING

SUPERVISION

SWIMWEAR

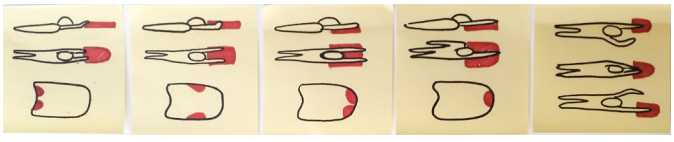
SPECIAL NEEDS

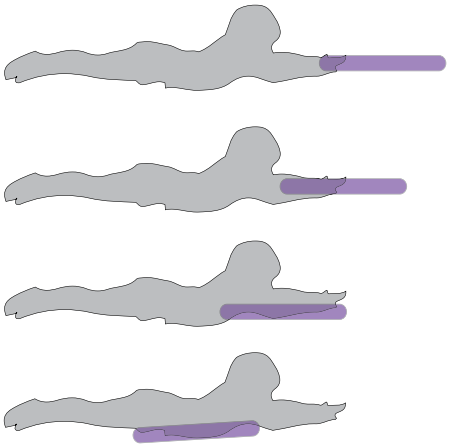
FLOATING

PLAYING

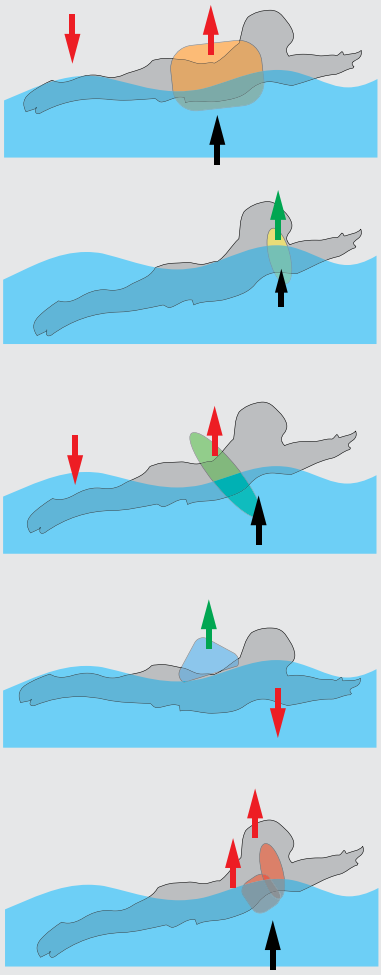
OTHER

SWIM FLOAT HOLDING POSITIONS:

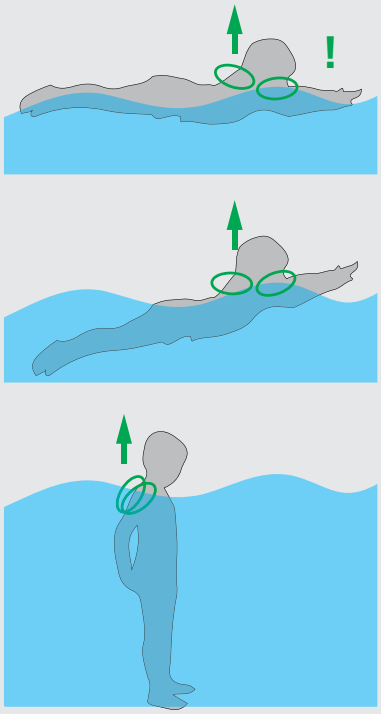




BUOYANCY AND BODY POSITION:



HYPOTHESIS AND IDEAS:



THE SWIM BACKPACK

I am considering developing a product similar to a small backpack that provides floatation. It can be a combination of two parts; where one of them could be used for learning to swim like a swim float. In addition, the swim float can be used as playful object for protection from water splashes in the water or during playing with the water-gun for example. There can also be a possibility to connect a water-gun or other toys to the swimming equipment while they are not in use.

PLAYFULNESS & TRANSFORMATION

Transformable equipment for different needs can also be an option. It can be based on the modular system that can provide a playfulness aspect like building new shapes. It also creates a possibility for children with the same equipment to play together by combining different parts of the product, which can lead to a new type of water activity.

No restriction of movements

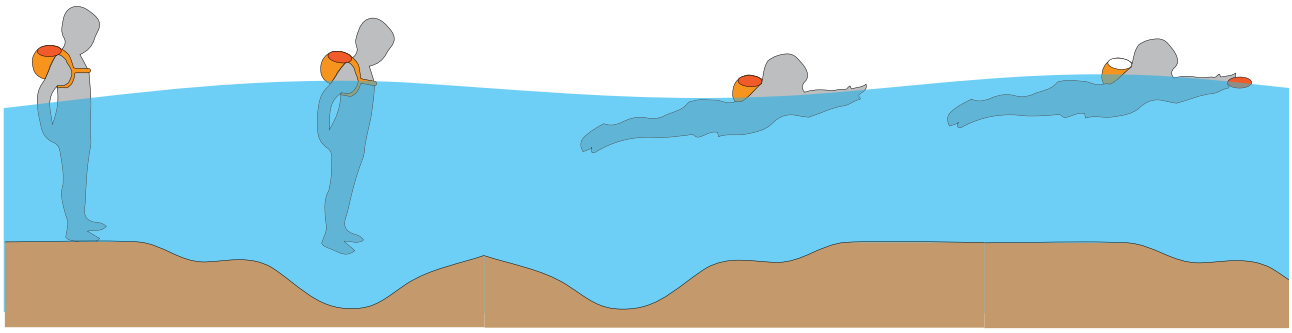
Unexpected depth - keeps floating (head up)

Right body position

Low dependence on swimming equipment

Arm float

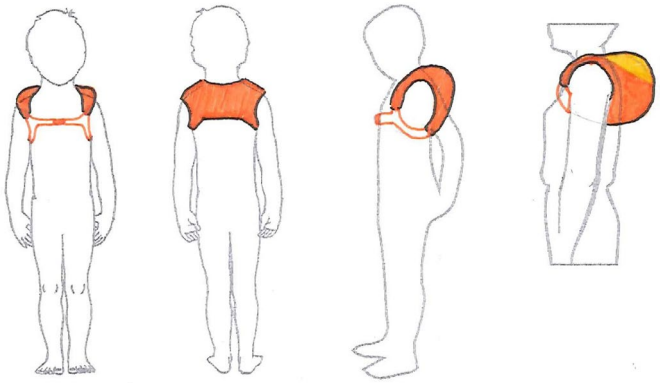
Learning to swim: body, legs, arms

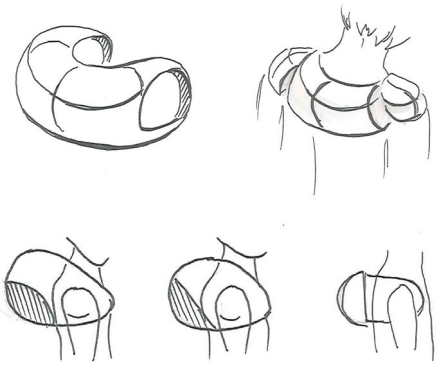


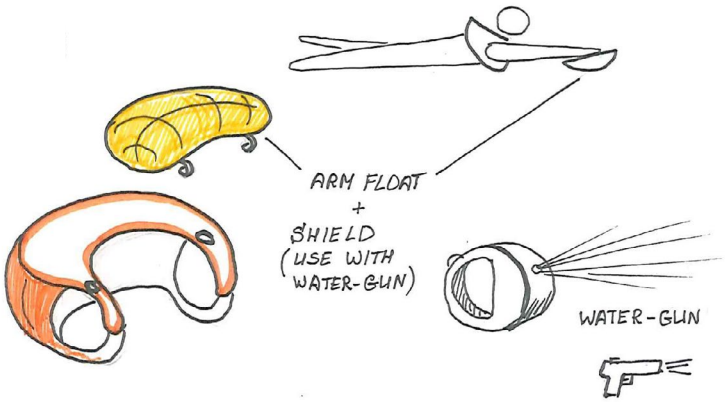
Visual aspect
backpack / character

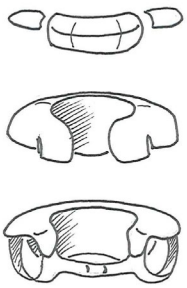
Transportation
inflatable

Playfulness
(water protection shield, place for water-gun etc.)

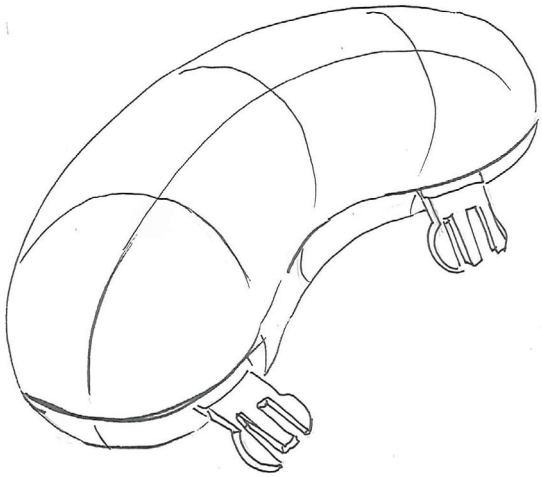


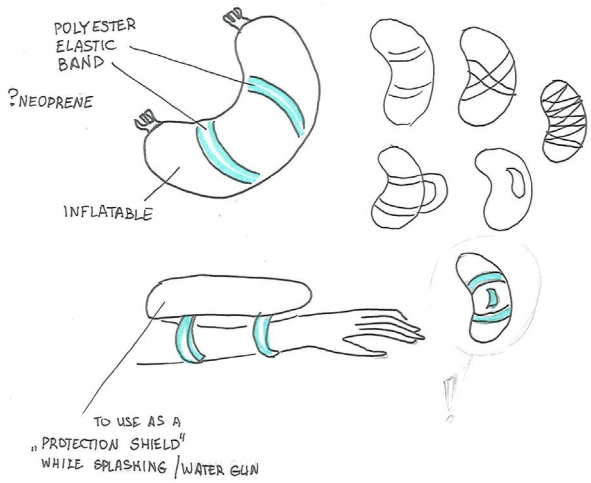


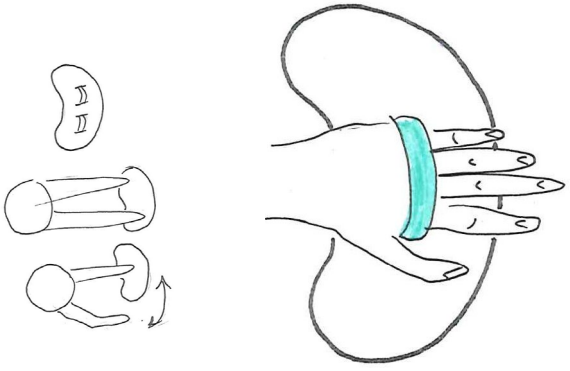


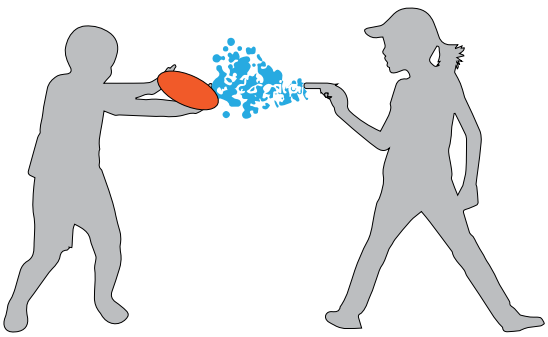


- UNEXPECTED DEPTH
  → KEEP FLOATING HEAD UP
- RIGHT BODY POSITION FOR SWIMMING + LEARNING
- LOW DEPENDANCE ON SWIMMING EQUIPMENT
- LEARNING SWIMMING
  - BODY POSITION
  - LEGS
  - ARMS
- PLAYFULNESS
- NO MOVENENT RESTRICTION (NO NEED TO LEAVE EQUIPMENT) GO BACK AND FORTH
- TRANSPORTATION INFLATABLE ?
- VISUAL









BUOYANCY

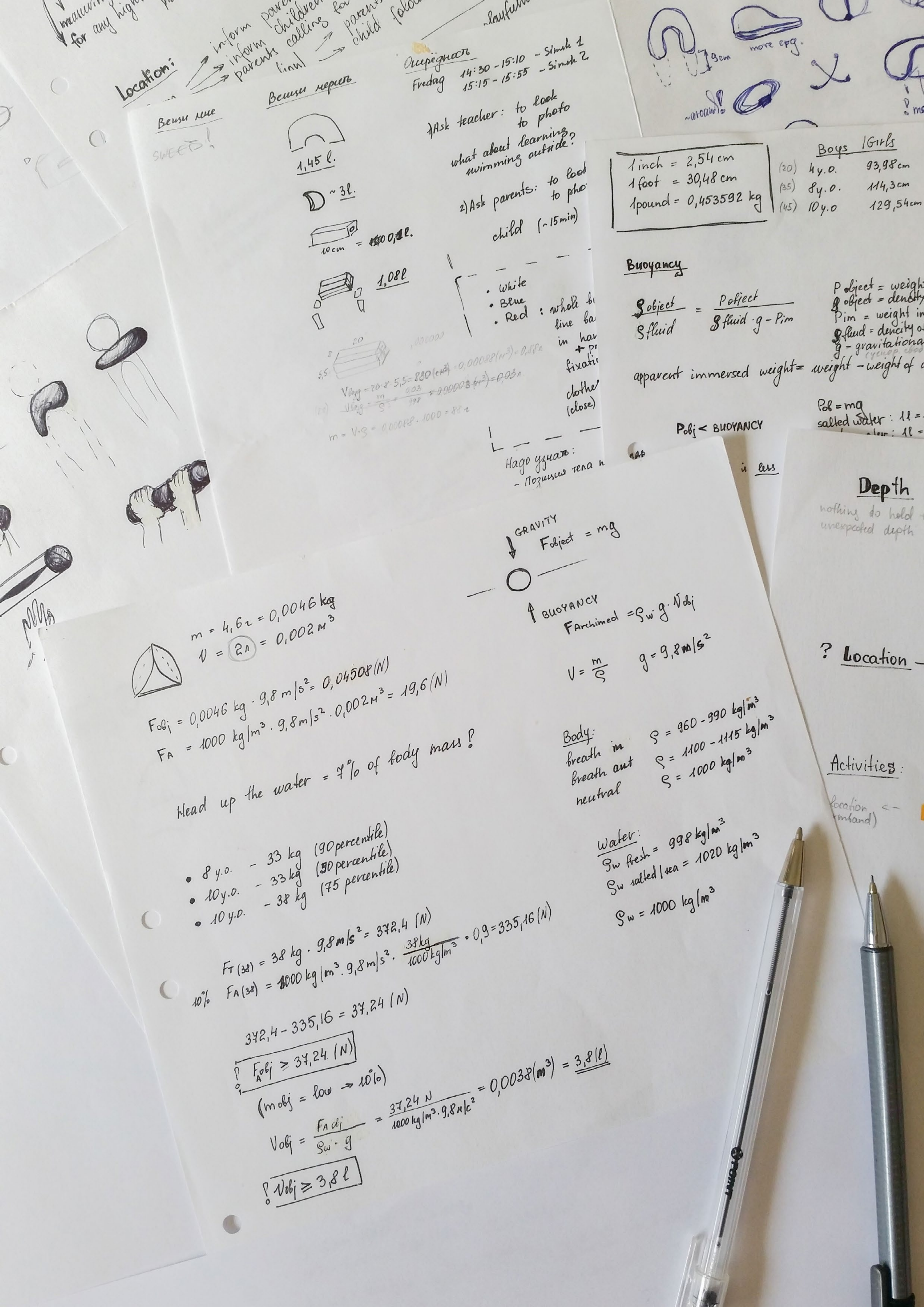
Everyone has his own natural level of buoyancy that keeps body float in the water. For the beginners it is difficult to feel buoyant because of the incorrect type of movements and breathing rhythm. Keeping specific body parts above the water (e.g.: the head for breathing) reduces buoyancy force and more effort is required to float. As a result, different swimming equipments are used to increase the buoyancy force.

