DEVELOPMENT OF A TOOL FOR **INDIVIDUAL AQUATIC RISK MANAGEMENT** AMONG CHILDREN OF 6-12 YEARS

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DEVELOPMENT OF A TOOL FOR INDIVIDUAL AQUATIC RISK MANAGEMENT AMONG CHILDREN OF 6-12 YEARS (IARM-C)

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Funciones de los autores:
The first, second and third author were constructing and guiding the research plan and process. The second author

Abstract

Background: When it comes to children's competence in, on and around water, their risk management also plays an important role. For an optimal and save participation in aquatic recreation, there is a crucial need to communicate about a realistic perception of potential dangers in relation to one's own actual and perceived aquatic skills.

Goals: The aim of this study was to develop and validate a tool for Individual Aquatic Risk Management for Children (IARM-C) useful in both research and practice regarding water safety for elementary school children and their families, as offered in schools, by local communities and different (water) sport organisations.

Method: The IARM-C tool was developed and validated in three subsequent phases: (1) a selection of relevant aquatic situations with possible risks for children based on the literature and discussed with experts, resulting in 10 aquatic situations that were drawn, (2) a pilot study with 22 children to test content (face) validity, and (3) a cross-sectional study with 70 children (6-12 years, 35 girls and 35 boys, 8.9 ± 2.0 years) recruited via convenience sampling in different (swimming) schools in Brussel (Belgium) to test their risk perception, assessment and decision making in these 10 situations.

Results: For each of the 10 aquatic risk situations of the IARM-C, data collection was organised in a one-on-one interview in order to assist the child in completing the questionnaire. Six of the 10 pictures resulted in a correct risk perception for > 80% (range between 83-94%) of the children. For one drawn aquatic risk situation in the swimming pool context (i.e. falling on someone else), only 60% of the children gave a correct description of the situation. In the drawn open water aquatic risk situations, three pictures scored quite low (range between 49%-54%): warning flag at sea, dangerous objects and sandbank in the sea.

Conclusions: The IARM-C tool, showing pictures of aquatic risk situations followed by three categories of questions (risk perception, assessment and decision making), is a useful instrument for further research and education purposes, especially for the swimming pool cases.

Keywords: Water competence, aquatic skill, risky play, water recreation, swimming, swimming pool, open water.

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Introduction

Motor / water competence: actual & perceived

+

Potential risks in water recreation

Introduction

Teaching school-aged children basic swimming, water safety and safe rescue skills are emphasized as **cost-effective community-based actions** (WHO, 2014)

Interested in how people develop into more **competent, confident, and motivated participants** in an aquatic environment (Dudley, 2019)

The **role of individual risk management** in relation to **drowning** in children is poorly understood (Moran, 2006)

Risk can be managed by **teaching sound aquatic risk management strategies** as a part of swimming/water safety education

(Asher et al. 1995; McCool et al. 2009; Stallman et al, 2017; Turgut et al. 2016; Wiesner & Rejman, 2014)

Introduction

Broad view of risk in education is necessary

Beneficial risk

Injuries / drowning

Focus on ‘<u>beneficial risk</u>’

engaging in experiences that take persons <u>outside of their comfort zone</u>, including outcomes that may be beneficial to learning, development and life satisfaction

(Cooke et al., 2019)

Introduction: research questions

What are the most relevant potential risky situations for a child in an aquatic environment during leisure time?

A. Is a child able to describe the risk in the pictures: '<u>RISK PERCEPTION</u>'?

B. How is the '<u>RISK ASSESSMENT</u>':

(1) What about the feelings of a child when it is in the same situation as drawn in the pictures?

(2) What is the likelihood those situations happen to a child?

C. '**<u>DECISION MAKING</u>**': What are child's own actions when in trouble and what to they expect from peers & adults?

Methods

DEVELOPMENT OF TOOL: PHASE 1

What are the most relevant potential risky situations for a child in an aquatic environment during leisure time?

Literature
Expert opinion (Belgium & Netherlands)

SWIMMING POOL ICON

Table 1. Aquatic risky situations in a swimming pool (in grey those selected with experts)

Swimming pool (Indoor/outdoor)	References
Water slide with accelerations	(Chalmers et al., 2003; Cunningham, 2019)
Risky play with a ball (like water polo)	(Langendorfer, 2011)
Diving board (bad diving in water or diving from to high)	(Peden et al., 2020)
Indoor play castle (floating devices)	(Peden & Franklin, 2020)
Jumping on each other (slip and not paying attention)	(Peden & Franklin, 2020)
Supervision by parent/friend(s)	(Morrongiello et al., 2013; Stanley & Moran, 2017)
Lifeguards inattentive	(Pelletier et al., 2011; Schwebel et al. 2007)
Absence of barriers (fences)	(Hamilton et al. 2019, Raman et al., 2021)
Peer pressure	(Willcox-Pidgeon et al., 2020)
Unexpected depth change	(Peden et al., 2020)

Table 2. Aquatic risky situations in an open water environment (in grey those selected with experts)

Open water (river, lake, sea ...)	References
Cold water temperature (cramps)	(Stallman et al., 2008)
Canoeing in river (not wearing life jacket)	(Peden & Franklin, 2020; Willcox-Pidgeon et al., 2020)
Playing in sea, high waves & yellow flag to warn	(Peden & Franklin, 2020; Stallman et al., 2008)
Bumping head against a large object in open water (ponton)	(Peden & Franklin, 2020)
Sandbank/sandbar in the sea	(Hatfield et al., 2012; Moran & Webber, 2014)
Incident light reflecting off the water	(experts' input)
Depth indication	(Stallman et al., 2008)
Filthy water & loose material (stuck in mud)	(Connolly, 2014)
Ignoring safety signs	(Williamsen, 2010)
Swimming in a canal/river	(Peden et al., 2020)

Methods