In order to find out how much buoyancy is provided for the child by the swimming equipment, the experiment was done with the inflatable arm floats. It is usually enough to have just them to keep the child's head and shoulders above the water. Submerged in the water, one arm-float displaces 2 litres of water. That let to assume that if an object displace 4 litters of water it will be absolutely enough to keep a child (at the age of 4-12 years old, with the weight up to 50 kg) float with the head above the water or even more.

In order to verify these findings, data from the children's "weight by age" charts was used to count the required amount of buoyancy. The Archimedes' principle was used as a base for counting the amount of buoyancy that is needed. It states: "Any object, wholly or partially immersed in a fluid, is buoyed up by a force equal to the weight of the fluid displaced by the object."— Archimedes of Syracuse.

For this purpose it was also discovered that the head mass takes the 7% of body mass, so it has to be taken into account if we want to keep the child float with the head above the water. Because of the existence of influence caused by different factors, there can occur an error in counting. To be more sure and secured, I decided that 10% of body mass has to be kept floating by swimming equipment. In saltier water it is easier to float than in fresh water because of the difference in their density. For a better result, the density of the fresh water was used for counting.

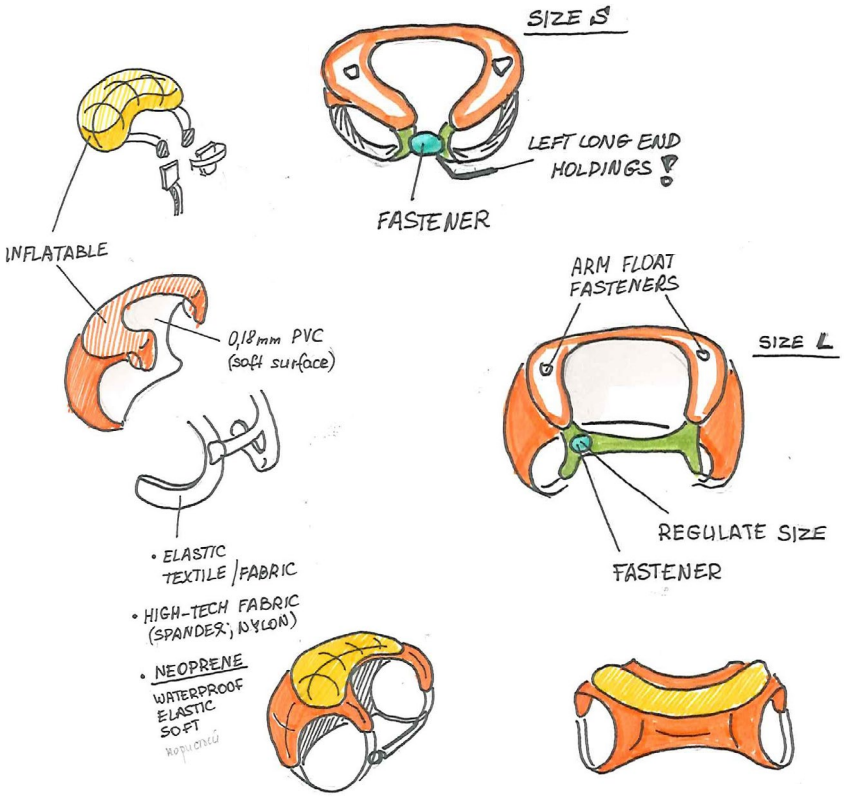
It was found out that for a child who is 10 years old and weights 38 kg, the additional amount of buoyancy that has to be provided in order to keep the child's head (and possibly shoulders) above the water has to be higher than 3,8 litres.


Location:
Boys / Girls
1 inch = 2,54 cm
1 foot = 30,48 cm
1 pound = 0,453592 kg
Buoyancy
apparent immersed weight = weight − weight of
Depth
Location
Activities
GRAVITY
F object = mg
BUOYANCY
F Archimed = ρw · g · V obj
V = m / ρ
g = 9,8 m/s²
m = 4,6 г = 0,0046 kg
V = 2л = 0,002 м³
F obj = 0,0046 kg · 9,8 m/s² = 0,04508 (N)
F A = 1000 kg/m³ · 9,8 m/s² · 0,002 м³ = 19,6 (N)
Head up the water = 7% of body mass!
Body:
breath in ρ = 960 - 990 kg/m³
breath out ρ = 1100 - 1115 kg/m³
neutral ρ = 1000 kg/m³
Water:
ρw fresh = 998 kg/m³
ρw salted/sea = 1020 kg/m³
ρw = 1000 kg/m³
8 y.o. - 33 kg (90 percentile)
10 y.o. - 33 kg (50 percentile)
10 y.o. - 38 kg (75 percentile)
F T (38) = 38 kg · 9,8 m/s² = 372,4 (N)
10% F A (38) = 1000 kg/m³ · 9,8 m/s² · 38kg / 1000 kg/m³ · 0,9 = 335,16 (N)
372,4 − 335,16 = 37,24 (N)
F A obj ≥ 37,24 (N)
(m obj = low → 10%)
V obj = F A obj / ρw · g = 37,24 N / 1000 kg/m³ · 9,8 m/c² = 0,0038 (m³) = 3,8 (l)
V obj ≥ 3,8 l

SIZE

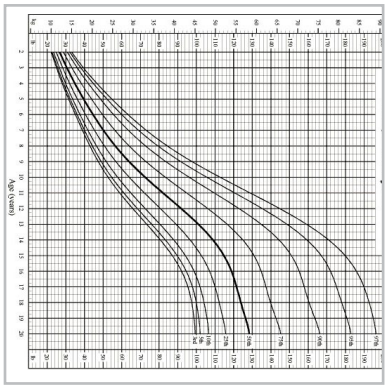
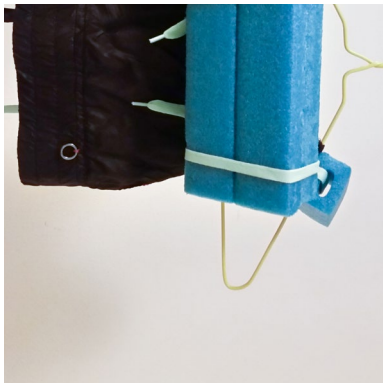
For further development, there appeared a need for finding the child's upper body part's measurements. Based on the child's "height by age" charts, the sewing patterns of the vest were selected from Burda sewing magazine. Comparing the smaller and larger sizes measurements, let to make changes in the pattern in order to obtain a more universal size. Then it was suggested a connection that will allow size adjustments.

In order to check the findings and hypothesis, first mock-ups were made and an experiment was conducted.



FLOATATION BACKPACK PATTERN / SIZE






EXPERIMENT

The first mock-ups were created to visualise my ideas in three-dimensional space and raise discussions around them. It was important to think about the object's position on the body, size and shape, as well as the places were the support may be needed, possible connections and transformation aspects.

Buoyancy level of different materials was checked in order to find out the amount of each material needed to provide enough floatation. As a result, it was found out that air-filled objects provides more buoyancy by using less space. This aspect is useful in order to make a compact product that can be easy to transport when taken to different water settings.

The idea of the possibility of the size changing was tested with the help of the mock-up on different children that had different body proportions, depending on their height and age. Applying the principle of changing the size had shown great results during testing.

The possibility of the connection of additional parts, like arm float, was analysed too. It was checked the ability of the child to connect and disconnect it. In account it was also taken the position of the connections, the possibility to reach the places where the part is connected and the type of connections itself. It was working, but during further development, this option was excluded, because it did not seem necessary.

It was also checked that the object on the upper body part will not hamper the child's movements. It is useful when the depth occurs (it keeps the child float with the head up, but unfortunately the mock-up did not provide enough buoyancy, so the child's head was half above the water level). It worked for the horizontal swimming position in a way that the object stayed above the water and provided less floatation. If the child can't hold his/her body in the right position, then more floatation support was provided by the object's immersion in the water. As a result, the better e child's body position is, the less floatation is provided. The object's placement on the very upper body part allows the child to move other body parts freely, so that he/she can feel and control the position of the body.

Even various ways of holding the object in the hand for learning exercises and playing were checked.

The discussion was risen around the area of the distinguishing of the floatation and learning functions of the object.
See further in the report.

LEARN & PLAY

EXPERIMENT

CONNECTION

VISIT TO THE SWIM LESSON

Various ways of teaching children to swim were discussed with the swimming trainer in the beginning of the research process. The information from different books, articles and videos of swimming lessons was taken into account too. In order to see in real life how it is actually happening, a visit to the swimming lesson at the swimming pool was organised.

It was chosen to visit some swimming lessons for children that took part at the Delphinen swimming pool in Lund, organised by swimclub SK Poseidon in Sweden. The beginners group was selected for the main observations and the second level group for discovering additional aspects related to further learning process.

TALK TO THE SWIMMING TRAINER

Jill Lundström, child swimming trainer at the SK Poseidon swimclub, friendly welcomed me. Swimming became a part of her life since she was 5 years old. That brought her a broad knowledge and experience in this particular area.

We talked about aspects related to the ability of the children to learn to swim and she also showed me a teaching program that she is following and explained the usefulness of each swimming exercise. I was allowed to watch both swimming lessons and got permission from the parents and the trainer to take photos for my own research process.

SWIMMING LESSONS

In the beginners group there were 6 children age 7 to 9 years old. They started from having absolutely no skills to swim and this was their tenth lesson. From my point of view, they were quite successful in learning, as the result that I saw was better than I expected. They were using swimming equipment that is suitable for the teaching process. In some exercises they were able to swim without equipment, but just for a short distance and taking short breaks. The lesson included warming-up, different exercises for the front swim and back swim, diving for collecting toys from the bottom and jumping in the water.

In a bit more advanced group there were 5 children age 9 to 12 years old. They were able to swim for a short distances without swim-floats and without stops. They were practicing for improving these movements and for swimming longer distances. Depth aspect was also introduced to them.

The small amount of children in the group provided a possibility for the trainer to describe and help each child individually, which in my opinion works for a better results.

The observations and information from the research helped me to figure out what swimming exercises are most common for teaching and what type of swimming equipment is used and in which way.

HUMAN ASPECT

Children behaviour in the water was also observed. Of course, they did exercises as it was said to do, but it seemed that they enjoyed the time they spend there, because sometimes they started to talk to each other, tried something that comes to their mind and even decided to compete with each other for the sake of to having fun. All of this I see as a positive effect for the teaching process, rising children's interest and getting better results.

One more thing that nicely surprised me was parents' behaviour. I thought it can be boring for the parent to wait for a child each time during the entire lesson, but actually it was the opposite. The parents were following the lesson's process, sometimes giving an advice to their children or praise and encourage them. Each time when something unusual and interesting happened, the parents were tend to talk about it to each other. It seems that the parents have a good time there too and are participating a bit in the lesson. That let me to assume that it can be interesting for the parents to help their children to learn to swim.

arms movements

front swimming

back swimming

swim with the support in one hand

PROTOTYPE TESTING

Previous experiment and observations from the swimming lesson brought a lot of useful insights in different areas, helped to check the hypothesis and revealed problematic areas that led to search for a solutions. That resulted in the importance to take an overlook at all that was done before, define in which way to go for developing a product and determine the boundaries for the next steps.

DECISION MAKING

It was decided:

- to keep the idea of an object for the very upper body part, but simplifying the shape. It will support the floatation if there will appear dangers such as depth, fear etc.

- to separate, but to keep both functions: floatation and learning. To have just one option at the time will provide better results. During the learning process the child will also learn to feel the flotation of his/her body.

- to extend the shape of the object to the shoulder's area and a bit to the chest. That can help to provide some support in the front and not to let to be turned and kept completely face down in the water.

- to fill the object with air and explore the amount of buoyancy and dimensions of the object. It can also make the object more suitable for transportation.

- find a way to use the object for teaching purposes. Explore the variations to hold it in one or both hands and on the chest, providing the possibility for different types of swimming exercises.

- to analyse the way of teaching and learning process. It can be difficult for young a child to understand how to use an object. Possibilities of the explanation can be a cartoon book, a playful process, a parents help etc. Parents' guide seems a more beneficial option.

- if the parents will took part in a teaching process, how can the information for the parents be provided? Instructions, application or cartoon story book for children can be used.

- to take into account the way of rising interest in this activity for both children and parents. Spending time together is one of the attractive aspects. It is also lead to increase of the supervision level.

Based on things stated above, prototypes for the next experiment were prepared.

TESTING ON CHILDREN

Prototypes were tested on the children in the swimming pool. The result of the use of the object for different swimming exercises was successful. The option to hold the object in one hand can be developed more.

Changing of the object shape made unclear the principle of the wearability and tight fixation. Tight fixation is required in order to immerse the object in the water and get the required buoyancy. Different variations were tested, but the solution was not obvious. It created a need to test the object on myself, that can also help to check the buoyancy level and to experience on my own how it actually feels.

Overall, the size of the object was excellent both for wearability and the teaching process. Just for my own interest, the size was also checked on a 3,5 years old child (out of my demarcation borders). The dimensions appear good for the movements, but it was covering 3/4 of the back.

TESTING ON MYSELF

Different variations of wearability where tested in order to find out in which way to hold the object tightly at the place were it should be. It was also tested in the water to realise if it is tight enough and how comfortable it feels.

Buoyancy level appeared high enough, because the object was easily keeping me floating with the head above the water. A variety of swimming exercises with the object was tested too and it didn't caused any disturbance.

It was found out that it feels very cosy to hold this object on the chest. It reminds of the feeling of hugging a pillow. If to wear it in the front, the face is more likely not to be submerged in the water. The advantages of these two aspects have to be analysed and discussed further.

It appeared very comfortable to use this object under the head as a pillow, while laying on the ground (e.g.: laying on the beach, etc.)

BODY POSITION

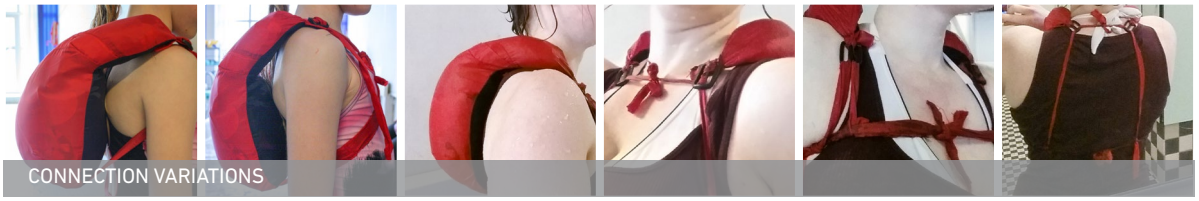
FLOATATION

FRONT SWIMMING

ONE HAND SUPPORT

BACK SWIMMING

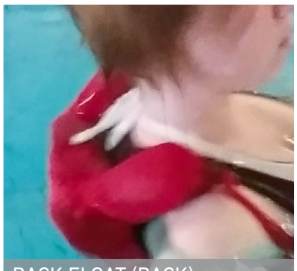
FRONT SWIMMING



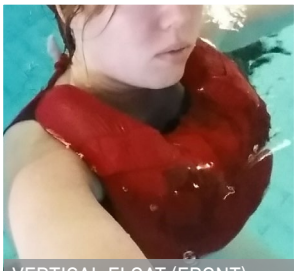
CONNECTION VARIATIONS

FLOATATION AND SPACE FOR THE HEAD (BACK)

ENOUGH SPASE FOR HOLDING HEAD BACH (BACK)

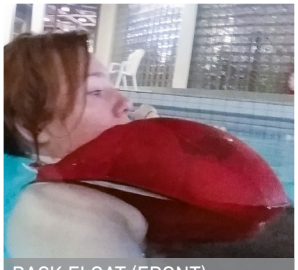


BACK FLOAT (BACK)



VERTICAL FLOAT (FRONT)

FRONT FLOAT (FRONT)



BACK FLOAT (FRONT)

MEETING WITH A SPECIALIST

During the visit to the swimming lesson I get a suggestion to contact Thorbjörn Holmberg, who is the head of sport at swim club SK Poseidon and executive director at Swedish Center for Aquatic Research (Lund, Sweden). He can share his knowledge and provide me more useful information for my project.

Thorbjörn Holmberg gladly accepted my request for a meeting to discuss the situation related to teaching children to swim.

KNOWLEDGE GAINED AT THE MEETING

The method that they are using for teaching children to swim is based on principles of Milt Nelms and Shane Gould, who are the prominent teachers in the world right now for teaching kids to swim. It is also related to places like Fiji and Australia, countries were swimming is not big. People there drown more often because they go out on boats. The percentage of deaths caused by drowning is the highest.

Usually children don't have an understanding about what it is to float and swim. For safety reasons, something is attached to their body and keeps them floating. Children think that it is ok. But when children don't wear it, they still behave the same way as when they have it, because they think they are safe. This is a big problem. As a result, it is not a right thing to attach something to the body in order to teach a child to swim, but it is ok to have something floating that they can hold on to and by removing their hands they will sink. That will help to learn how it feels to float by yourself and be aware of that there can be a danger in the water if you do not do the right things. But for a safety aspect, when you go out with the kids on a boat, then it is very important to have a floating device.

It is easier to learn to swim and float when the child has cyclopes and snorkel. That takes away one of the most stressful things during the floating: that they can't breathe. With a snorkel they can work on a floating position for a longer time and it actually speeds up the learning process.

The best teaching pools now are the ones that are beach entries. Instead of pools with sharp edges, where it is deep right away, beach entry allow to go slowly down in the water, like in natural waters. Children can even lay down and play. It also brings an understanding of the depth. Beach entry in swimming pools is very uncommon. It is more expensive to build and pools are mainly made for water sports. Something equivalent to beach entry or providing the same experience can be useful.

The parents should also do things in the water. The preferred distance from a parent to a kid that is playing is about 4-6 meters. Children will pick up this and try to do the same and the parents are close enough to save them if something happens. It is important to smile all the time, because what kids see, will be then their reaction to the water.

Kids at early ages have to pick up the movements of the water, its rhythm and pulse. At the age 5 to 7 years floating is the main purpose. Also it is good to learn 360 degree swimming, which is related to body awareness, meaning that the child can be in any position and feel comfortable. After that they can be taught more swimming.

In Sweden, kids who are in the 5th grade and can't swim can be divided in three categories:
- those who are from Sweden, but something happened when they were kids and now are afraid of the water;
- kids whose parents haven't learn to swim so they were not experiencing swimming;
- the foreigners that came here and they have no experience to swim because they had no need for it before they came (e.g. no water setting in the country etc.).

The most common way to learn to swim in Sweden is to enter a swim club or a "learn to swim" program. The swim teaching process for kids who are afraid of the water was also discussed. If a child can't swim, he/she can feel separated during different activities in the water and this is a huge problem.

Moving water is preferred. It will be great to have this option in teaching pools like a laser river and something that could shift the water (like rocks). It will also increase the understanding of the pulse of the water.

When you teach swimming you want the children to understand that there is a danger in the water, but also that the water is not dangerous if we do right things.

The best teaching pools now are with beach entry.

The preffered distance from a parent to a kid that is playing is about 4-6 meters.

As soon as something is attached to the body, the small children think that that is ok and they can float in the water. Even if they don't wear it, they think they can float, which can kill them.

One thing that we don't want for learning to swim are attached floating devices. We want things that are floating so the children can hold on to, but sink if the object is remove.

As for a safety device, if you go out with kids in a boat, then it is very important to have a floating device.

Swimming is a big part of the Swedish culture. (Bastu parties, etc.)

Smile all the time. Because what the kids see, will then be their reaction to the water.

With a snorkel children are less stressed because they can breathe normally. That helps to work on a floating position for a longer time, which speeds up the learning process.

DISCUSSIONS & INFERENCES

There is an option to reduce drowning risk among children by improving their swimming skills. Having no swimming skills will also limit the child socially and it becomes more obvious through the age.

It will be great if swimming lessons become a part of the school curriculum in every country and will be available and affordable for everyone. Introducing the beach entry in the pool will also be beneficial. Unfortunately, it can take longer time for the government to improve the nowadays situation. There exists a variety of aspects which have strong influence on that.

But what can we do now?

It is common to spend time close to the natural water settings when weather conditions are favourable, especially during the summer holiday. Children enjoy staying in the water and parents need always to follow them because of the safety reasons. So, I see an opportunity to provide the parents and children with an useful and interesting activity and inspire them to spend time together in the water.

Parents are those who take care of their children, so they will be able to help their child to learn to swim from early age. It will also increase child's confidence in the water and parents' supervision.

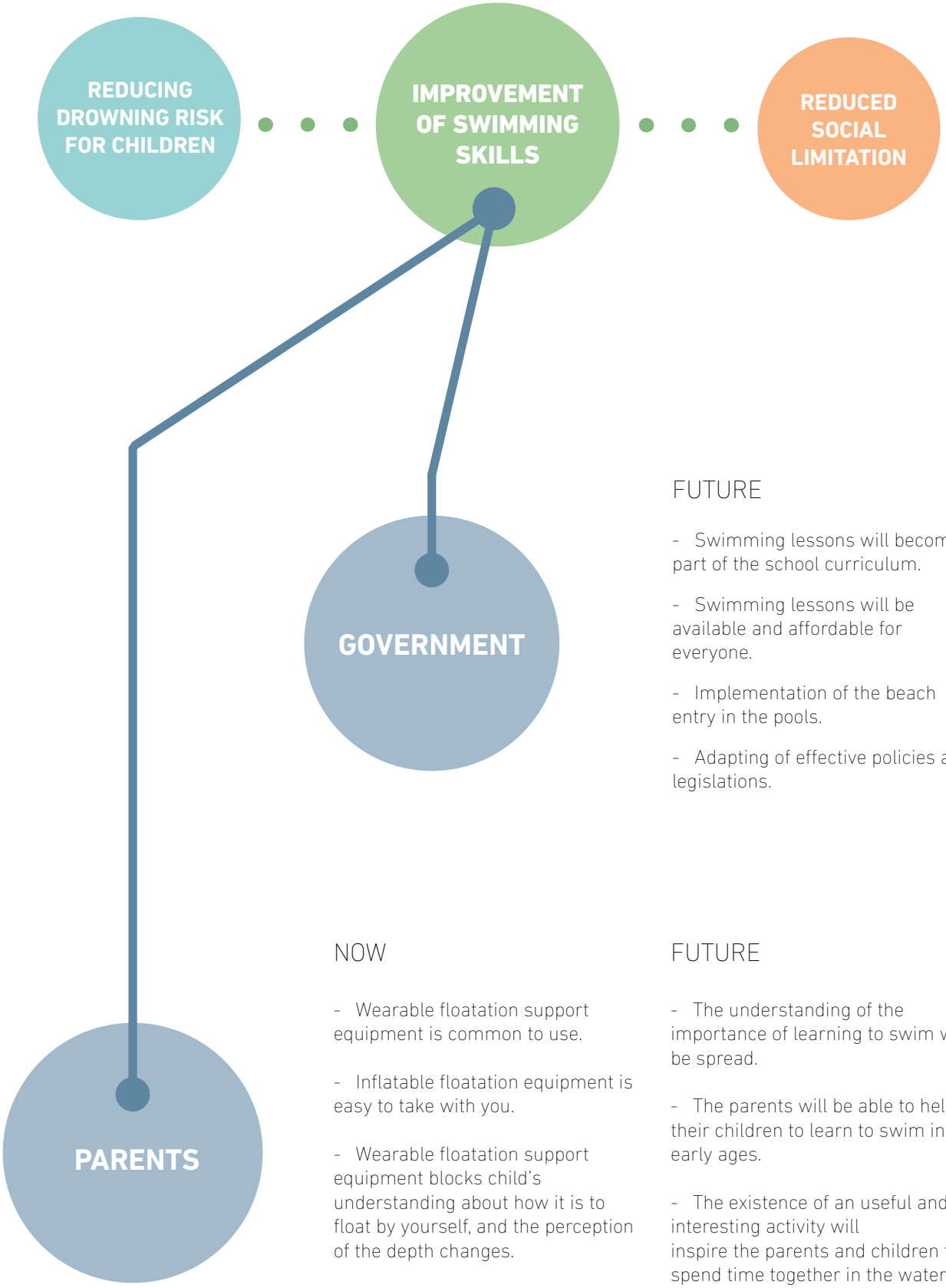
Usually parents buy inflatable floatation equipment (swim ring, arm floats etc.) for their children in order to keep them safe in the water. It is always easy to take them with you.

Of course, keeping a child floating with the help of a swimming equipment that is attached to the body increases safety, but if it is done all the time, it blocks the child's understanding about how it is to float by yourself and the perception of the depth changes. That increases the risk to get drowned when not wearing this equipment, because there is no contribution for the learning to swim and understanding of the water. Unfortunately, that aspect is not well known among the parents.

It will be useful to inform the parents about it and also to provide them with the basic knowledge about how they can help their child to learn to swim.

I assume that it can be difficult to convince parents to stop using the swimming equipment which they consider as being a safety product. Children like to change activities and, of course, they will not stay in the water just for learning. It also takes some time for a child to learn to float and to swim for a longer distances. So, what to do if the child is just a beginner in swimming or does not have developed swimming skills, but still want to run around, jump and play in the water while the parents can't follow him all the time? In this case the safety is important.

For these reasons, THERE IS A NEED FOR THE STEP IN-BETWEEN LEARNING AND SAFETY.



FUTURE

- Swimming lessons will become a part of the school curriculum.
- Swimming lessons will be available and affordable for everyone.
- Implementation of the beach entry in the pools.
- Adapting of effective policies and legislations.

NOW

- Wearable floatation support equipment is common to use.
- Inflatable floatation equipment is easy to take with you.
- Wearable floatation support equipment blocks child's understanding about how it is to float by yourself, and the perception of the depth changes.
- Parents have not enough knowledge about the learning to swim process.

FUTURE

- The understanding of the importance of learning to swim will be spread.
- The parents will be able to help their children to learn to swim in early ages.
- The existence of an useful and interesting activity will inspire the parents and children to spend time together in the water.
- Increase of child's confidence in the water of the natural water settings.

SOLUTION

THERE IS THE OPTION TO FULFIL THE NEED BY PROVIDING AN ALTERNATIVE FOR THE EXISTING EQUIPMENT.

The existing equipment can be replaced by another one which provides the same function and also have an option for learning to swim. That means that parents, in addition to an object that they used to have. They will also get a tool for helping their kids to learn to swim. Then it will be up to the parents to decide what function and when they are going to use.

The alternative is also a beneficial option for spreading information about learning to swim among parents, because almost everyone is a user of the similar type of equipment.

I believe that it will help to make time spend close to water settings more safe, social and joyful.

Moreover, if the parents will start helping their children to feel more comfortable in the water from early age (from 4-5 y.o.), it will still be useful to have swimming lessons at school. They can be used not just for teaching kids with no swimming skills, but also to provide a deeper swimming experience for those who can already swim.

POTENTIAL USERS

The potential users among parents are:

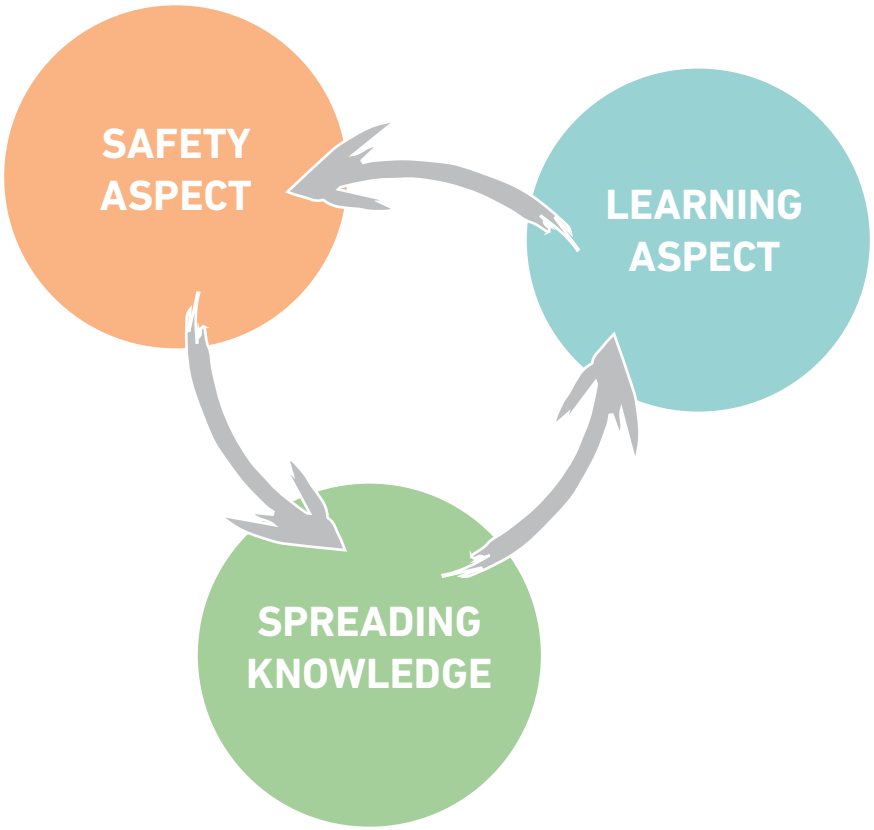
- those who have children age 4 -12 y.o.

- those who want to help their children to learn to swim and see it as a great activity for spending time together with their child.

- those for whom swimming lessons are not affordable.

- those who, depending on the situation, need both options: help the child to learn to swim and provide safety (for a variety of activities in the natural water settings and deep swimming pools).

- those who mostly care about child's safety aspect by providing floatation support and maybe don't have time, interest or possibility to help their child to learn to swim.


SAFETY
ASPECT
LEARNING
ASPECT
SPREADING
KNOWLEDGE

FINAL RESULT

Model making & Testing

LEARNING OPTION

SPREADING OF THE KNOWLEDGE

As it was stated before, the swimming equipment has to provide the parents with the option to help their child to learn to swim.

First thing that has to be done is to spread the information, that in order to learn to float by yourself, the buoyant equipment should not be worn, but be hold instead. It can be done easily, if a product that parents used to buy for their children for swimming will contain this information.

Usually, the swimming equipment is bought for safety aspect, so it is wearable. In this case, this function should still be provided. So, when the information will be received, the parents may wonder about what to do.

For that reason, the equipment need to provide another function: to be suitable for learning to swim. The information about how the object can be used for learning purposes has to be included.

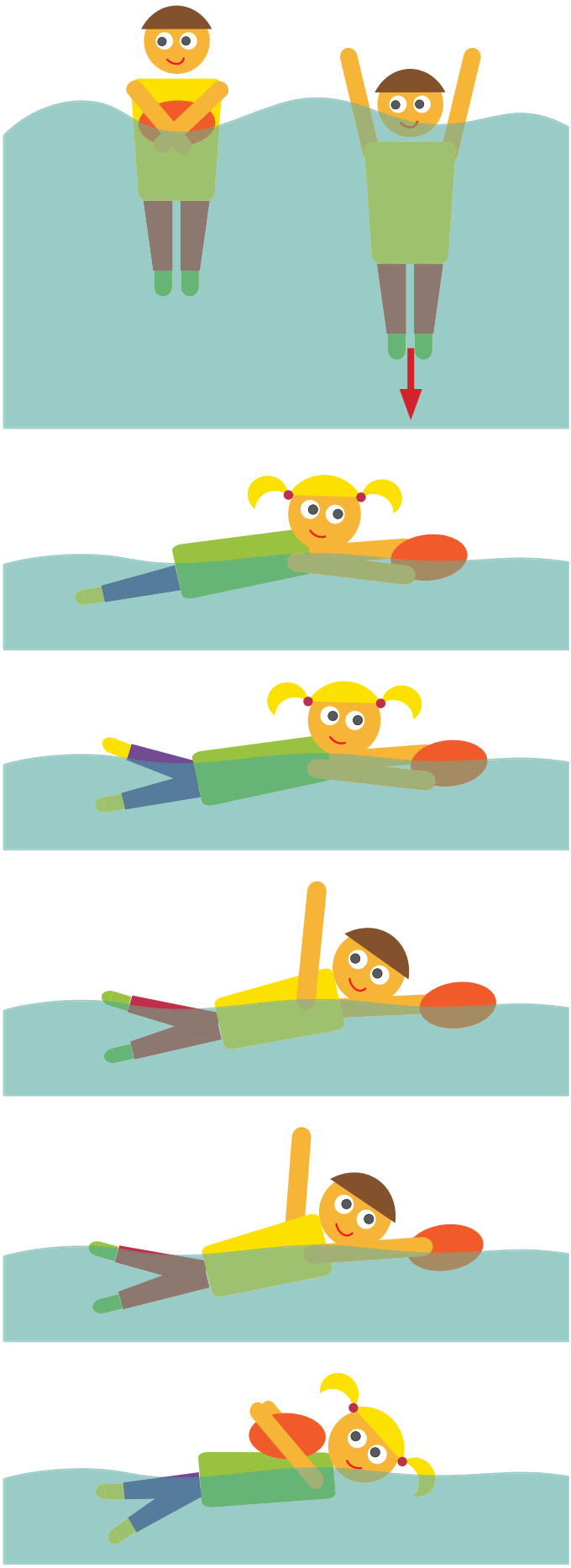
INSTRUCTIONS

Based on previous research, basic swimming exercises were identified. The shape of the object was created to support them. As a result, in order to inform the parents about another possible way of using the equipment, it was decided to include instructions.

Selected swimming activities with the support:

- work on the understanding of the floating and sinking;
- practicing floating by holding the float with straight hands;
- leg kick of the crawl stroke with the float in both hands;
- leg kick of the crawl stroke with the float in one hand (variation of changing hands while swimming);
- arm movements in the crawl stroke with the float in one hand (variation of changing hands while swimming);
- leg kick in the backstroke with the float.

It is important that the instructions will be understandable for the parents and the illustrations will be adapted for children in order to rise an interest in swimming.



SHAPE

COMBINING FINDINGS

Previous experiments let to figure out the amount of buoyancy that is needed to keep the child float with the head above the water, check the size changing connection principle, select the ways of how the equipment have to be used and test if it works.

Taking into account all findings, some decisions were made and next prototype was created for testing. *See picture.*

TESTING

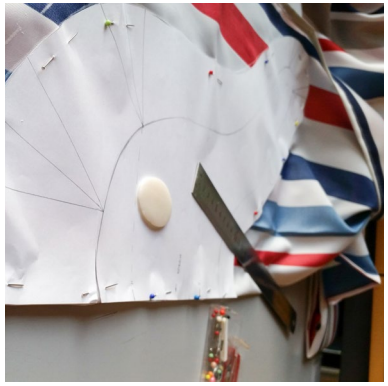
The main things to check were: the size of the object, how it stays on the body and how it keeps the child float when it is worn on the back.

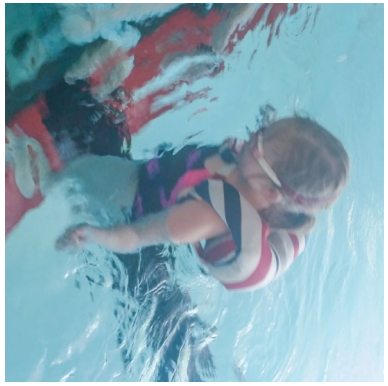
The size was checked on three different children. The object stayed in the part of upper back. The size changing principal and connection worked well. It stayed quite tight on the body and it was enough to hold the child's head above the water. Children were feeling comfortable. I also asked them about some aspects that in my understanding may cause discomfort. Still I would like to develop the shape more.

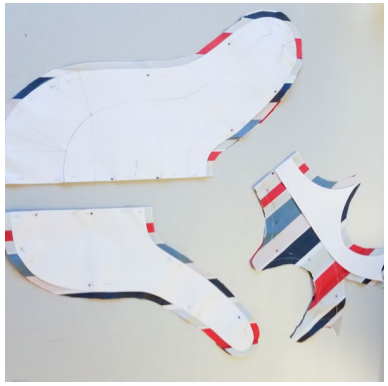
FLOATATION

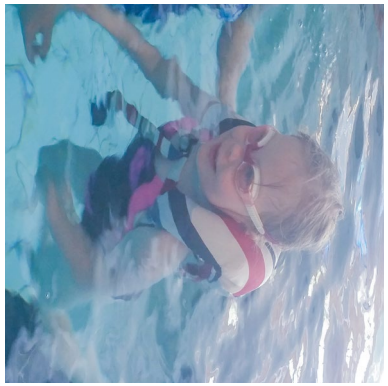
WEARABILITY

PATTERN CHANGES









FURTHER DEVELOPMENT

MY INITIATIVE

By analysing object's behaviour in the water, I still prefer to have one more testing session. I want to make some changes in order to see if my hypothesis will work. I think that object tight attachment to the body can be increased by adding one more connection. It will increase the amount of buoyancy. It is also important to check if it will be comfortable to use for the other functions. The textile part of the straps under the arms can be also filled with air. That will provide the user with softer feeling of the straps when in the water.

HELP FROM THE SPECIALISTS

I also would like to test different materials and see how they work. For inflatable products it is common to use 0,18 mm PVC. I think that the one with the soft surface, which is used for inflatable pillows, can provide a nicer feeling for the user. It is also not an expensive one. A bit elastic, but strong flexible materials like neoprene, can also be tried for the straps part. It will be useful to discuss the material aspect with production specialists, because I have not enough knowledge in this particular area. It will also help to figure out where the cap for inflating should be and a possibility of double inflatable camera.

Laws and legislations for particular equipment for children have also been taken into account. That also can lead to some changes in the object. A discussion with a specialist is required.

COLOUR VARIATIONS

Different colours and patterns can be used for the object's outer part for personalisation aspect. Graphics can also be associated with the backpack, superhero's tools or animal hanging on the shoulders. That can attract children's interest.

SOMETHING MORE

I see an opportunity to work further on the object. Aspects like reducing amount of the air support by rolling up a part of the object, packing of the object and probably even more ideas can be taken into account.

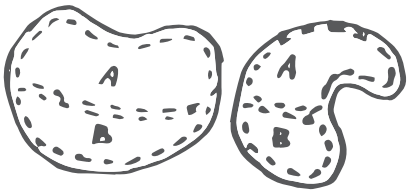
MATERIALS

INFLATING CAP

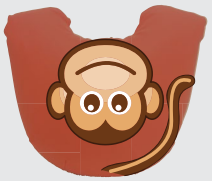
COLOR / PATTERN

?

LAWS & LEGISLATIONS



INFLATABLE CAMERAS



FUTURE POSSIBILITIES

Providing the parents with a tool for helping their child to learn to swim can raise an interest to discover more about swimming.

APPLICATION / WEBSITE

That creates an opportunity for launching an mobile application or website for the new product that can include:
- information about the product;
- detailed instructions about usage and descriptions for the learning process;
- more information and tips about learning to swim at different ages and aspects that are important for the parents to take into account;
- the child's development steps in swimming.

Having a forum is also an option. It can help parents to get answers for their specific questions and share the experience. It is also good to get a feedback for the product and information that can be used for further development in this particular area.

CHILD INTEREST

In order to attract child's interest towards swimming and provide children with useful knowledge and support understanding, the principle of storytelling can be used.

It can be done through books and cartoons with stories based on the real situations related to different swimming steps and experience. Main characters can help to guide the child through the learning to swim process and support his/her confidence.

Games for knowledge and skill testing can have a bonus system, which can encourage the child to perceive the information.

EVENTS

There is also the option to organise events. The information can be spread through the website and application.

Organised events can be beneficial:
- for getting more information about swimming;
- for children to get different training practices by learning in a playful way with other children;
- for spending a great time with other families and get to know new people;
- for raising interest in swimming activities;
- for increasing the supervision.

NEW PRODUCTS

Spreading knowledge about learning to swim process can have influence on the parent's choice of the swimming equipment. That let to assume that the need in compact (possible to take with you) equipment for learning to swim will appear. That will provide the opportunity for creating of a new series of the swimming equipment for learning purposes.

CONCLUSION

Gained knowledge about swimming tends to be transmitted through the generations, as parents always teach their children that they know.

That can help to improve children swimming skills from early age, gain understanding of the swimming and raise awareness of the possible danger in the water settings. All of this is beneficial for reducing drowning risk and lead to more safe, healthy and joyful time-spending, because SWIMMING IS LIFE.

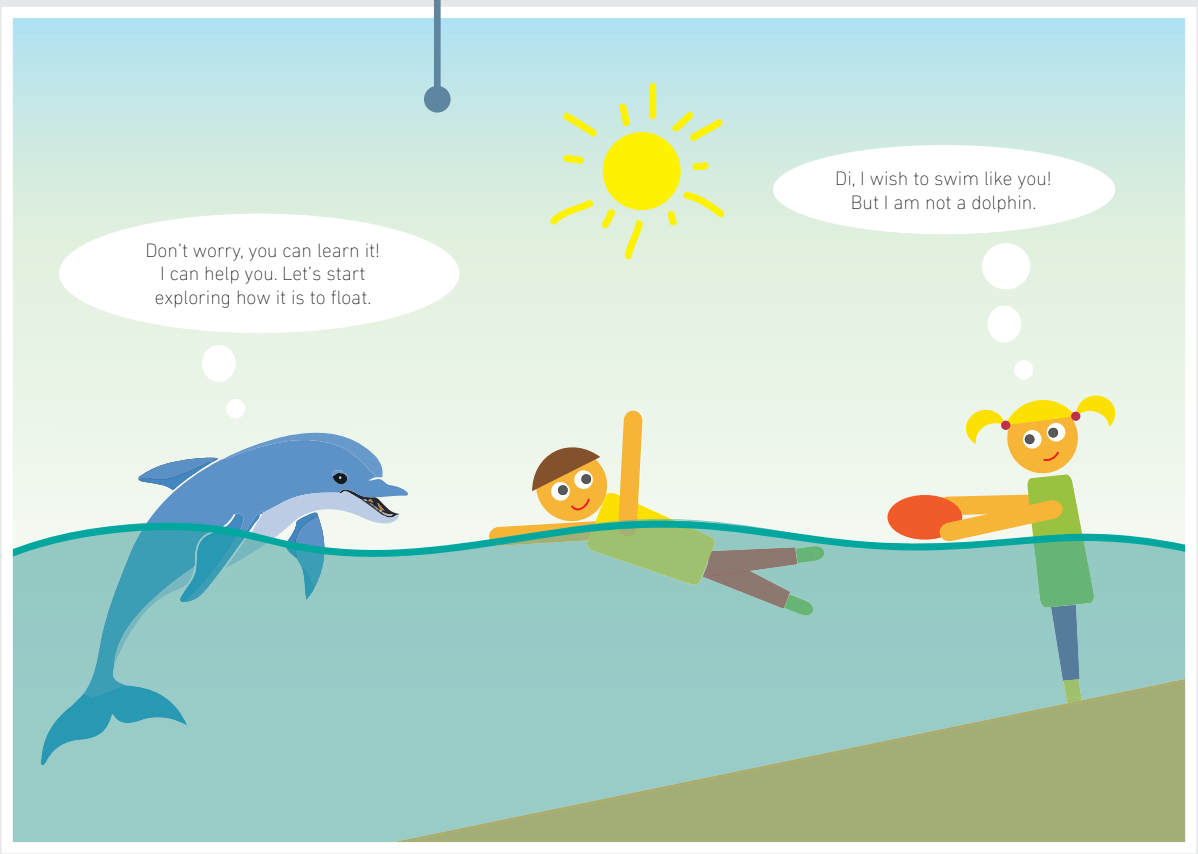
FUTURE SYSTEM

WEBSITE / MOBILE APPLICATION

CHILD'S INTEREST

EVENTS

NEW PRODUCTS



MODEL MAKING

The first steps for the model making process were done already while making prototypes for different experiments and testing.

During the working session on the size, shape and function, there were also created various sewing patterns, which were further developed through the rest of the process.

In order to check the dimensions and the functionality of the object after all pattern's changes, a two-colored model was made from textile. Stuffing material and air-filled objects were used as the shape's support. Wearability and position of the object on the back were checked on myself and on the children.

One of the requirements that were set for the final model was the possibility to test it in a real life. For this reason, rubber coated fabric called Galon was selected, due to its waterproof properties and possibility to be sewed. The fabric's coating can be melted where stitches are, which supports waterproofness and air isolation. An inflatable ball and air-filled pillows were used for buoyancy purposes and for holding the shape.

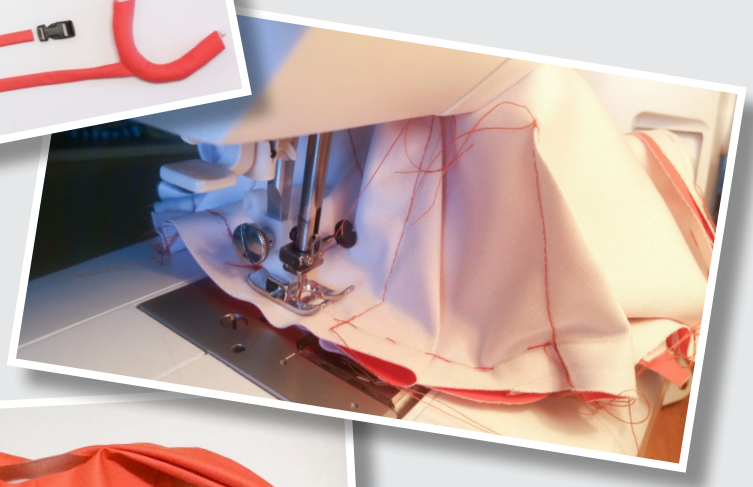
The final model represents a possible solution for this type of product and a new concept system related to swimming. Thus, further product development will be necessary in order to achieve a final solution. These aspects were mentioned in the chapter "Further development".

Sewing pattern and
cutted pattern parts

Inflatable ball

Air-filled pillows

Different model parts
prepared to be combined
together



Sewed model without
inflatable camera

SWIMeee!

Swimming is Life

INTRODUCTION

What could be more joyful for children during the hot summer time than having fun in the water by dipping in a lake or sea? Spending time in the nature is attractive and relaxing for most of the people, isn't it?

What if this enjoyable way of spending the time may include developmental aspects for the children? What if the patents, while spending time with their children, can also help them learn to swim in the natural water settings?

SWIMeee!

"SWIMeee!" - is an inflatable float that provides parents with an opportunity to help their children to learn how to float and swim. It can also be wearable in case there is a need for floatation support for safety reason. Due to its compactability it is easy to take "SWIMeee!" to the beach, lake or other water settings.

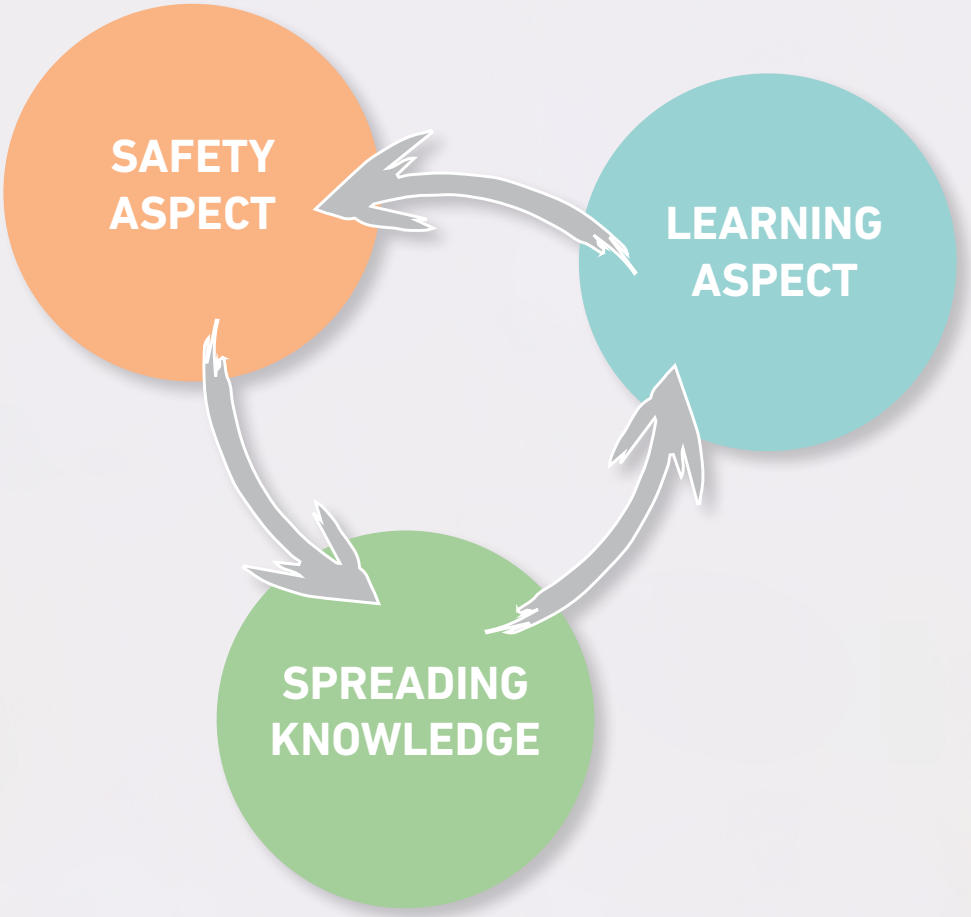
It supports a joyful activity for parents and children to spend time together, develop child's swimming skills and increase level of supervision.

IMPORTANT ASPECTS

Most parents are not aware about the fact that using wearable swimming accessories too often can hinder a child's ability to swim. That is why the device should be not wearable. On the other hand, if the child can't swim, there is still a need to keep him/she safe during various activities in the water: like jumping, running, playing and etc. "SWIMeee!" takes all these aspects into consideration.

INFLATABLE

easy to take it with you to the natural water settings


SAFETY
ASPECT
LEARNING
ASPECT
SPREADING
KNOWLEDGE

SUPPORT DEPENDS ON THE SWIMMING SKILLS

SAFETY ASPECT

Wearability option can be used if there is a need for the floatation support for safety reasons:

- during children's activities (jumping, running, playing with children who differ by height and level of swimming skills, etc.) when supervision is low and swimming skills are not developed.

- in places where the water levels are too high for the children with low developed swimming skills (depth changes, deep pools, aqua parks, etc.).

WEARING ALTERNATIVES:

- Wearing "SWIMeee!" on the upper back part will provide floatation support just when it is needed. It does not hamper child's movements, so he or she can enjoy the activity freely. If the child will swim with it, it will provide the amount of floatation support, needed depending on child's swimming skills. If the child can keep the right body position, the float will rise up from the water reducing the support.

- Wearing "SWIMeee!" in the front makes it easy for the child to be kept floating for a longer time if there are waves. It can also be an option for younger kids.

CHEST WEARABILITY OPTION

FREEDOM OF MOVEMENT

AGE 5-10 y.

fits younger and older children

LEARNING PROCESS

LEARNING ASPECT

Holding “SWIMeee!” helps to:

- experience the water behaviour in the natural water settings and develop a perception of the depth;
- understand the right body position and feel the floating by yourself;
- It is also suitable for different basic swimming exercises that help to understand and train breathing and arm and leg movements.

INFORMATION & INSTRUCTIONS

"SWIMeee!" comes together with a "swimming guide" that contains basic knowledge for parents for helping the child to learn to swim, which includes:

- instructions for how the float can be used for safety reasons and for main learning exercises. Illustrations are adapted for kids too in order to raise an interest in swimming.

- information and a summary about the web-page and mobile application which include:

• detailed explanation about swimming steps;
• swimming events;
• discussion and social forum;
• educational cartoons for children related to swimming with attractive characters.

INSTRUCTIONS

ADDITIONAL OPTION

PUPPY

ADDITIONAL FUNCTION

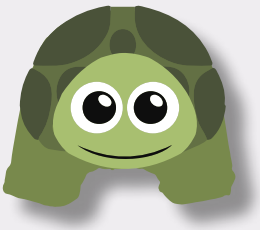
"SWIMeee!" can be used as a support for the head when lying on the ground or on the coast in the shallow water.

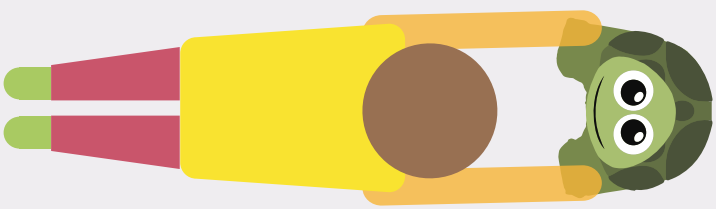
COLOUR VARIATIONS

"SWIMeee!" can be available in different colours and patterns. The "Friendly Animal" theme may increase the interest in learning to swim by providing the feeling of companionship.

ON THE MARKET

"SWIMeee!" can compete with existing products on the market by providing more usage options at a reasonable price.





CHICKEN

TURTLE

LION

CONCLUSION

Discussions & Reflections

CONCLUSION

The final result of the project is an example of the in-between step that can be used in order to make changes in the existing situation in order to achieve preferable results.

From the beginning it was planned to create a product that will have a contribution to solving the existing problem. During research process, the variety of aspects that were suitable for further development were discovered. It was important to choose one of the directions in order to make more detailed analysis and suggest a solution in a given time. That was a challenge to make a decision, because it was not very obvious where it may end and what will be the level of contribution to the problem of the final result.

It was also important to find the right sources of information and knowledge that will help to continue the project in the right path. It created some difficulties because I was not specialised in this area and had a lack of contacts in Sweden. At the same time I was able to contact people from different countries that helped to broader the research boundaries. Very valuable were the observations, questionnaires and interviews with the specialists. Each one brought specific information based on different perspectives. It was interesting to realise the connections between all of them and it was important to take all into account.

Last of the interviews highly broaden the horizons for the project and it happened that some particular knowledge was discovered closer to the end of the project. Still, it helped to strengthen the developing direction and brought new aspects for creation of the future system, which still retains an attractive area to work with.

One more interview with the same specialist was conducted at the very end of the project. It is not included in the report, but it provided me with a valuable feedback on the final result and the aspects related to it. That helped me to realise that my thoughts and understanding are in the right direction and that there will always be contradictions between user's needs and specialist's opinion. That inspired me to search for a compromise that in the future can lead to the reduction of the level of contradictions. One more thing: there were some strong positive comments on the future system and intention to provide help with special knowledge and contacts (if some system parts will going to be developed).

A lot of useful information and experience in product development were gained during experiments. Ideas and prototypes testing were conducted in several cycles that provided me with the knowledge about object behaviour in reality. That also taught me more about the design process itself.

Areas related to construction, materials and production still required deeper research. It will be useful for me to have an opportunity to do that and provide some suggestions. It will be also worth to talk with specialists about those areas.

For this particular final result one more important aspect is the colour of the object. It is important that the object will speak about itself in a right way. The model made in orange rose a lot of discussions. Unfortunately, there was no possibility for me to make it in the colour variation that I had introduced later. I was too much concentrated on the functional aspect, in order that product will work as it has to work, so I put a lower accent on graphical perception because of the lack of time.

Overall, I am pleased with project's result. Of course, deeper development is still required and project itself has directions to be continued. I think I managed to fulfil my expectations and came out with more than just a final product, but also with the future system. All the outcomes and lessons I gained through this project provide me with the useful knowledge and design process experience. I feel that going through this process has been necessary for me to summarize my education and motivate myself for the future.

ACKNOWLEDGEMENTS

I am highly grateful to everyone who somehow took a part and helped me with my Master's degree project.

First of all, I would like to thank my supervisor, **Karl-Axel Andersson**, for his guidance and his great patience, encouragement and advice throughout this project.

I would like to thank my examiner, **Claus-Christian Eckhardt**, for his critical and invaluable advices to this project.

I am thankful to swimming trainers: **Natalija Zareckaja**, **Jill Lundström** and **Thorbjörn Holmberg**, for their insightful knowledge and generous time spending on sharing it with me. That has provided me with essential and indispensable information for fulfilling this project.

I am also thankful to **Olof Kolte** and **Charlotte Sjödell** for their valuable comments during the intermediate presentations.

I greatly appreciate all the support, feedback, interest and good mood from **Emilia Bancos** and **Marinda Sviden**.

I am grateful for the support from **my parents**, their encouragement and belief in my abilities. I would like to give my special thank to **my little brother** for the inspiration and for being a source of useful observations.

I am thankful for all parents who found time to participate in interviews and provided me with useful information. The same goes to the parents and children who participated in my experiments and model testing. Thank you for your interest and patience.

I am saying thank you to the fellow design students and teachers for all the valuable comments. I am grateful to the Industrial Design department for all knowledge, experience, support and fun that I received during the entire length of this Master's Programme.

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SWIMeee!

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APPENDICES

Additional information

SWIMMING EQUIPMENT

RESQUE AIDS:

LIFE BUOY / RESCUE BUOY

Description:
The life saving buoy is designed to be thrown to the person in the water, to provide buoyancy and prevent drowning.

Advantages:
The buoy's surface resists weather and temperature extremes. Buoys have an integral rope for easy handling.

Disadvantages:
The buoy is unsuitable for use in swimming pools. By throwing one into a busy pool, it could injure pool users.

Place of use:
Buoys are usually carried by ships. The are also located beside bodies of water with a high depth level and have a potential for drowning.

Material:
Solid closed cell plastic with a metal ring moulded inside for durability and balance.

LIFE VEST / LIFE JACKET

Description:
A piece of equipment designed to assist the wearer, who may be either conscious or unconscious, to keep afloat. Available in different sizes to accommodate variances in body weight.
Price range: expensive.

SPECIAL NEEDS:

The **Personal Floatation Device-Adapted PFD-A's** maintains the body stretched out in a dorsal position. It ensure greater stability in cases of morphological dysfunctions, involuntary sudden reflexes or loss of consciousness. It greatly increase users' confidence.
Available in sizes: 20 lbs (9 kg) to 190 lbs (86 kg)

The **Life jacket Lj-A's** allows individuals to swim comfortably on their stomach and to float on their back. It reassures the most apprehensive users and gives them freedom to acquire autonomy. Great capacity to bring the face out of the water almost instantly.
Available in sizes:18 lbs (8kg) to 250 lbs (115 kg)

The **Life Jacket-Adapted** is a new safety vest able to maintain effectively one person on vertical.
Satisfy the need of verticality in clients with multiple handicaps. Great capacity to keep the body to the vertical, instantly.
Available in sizes: 45 lbs (20 kg) to 145 lbs (65 kg)

INFLATABLE: -> Inexpensive, easy to find, durable.

ARMBANDS

Description:
Swim aids designed to help a wearer float in water and learn to swim. Worn on the upper arms. Provides buoyancy, helping the wearer float with the head above the water.

Advantages:
Armbands help the child to build a confidence. Provided amount of flotation can be decreased by deflating them partially. Easy to supervise the child. Available in adult sizes.

Disadvantages:
Armbands can slip off and lead to drowning. They do not prevent drowning and not a life-saving device. They teach the child to float in a vertical position, which is incorrect because swimming is usually done in a prone position. The child who wear armbands can become dependent on them.

SWIM RING

Description:
The swim ring is worn around the user's torso, giving support under the arms. It helps to keep the head above the water. It is not designed to save individuals from drowning.

Advantages:
It comes in a variety of sizes to fit the children and adults.

Disadvantages:
It is possible to fall through the centre of the ring (when swimmers raises their arms). It makes it difficult to swim in a horizontal position.

NECK RING

Description:
It provides the buoyancy which helps the wearer to float with the head above the water.

Advantages:
It provides a freedom of movements in the water and the possibility to learn to float and swim.

Disadvantages:
It supports floating in a vertical position. It can be uncomfortable for a kid to wear it, especially when he/she is playing in un-deep water.

SWIM JACKET

Description:
It helps the wearer to float in the water with the head above the water.

Advantages:
It provides a buoyancy for the larger body part.

Disadvantages:
It restricts the ability to move in the water.

BABY FLOAT

Description:
It is designed for a baby to sit in and safely enjoy being the water.

Advantages:
It keeps the half of the body above the water. The drowning risk is low.

Disadvantages:
It doesn't help the kid to learn to float and swim.

FOAM

SWIM NOODLE

Description:
Pool Noodles are flexible, fun, foam water floats. They can be used for floating, splashing, making waves, exercising or for riding like on a seahorse. Foam noodle is the ideal floating and buoyancy equipment and suitable for rehabilitation and therapy exercises.

Advantages:
It can be used for swimming on the front of the body or on the back. Arms are free to be used for swimming as well as legs. It is not attached to the body like a swim belt or arm bands. It moves along with the user and keeps him/her balanced. It provides enough support for a child and an adult.

Disadvantages:
Not safety swimming equipment.

Material:
Made from buoyant, lightweight foam, is highly resistant to the water absorption and pool chemicals, have excellent tear and resiliency, so can take a lots of bending, twisting and rough play.

SWIM FLOATS

Description:
Depending on how the float is being hold effects the swimmer in different ways.

Advantages:
Floats with holes for hands grips are suitable for total beginners to advanced competitive swimmers. Kick board helps arms to rest by keeping the head above the water and allowing the swimmer to concentrate on the leg kick.

Available in different shapes, colours and sizes. It can be fun for the child who is learning to swim.

Disadvantages:
It is necessary to have the correct size because the float has to hold the swimmer's weight in the water.

Material:
Polystyrene comes in variety of shapes and sizes.

ADJUSTABLE ARMBANDS

Description:
Fits kids at age1 to 6 years.

Advantages:
Allows to remove the individual foam layers of buoyancy. The assistance can be reduced and the swimmer has to work harder.

Disadvantages:
It is not a life-saving device. It teaches children to float in a vertical position, which is incorrect because swimming is usually done in a prone position.
The child who wear armbands can become dependent on them.

Material:
The highest quality super soft foam, chemical free.

PUDDLE JUMPER

Description:
It is the fabric covered floatation pieces for the use around the arms and chest. It keeps the kid's upper body part above the water and provides the confidence to swim around on his/her own.

Advantages:
Puddle Jumpers are easy on, easy off. Available in different colours and designs. Has the quality of a full life vest.

Disadvantages:
It is intended for calm water only, such as in swimming pools and inland water. It is not designed to turn the child "face-up" in the water. Can be used by children who weights 30-50 pounds.

FOAM BLOCKS

SWIM BELT

Description:
Swim belt ties around the waist and gives the mid support.

Advantages:
It keeps the movements of arms and legs free. It is possible to remove the little polystyrene blocks one at a time which can be done on a gradual basis giving less support each time until the user can remove them all together. It helps a child to maintain a good vertical body position.

Disadvantages:
It is not always suitable for the non-swimmers, but can be used with additional floats. Not suitable for the non swimmer in deeper water on its own because it does not keep the head above the water like armbands. There is need to go out of the water to put or remove the polystyrene blocks.

Material:
String of polystyrene blocks tied together with the cord.

SWIM VEST / JACKET

Description:
The buoyancy is around the body. It helps to put the swimmer in a horizontal swimming position with the face tilted forward. Contains 8 removable floats, which provide flexible buoyancy and a crotch strap for a better fit. Designed to fit users from ages 8-14 and up to approximately 120 lbs.

Advantages:
Swim jacket makes it possible to achieve a far better swimming position than alternative swimming aids.

Disadvantages:
Not suitable for absolute beginners. It works best for swimmers who are fairly water confident.

Material:
Constructed from durable neoprene shell with a soft chlorine resistant poly interior.

SWIM SUITE

Description:
Suits children ages 1 to 5 years. It is a swim suit and buoyancy aid in one. It works on the same principle as a swim jacket providing adjustable buoyancy for the swimmer and the freedom of movements.

Advantages:
Individual floats can be easily removed from the float suit as a child becomes more confident in the water.

Disadvantages:
If a child does not go swimming, for the comfortability reason there is a need to change swimming suit or remove floats.

Material:
Soft cotton fabric. Provides 50+ UPF sun protection.

SWIMFIN - SHARK

Description:
For beginner swimmers, the body is lower in the water causing the SwimFin swim aid to be more submerged which gives the swimmer more uplift and support without the arms being restricted. Worn on the back, it does not hamper or restricts the ability to move in the water.

As confidence grows and body position improves, the SwimFin float appears more out of the water and therefore provides less support. SwimFin swimming aid does it automatically by working with the swimmers natural ability but also giving immediate support if required. SwimFin is also great for swimming on the back, the learner simply leans on the SwimFin.

OTHER

SWIM GOOGLES

SNORKLE AND MASK

NOSE CLIP

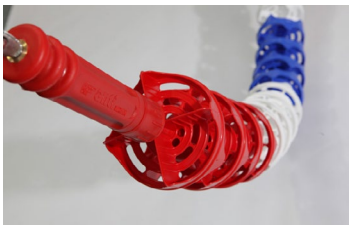
FLIPPERS

SWIM GLOVES

BALL

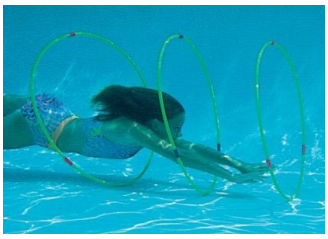
ADJUSTABLE ANKLE WEIGHTS

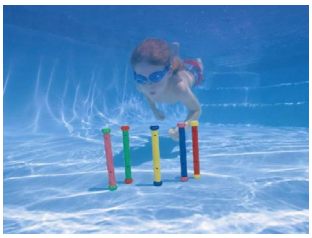
RUBBER BAND TENSION SWIMMING EQUIPMENT

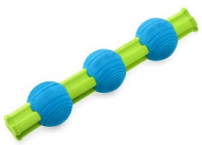


SAFETY LINES / ANTI-WAVE

SWIM TOYS & LEARNING







ELECTRONICS

WATER PATROL
CHILD GUARD

Description:
The Water Patrol Child Guard is a wireless anti-drowning electronic device that sounds an alarm when the wristband is submerged in water, alerting of potential danger. It is a portable unit which is easy to use and operate. It consists of the wireless remote receiver and the fun fish wristband that children love to wear. This acts as the wireless transmitter. The device is suitable to use around any form of water hazard. It has the wireless range of up to 60m in open surroundings. The receiver runs on both main power and the rechargeable battery.

Price: $149

SEAL Anti-Drowning
Safety Device

Description:
It's a wearable piece of tech that acts as a swim monitor. It looks like a necklace or neckband, and child simply wears it while in the water. Through this new technology, the neckband reports back to the wristband that the parent, lifeguard or babysitter also wears (and it reports back to the central hub).

If the safety device determines that the child is in distress while in the water, all kinds of alarms and lights start going off on the wristbands and the hub.

Price: $150 per child

ISWIMBAND

Description:
The device can be a wristband, an armband, and even a headband (preferred option). iSwimband connects to parents' smartphones to alert them if there is a danger. Bluetooth technology is used to maintain a link to an iOS device. User can set the sensor in the iSwimband to send an alert whenever the child actually dives in a body of water (or, if he/she aren't allowed to go swimming). The rest of the time, the device will keep track of how long the child stays submerged and send out alerts when it takes too long to get out to the surface.

Price: $99 / €73

WAHOOO SWIM
MONITOR SYSTEM

Description:
The system requires each swimmer to wear a headband, called a swimband. The band contains two sensors and a sonar transmitter that sends out a signal when it is submerged longer than 20 seconds. The signal triggers warning lights posted along the waterfront begin flashing yellow, and after 30 seconds, the alert turns red and a siren starts going off, alerting lifeguards that someone is in danger.

FLYFIT - The fitness tracker to strap to ankle.

Description:
Designed to measure different leg movements associated with cycling, swimming, and running. Created to be worn on ankle, as the wrist is not the best place to measure Cardio exercises that involve the lower body.

The tracker can recognize things like running, climbing stairs, pedalling, or kicking your legs in a pool. It can also track distance travelled via GPS, monitor your sleeping habits, and – of course – sync with your smartphone via Bluetooth for easy access to all your data.

Price: $100

OTHER

SAVE TRIGGER
A Life-Saving Device to Throw A Water Rescue ThrowBag

Description:
Throwing a water rescue Throwbag to a drowned victim can be difficult if person don't have the power and agility skill. Save Trigger tries to solve that issue by offering a life-saving device in a gun shape to allow any user to easily shoot out a life line to the person in need. Using Save Trigger, it would be easy and fast to throw any life saving device to a drowning victim in emergency situation, people are familiar with the shape and how to use it.

Designers: Sujin Lee, Haeryung Lee and Moonjeong Choi

SWIM'IT
Swim Safety Device

Description:
Swim'It is a reusable, personal flotation device (PFD), designed by triathletes for open water swimming training and racing. Providing no drag to the swimmer when worn, the Swim'It, flotation device can quickly inflate with just a jerk of the inflation tab. It delivers 17 pounds of flotation when inflated.

Strap it on right leg, and go for a swim! If needed, grab the red "jerk to inflate" tab and give it a jerk! Swim safety device life jacket will automatically inflate and float to the surface next to.

EASYBREATH SNORKEL MASK
Land-like breathing underwater

Description:
Snorkelling is a great way to explore the water while remaining close to the surface. Instead of covering the user's eyes with goggles and then having a separate tube for breathing through the mouth, Easybreath covers the whole face with one piece, and contains the breathing portion right inside of the mask. Once it's on, the creators promise that the wearer can just breathe naturally.

The mask uses a double airflow system that allows the wearer to take in oxygen through the spot on the top, while allowing them to breath out through a different portion of the tube. This airflow system is what prevents the mask from fogging up while underwater, as the air the user's exhaled air is quickly removed from the mask. Air comes in via the portion the user is looking through and leaves via the outer portion of the mask, further aiding in preventing fog.

While some goggles cut off peripheral vision, Easybreath promises a larger field of vision, and seeing as much of the underwater world as possible is really what snorkelling is about.

TRITON SCUBA MASK

Description:
A conceptual scuba mask that would allow divers to breathe underwater without air tanks. The mask, called the Triton, consists of two branching arms designed to serve as "gills" that extract oxygen from the water and deliver breathable air directly into their wearer's lungs.

The device is covered in plastic "scales" which allow water to enter through small holes, where it enters a chamber that separates the oxygen from the liquid. The Triton's internal filter utilizes fine threads with holes smaller than water molecules, so that only air is able to pass through. The oxygen is then compressed and stored in a miniature storage tank. The entire gadget is powered by an incredibly small, easily rechargeable micro-battery.

Designer: Jeabyun Yeon (S. Korea)

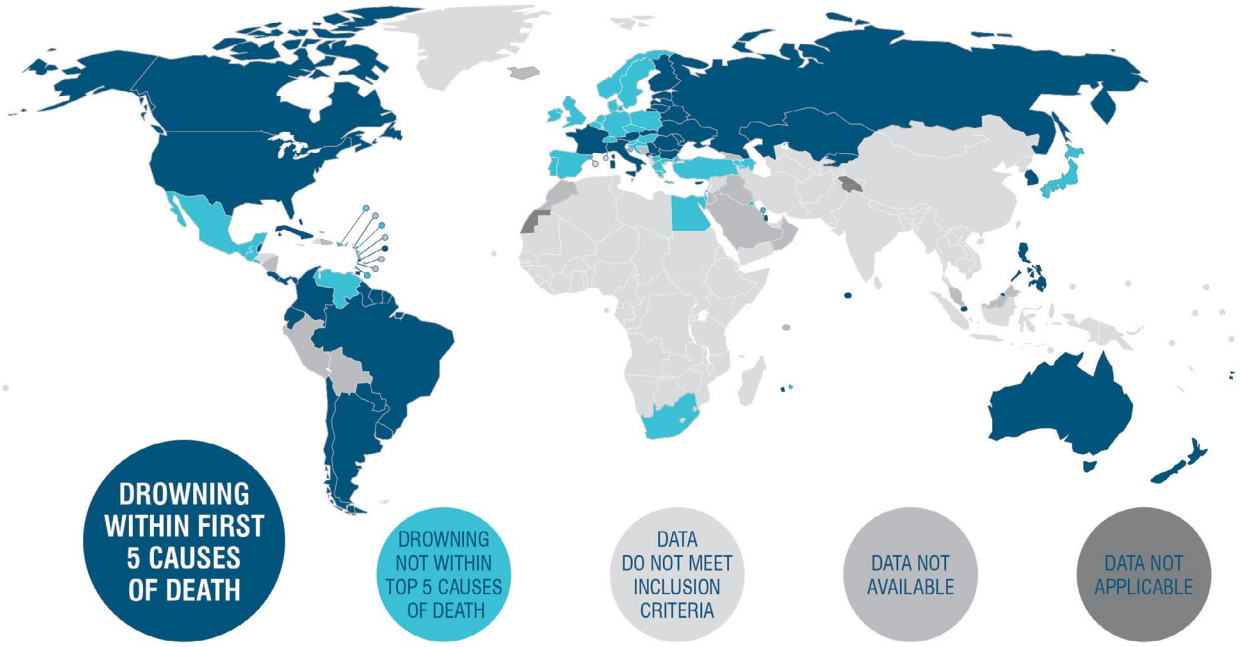
THE LITTLE MERMAID
Swimming for children with disabilities

Description:
It's quite a heart breaking sight to watch wheelchair bound children not taking advantage of the swimming pool due to their limitations. The Little Mermaid is a floatation aid that is aimed at such children. It comes fitted with a hand-wheel that helps the child to navigate across the pool independently. So besides some hand exercise, the child can enjoy waddling in the water!

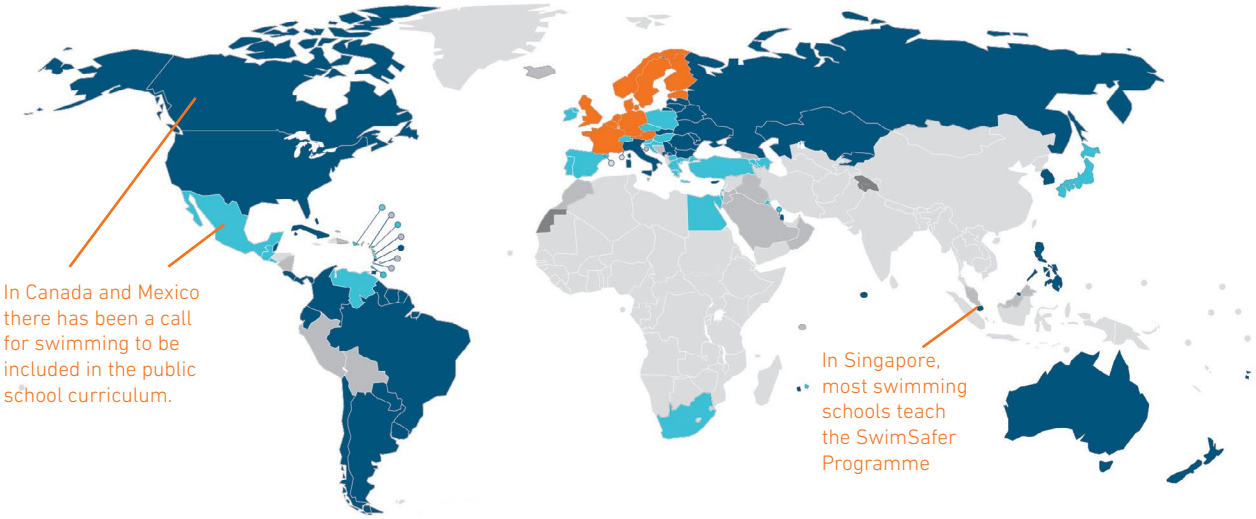
Designers: Soyeon Park, Taeyeong Park & Hyeonjee Lee

SWIMMING AT SCHOOLS

DROWNING AS A LEADING CAUSES OF DEATH AMONG 1-14 YEAR OLDS, SELECTED COUNTRIES
Sourse: World Health Organisation, 2014



COUNTRIES WHERE SWIMMING IS A PART OF THE CURRICULUM FOR PHYSICAL EDUCATION AT SCHOOL (my own research)



INTERVIEWS

CONCLUSIONS OF THE PARENTS QUESTIONNAIRE:

• In the questionnaire have participated 9 parents in the age 22 - 42 years old. Their children's ages 2 - 8 years.

• Common water settings: sea, lake, swimming pool, river.

• Common children's activities: splashing, playing, jumping, diving, pouring the water, swimming.

• Children ages 2 - 8 years old mostly can't float and swim. They can do it just with the support.

• Children have to be taught swimming. Parents or a swimming trainer have to describe and explain it.

• Parents mostly can swim. They have learned it at the age 8 - 11 years old or much later when became adults.

• Parents agreed that it is important to learn to swim. It is good for physical strength, health, in order not to drown and it is a fun activity. Otherwise, what else to do in the water?

• Right age to start learning to float or swim - as early as possible.

• Dangers for children in the water: swallowing too much water, drowning, low supervision, depth, waves and children don't have a sense of danger as in water, as when playing.

• Swimming equipment helps to keep the child over the water. Children like it. But it is still additional equipment for entertainment. It is not safe and mostly not suitable for teaching. Armbands are less restricting for the movement. Swim jacket is not comfortable. Children afraid to swim without swimming equipment.

• It is important that a child will be not afraid to swim in the water.

• It is easier to learn to float when you put your face in the water, as you don't have to hold your head, but to do this is possible just for a short time.

QUESTIONNAIRE FOR PARENTS

The questionnaire was done in three languages: English, Russian and Lithuanian. Translation was made by me.

	Country	Denmark	Denmark	Lithuania
1.	What is your name and age?	Mouna, 26 years	Marwa Taha, 22 years old	Liuba, 25
2.	What is the age of your child / children and what is his / her /their name/s?	6 years old, his name is Yasin	Jacoub Taha, 2 years old	Beatrice, 5
3.	Where you with your child / children usually spending time near the water settings?	Yes, when the weather is good, then we always spending time there.	We go to the beach a few times a year in the summer.	Near the lake or sea.
4.	What is/are your child / children usually doing in the water?	Fooling around, playing, swimming.	He enjoys splashing the water around.	Jumping, learning to swim.
5.	Can your child / children swim? If YES, how your child learned it? How old he/she was? If NO, how do you think he/she can learn it?	He loves being in the water, but he needs a support / help to swim. For example he uses arm floats. He will learn it in school, cause here in Denmark when you start school you have to learn swimming.	No, but he will definitely learn it eventually in school.	No. I think special equipment or lessons in a swimming pool would help.
6.	Can you swim? If Yes. -> How you learned to swim? How old were you? If No. -> What is the reason? Do you want to learn how to swim? Why?	Yes I can. I was around 9-10 years old, and I also did learn it from school.	Yes, I learnt how to swim in school, when I was about 10 years old.	Yes, I have learnt to swim when I was 12-13 years old, my father taught me without any special equipment.
7.	What is your opinion is it important to learn how to swim? Why?	Of course, it's important to learn how to swim, because then you are more safe, when you are in the water – and its more fun.	It is important as it's both enjoyable and helpful in dangerous situations.	Yes, it is, because of safety and you can try all leisure water activities.
8.	When it is the best age to start learning to swim?	As earlier as better.	As early as possible, because children have an easier time learning.	As early as possible, other start to swim being infants.
9.	What creates a danger for a child during different water activities?	Children maybe too eager and violent. Children should be supervised under the water.	Children don't have a sense of danger and their care-freeness can cause problems if they don't have grown-ups watching over them.	Unsafe toys, in appropriate depth.
10.	What is your opinion about inflatable or foam swimming equipment, toys for children? Does your child use it? Which type of it? Does he like it?	A good activity that can keep small children over the water. Yes he use arm floats and swim ring /float.	Swimming equipments are very good to use, especially if they are just learning how to swim. It makes children feel safe even if they go deep into the water.	It is good if it's safe and good quality. My child uses swimming ring and swimming sleeves and she likes them both a lot.
11.	Maybe there is something else you would like to say?	Good luck with your project.		

	Country	Lithuania	Lithuania	Lithuania
1.	What is your name and age?	----- (mother)	----- (father)	Vitalik, 42 years old
2.	What is the age of your child / children and what is his / her /their name/s?	Robert, 6 years old Monika, 3 years old	Sofia, 7 years old	Dasha, 8 years old Elina, 14 years old
3.	Where you with your child / children usually spending time near the water settings?	Near the lake, sea, in the swimming pool.	Lake, sea.	Sea, lake
4.	What your child / children usually doing in the water?	Splashing, pouring the water, playing.	Splashing on the inflatable ring, try to dive.	Splashing, diving, play with a ball, swim.
5.	Can your child / children swim? If YES, how your child learned it? How old he/she was? If NO, how do you think he/she can learn it?	At the moment no. Really don't know, but think with our help.	Tries, but fails. To support a child with the hands and slowly show and describe how to work with hands and feet.	No. Trying to learn. Swims with armbands.
6.	Can you swim? If Yes. -> How you learned to swim? How old were you? If No. -> What is the reason? Do you want to learn how to swim? Why?			Yes, when I was 8 years old. How I don't remember, but without swimming equipment. Usually spend time near the lake.
7.	What is your opinion is it important to learn how to swim? Why?	Think yes.	Important.	Important in order not to drown.
8.	When it is the best age to start learning to swim?	From 1 year old, as they already have instinct for this.	Before the school age, as at this age it is easier to learn.	When a child starts to understand and not afraid. Maybe from 6 years old.
9.	What creates a danger for a child during different water activities?	Can swallow too much water, get panic, get lost, drown.	If under the supervision, there is no danger.	To swallow too much water, even under the supervision.
10.	What is your opinion about inflatable or foam swimming equipment, toys for children? Does your child use it? Which type of it? Does he/she like it?	These are just additional equipment. It is not safe. My child use an inflatable ring, but with an adult supervision and in the swimming pool.	Inflatable equipment is just for playing. Not suitable for teaching swimming.Uses inflatable ring. Child likes it. But when there are waves, there is a danger, as it can flip over.	Inflatable equipment is just like toys for entertainment. It can be ok to hold a ring and work with feet. It is interesting for children, but not so much. Jackets are not comfortable and restrict swimming in the water.
11.	Maybe there is something else you would like to say?	Will be good to have an equipment which can help child to learn how to float and swim by himself and also be safe.	It will be good if at schools there will be swimming classes with trainer.	

	Lithuania	Lithuania	Lithuania
1.	----- (mother)	Barbara, 31 years old	Jelena, 41 years old
2.	Airika, 5 years old		
3.	River, lake, sea, swimming pool.	In the childhood I spend time just in the lake. We were playing and splashing.	River, lake, sea, swimming pool.
4.	We went to Vichy aqua-park. There we taught our daughter to swim. She often used inflatable armbands and for playing inflatable ring. She also likes to dive. It was absolutely ok with the armbands, but without them, she was afraid to swim.		
5.	Tried to swim by herself. Father taught her also. She started swimming when she was 4. Once we were at the holiday and decided to take lessons with a swimming trainer and she learned to swim.		Child can learn to float and swim in the swimming pool with the help of the trainer. Important to describe and that child will not be afraid. To float on the water with the face down.
6.		Yes, I can. I start swimming while diving under the water. I put my face in the water and try to float. It is easier, as no need to hold a head. But it is difficult to stay longer, as there is no air to breath.	Yes, around 11 years old in the swimming pool. But I was forced to learn. In childhood I was put in a deep water in order to learn how to float and swim. I was afraid. After this, I was just staying in un-deep water.
7.	Yes, important. It is good for the physical health and it is a nice way to spend your time.	Yes, important because of the life circumstances.	Yes, important. What else to do in the water? Good for the physical health.
8.	As early as possible. It is important to know how to teach. There are special interesting activities to attract child's attention and teach him/her.	As early as better. But it is possible to learn to swim at any age. My experience.	As early as possible.
9.	The danger is when there is no supervision. Also not the right way of teaching, when parents throw child in the water that leads to that child afraid to swim then.		To swallow too much water and to drown.
10.	I like armbands, as they help child to float with less movement restriction and provide confidence feeling. A child is less afraid. Other inflatable equipment are just toys. We are using armbands. Ring was good before age 1,5 years.	There are no swimming equipment that is safe.	All for entertainment. Uncomfortable. Just armbands.
11.		It is easier to float in the sour water. My uncle learned to swim there.	

QUESTIONS FOR A SWIMMING TRAINER:

1. Tell me please about your activities related to t the eaching children to swim.
How long have you been teaching?

2. How do often the parents bring their children to the swimming pool in order to teach them to float and swim?

3. What is the common age to let a child to swimming lessons?
What is you opinion when it is better to start to teach a child to swim?

4. How long does it takes to teach a child to float and swim?

5. Some adults can't swim. Can they learn it? Is it harder to learn for an adult than for a child?

6. Can you describe the process of teaching children to float and swim.
How to start, what is important to keep in mind, how to explain to the children?

7. What is your opinion about the existing equipment for swimming?
Which items do you use for the teaching to swim?

8. What do you think about the inflatable equipment that are usually used by the child when he/she is placed in the water? What is the level of safety and role in the learning to float and swim process of that type of equipment?

9. How children usually behave in the water?

10. What creates a danger for the children in the water?

11. How the safety for a child is created in the pool?

12. What may be helpful for a child in order to prevent the possibility of drowning?

13. Maybe you want to add something related to this topic?

SUMMARY OF THE INTERVIEW WITH THE SWIMMING TRAINER:

Translated from Russian and Lithuanian by me.

At the beginning it is important that the child could put face down in the water, open eyes (goggles can be used), take a look. The child has not to be afraid to do this. For this reason different toys can be put on the bottom in order to attract the child's attention. It is also can be done not being in the water, but using something like a bowl or bucket.

The child has to learn to blow the air throw the nose while his/her face is submerged in the water. This will not let the child to breath throw the nose, like it is common for a normal breathing, and not let the water to get into the nose, that causes uncomfortability and frighten the child.

If the child is very scared of the putting down face in the water, it is better to start from the laying on the back. Armbands can be used for the support purpose.

Inflatable equipment is dangerous. It is interesting for the child as he/she can play with it and turn around in the water. The child can play with them just when he/she already can dive and not be afraid. Also not in the water were are waves.

Better equipment for the teaching is different floats and if the child is very afraid, armbands can be used just in the beginning.

Problem is that the parents provide their children with not the right information about the swimming lessons. Children see it as playful time and expect to have more fun, but not learning.

Some parents want to teach their children to float and swim at the age of 3 years old. This requires special lessons, as it is difficult to teach the kid because it has to be done through the playing.

At 5-9 months the child has a great connection with parents. This lead to that then the child will be not afraid of the water and can dive.

The time that is needed for a child to learn to float and swim is very individual. It is also depends on how often the child goes to the swimming lessons.

It is possible for the adult to learn to swim. It is more common to take individual lessons with a trainer.

The child must to hear what the parents or trainer says. The trainer must to speak in a right way that it will be possible to hear him/her from the distance and to understand.

It is better to use swim floats, swim woggles, swim toys. The swim belt doesn't provide the right swimming position. The child has to feel support by himself/herself. (to lay on the water like in the bed.) If the child's body position will change because of the swimming equipment, he/she will not feel how to lay on the water by himself. Armbands provides more freedom to move.

It is dangerous when someone pushes the child, something happens unexpectedly, appears depth changes, he/she swallows too much water. The child knows that bottom exists, but he/she has to be prepared that suddenly it can disappear. There will be nothing to stand on and to hold on. If it happens, the child have not to be afraid to go under the water or dive and then the water will bring him up. In the swimming pool someone can jump unexpectedly. The child can be scared in the situations when he/she lays on the back and then tries to stand, but can't feel the bottom, because of the wrong position and coordination. Waves are dangerous too. It is hard to understand were the up or bottom is and it is difficult to resist to the wave's movements. Teaching - in the calm water.

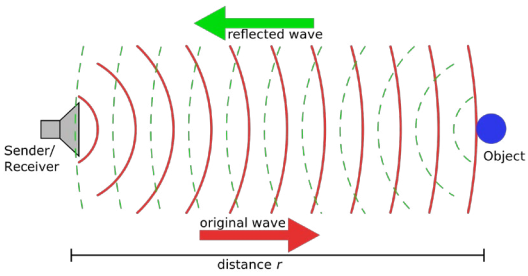
Breathing, floating, movements of arms and feet the child has to learn in the kid swimming pool (un-deep). When the child can float and move by using his/her feet, he/she can go to the deeper swimming pool. There everything has to be repeated again from the beginning, as everything is different. To learn to breath in and out takes time. First movements at the beginning are to sit and splash the water with feet. It is good to splash the water to each other in order not to be afraid of it. The child has to learn not to bend knees, but move having legs straight. The child can do it first lying on the back, then on the chest. While learning to move arms the support should be provided. The child can have foam float in one hand and move with another hand, then change it, then change it from one hand to another. Then the support can be reduced by taking the smaller float. Then it can be done without the support.

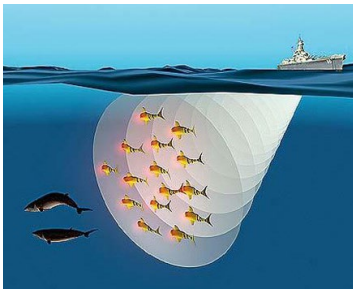
It is important that learning process will be interesting for the child and will attract his/her attention like a playing process. This will help to learn to swim in a shorter time.

Children with health conditions or impairments:
The child with autism (180 cm) has absolutely different movements, behaviour in the water. From the beginning he was just walking with hands rised up. When he started to lay on the water he was trying to hold to the swimming pool side. Then when he started to swim, he could swim well and fast.
Heart health conditions - not to overload (but it is not a training, but learning to swim!)
Epilepsy - parental control. Water is good compensator. Danger when the child is frightened.
Diabetes - not to overload.
Asthma - good to swim. Reduce health impairment. During all practice no need in medication.
Sinusitis - not to dive. / Cold snuffle - not to dive, ears can be hurt.

For all children - not to dive for long distances.

TECHNOLOGIES & MATERIALS





Ultrasound is an oscillating sound pressure wave with a frequency greater than the upper limit of the human hearing range.

Ultrasound is used in many different fields. Ultrasonic devices are used to detect objects and measure distances.

Ultrasonic imaging (sonography) is used in both veterinary medicine and human medicine. It used to visualize muscles, tendons, and many internal organs, to capture their size, structure and any pathological lesions with real time tomographic images.

In the non-destructive testing of products and structures, ultrasound is used to detect invisible flaws.

Industrially, ultrasound is used for cleaning and for mixing, and to accelerate chemical processes.

A common ultrasound application is an automatic door opener, where an ultrasonic sensor detects a person's approach and opens the door.

Sonar (originally an acronym for Sound Navigation And Ranging) is a technique that uses sound propagation (usually underwater, as in submarine navigation) to navigate, communicate with or detect objects on or under the surface of the water, such as other vessels.

Echo sounding is a type of SONAR used to determine the depth of water by transmitting sound pulses into water. The time interval between emission and return of a pulse is recorded, which is used to determine the depth of water along with the speed of sound in water at the time.

Echo sounding can also refer to hydro-acoustic "echo sounders" defined as active sound in water (sonar) used to study fish.

Deeper – smart sonar is a first of its kind, portable, wireless fish finder specially designed for amateur and professional fishermen.

Find Fish
High accuracy sonar shots reveal most of the fish species with a crystal clarity, and allows you to target your prey with confidence.

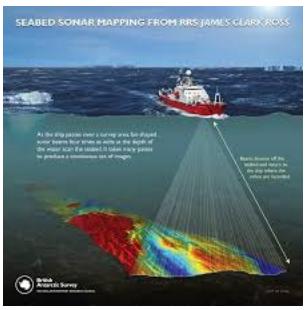
See Depth
Deeper sonar is powerful enough to perfectly function in the depths from 1.5 ft (0.5 m) to ~130 ft (40 m) below the surface in both salt and fresh waters.

Explore Bottom Structure
Enhance your fishing experience with the detailed view of the bottom terrain, and fish holding habitat using innovative Deeper Smart Imaging technology.

Know Temperature
Deeper temperature sensors provide accurate fluctuations of the water temperature so you always know the perfect biting time.

Reveal New Spots
With castable Deeper and its mounting solutions you can explore the lake, river or sea from every angle. Scan places other fish finders cannot reach.

Catch & Share
Become next generation angler with all in one solution - join global community of smart fishermen and inspire others by sharing your monsters.



THE "AQUAMAN CRYSTAL"

Scientists create crystal which would allow us to breathe underwater.

Researchers from the University of Southern Denmark have synthesized crystalline materials that can bind and store oxygen in high concentrations. The stored oxygen can be released again when and where it is needed.

"An important aspect of this new material is that it does not react irreversibly with oxygen -- even though it absorbs oxygen in a so-called selective chemisorptive process. The material is both a sensor, and a container for oxygen -- we can use it to bind, store and transport oxygen -- like a solid artificial hemoglobin," says Christine McKenzie.

"It is also interesting that the material can absorb and release oxygen many times without losing the ability. It is like dipping a sponge in water, squeezing the water out of it and repeating the process over and over again," Christine McKenzie explains. Once the oxygen has been absorbed you can keep it stored in the material until you want to release it. The oxygen can be released by gently heating the material or subjecting it to low oxygen pressures.

The material can draw oxygen from water just as easily as from air, so it remains an interesting proposition for the future of underwater diving.

The material may also be configured in a device that could absorb oxygen directly from water and allow a diver to stay submerged for long periods of time, without the need for bulky air tanks.

"This could be valuable for lung patients who today must carry heavy oxygen tanks with them," explains Professor McKenzie.

FiLIP tracks your kids and lets them call you, so you can relax

The FiLIP smart locator has assisted GPS along with GSM and Wi-Fi hotspot triangulation, so parents can pinpoint their child's location using the companion app for iOS and Android, whether the little one is indoors or out. You can also set up "safe zones"—geofenced areas like the child's preschool, home, the babysitter's home—and get an automatic push notification when the kid arrives or leaves.

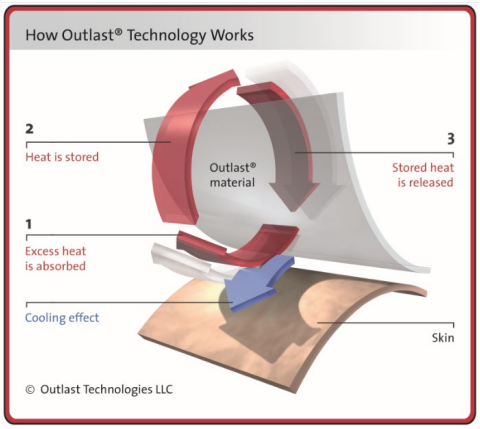
But it's not just a locator device. FiLIP is a real phone. Parents can program five contact numbers: their cell phones, landlines, and even other FiLIPs, that their kids can call. Parents can call the Filip, of course, or send a one-way text message, but kids can't send texts.

In fact, all the things your kids can't do are quite intentional. FiLIP doesn't let them text. It has no games or Internet. There isn't a USB port for charging, it uses a nifty magnetic charger instead, that snaps on to the back with a satisfying click. All this should help the simple, two-button FiLIP appeal to parents who want to keep track of their kids who are still too young for real mobile phones. Even the wristwatch form-factor contributes to this, since the child is less likely to lose it.

An emergency button on the side of the FiLIP, when held down for three seconds, sends a push notification to the parents while placing a call to the primary contact. If there's no answer, it keeps calling all the numbers until someone picks up.

FiLIP is available now through AT&T for $199, plus $10 per month for unlimited voice and data.

SWIMWEAR TEXTILES & TECHNOLOGY



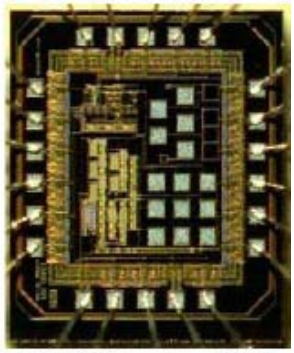


Fig. 2. RF CMOS transceiver at 433 MHz (1.6 mm×1.5 mm size dimensions) fabricated in CMOS 0.7 μm.

High-technology swimwear fabrics are scientifically advanced materials used for swimwear in competitive water sports such as swimming and triathlon. Materials of this type are normally spandex and nylon composite fabrics with features to reduce drag against the water. The fabrics include features that increase the swimmer's glide through the water (said to mimic marine animal skin) and reduce the absorption of water by the suit as opposed to regular swimsuits.

The swimwear that keeps you DRY: Material is impossible to get wet - even in the pool.

Two Bare Feet Classic Baby Wetsuit Navy

The Two Bare Feet Classic Baby Wetsuit is perfect for babies and toddlers who feel cold and shivery while swimming. The thick neoprene in these suits keep their little bodies nice and warm for longer. Which makes for a happier and more relaxed swimtime.

The Two Bare Feet Classic Baby Wetsuit is made from neoprene, like a standard wetsuit, so offers a total sun block as well as protecting your baby from cooler water or the wind while on the beach.

Outlast® materials improve comfort by regulating temperature through proactive heat and moisture management.

Outlast Technologies offers Thermocules, a microencapsulated phase change materials, which are incorporated into fabrics and fibers for absorbing, storing, and releasing excess heat. The company's products comprise temperature regulating textiles, fabrics, fibers, and knits. Its products are used in outdoor sports, bedding, apparel, and footwear applications, as well as home furnishings, packaging, military, and medical markets. Outlast Technologies was inducted into the Space Technology Hall of Fame in 2005 and become a Certified Space Technology in 2003.

The concept of wireless smart suit for hydrotherapy sessions allows the monitoring of individual biometric data, such as heart rate, movement and temperature of the patient body and swimming-pool water temperature. The smart suit will be lightweight, machine washable, comfortable, easy-to-use shirt with embedded sensors. The sensitive information is able to monitoring vital statistics and sending them remotely for further processing. Therefore, a small-size, robust, low-cost and low-power electronic microsystem embedded in the cloth is a promising approach.

The monitoring electrodes, the sensors and the electronics are sewed in the textile material (e.g. neoprene, usually used in diving suits) achieving a good skin contact. The sensors are plugged into the suit around patient chest and abdomen.

CORK

Cork is sustainable, environmental friendly, and easily recyclable material. It is elastic, waterproof, fireproof, and buoyant. Cork is perfect for bathrooms because it is waterproof and has natural anti-fungal properties.

Cork is the outer bark of a special oak tree. After each harvest the cork tree fully regenerates its precious bark and can be harvested over and over again until the tree reaches approximately 200 years of age.

Characteristics:
Elastic and Resilient - tend to turn to it's original shape.

Light - low density - floats on the water - strong watertight membranes not absorb water gain density / mass in humid conditions.

Insulation - low conductivity of heat, sound and vibration. Durable. Honeycomb structure.

Impermeable - to liquid and gasses, stops it rfom rotting or degrading over time.

Durablity - extremely durable, high friction coefficient. Survive repeat impact.

Hypoallergenic - not absorb dust. Ideal for those, who suffers from allergies or asthma). Easy to clean.

EVA foam

EVA foam is closed cell foam made from Ethylene Vinyl Acetate and blended co-polymers. It has a high level of chemical cross linking. The result is semi-rigid product with a fine uniform cell structure. This suitable for use in a wide variety of situations and applications.

Benefits of EVA Foam include:
- Impact and vibration absorption.
- Weather and chemical resistance.
- Acoustic and thermal insulation properties.
- Buoyancy with low water absorption.
- Suitability for thermos-forming and thermos-molding.

EVA and Polyethylene are similar forms of Closed Cell Foam. However EVA is softer and more resilient than Polyethylene, and has greater recovery characteristics after compression. EVA Foam range of densities varies from 30 to 400 kg/m3 and availiable in a variety of different colours.

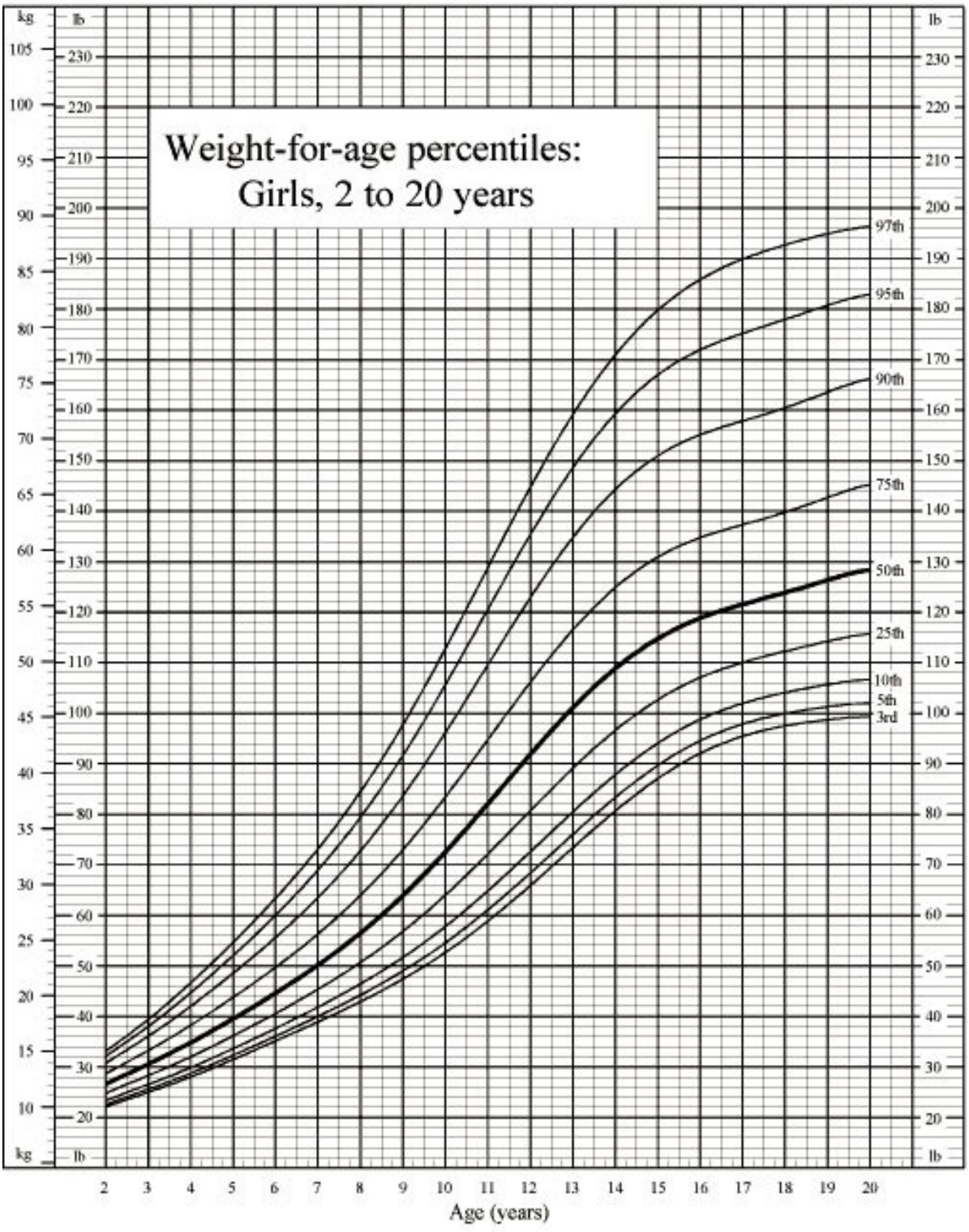
The foam is formed in a mould, resulting in a sheet of Closed Cell Foam known as a bun. The maximum length, width and thickness of the bun varies depending upon the foam's density. It can be cut into sheets of the required thickness or fabricate the material into a particular shape, piece or profile.

Application: EVA Foam is an extremely versatile product. It's suiting a broad range of different uses and applications. It is an effective replacement for many materials. Like felt, neoprene, natural rubber, polyurethane foam, pvc foam, wood composites, mineral wool and fibreglass.

Footwear: Wedge Soles, Runner, Top Line Padding, Moulded Soles, Orthotics.
Sports & Leisure: Kickboards, Sports Mats, Body Protection, Canoe Seats, Toys and Games, Camping Bedrolls.
Packaging: Cushion Packaging, Corner Pads, Case Inserts, Display Packaging.
Building: Nail Washers, Expansion Joints, Glazing Seals, Eaves Fillers, Impact, Sound Deflect, Insulation.
Automotive: Gaskets and Seats, Carpet Underlay, Headliners, Interior Padding.
Electronics: Work Station Mats, Shock Absorbing Pads.

WEIGHT-BY-AGE CHART

(was compared with other ones and information appeared the same, but more detailed)

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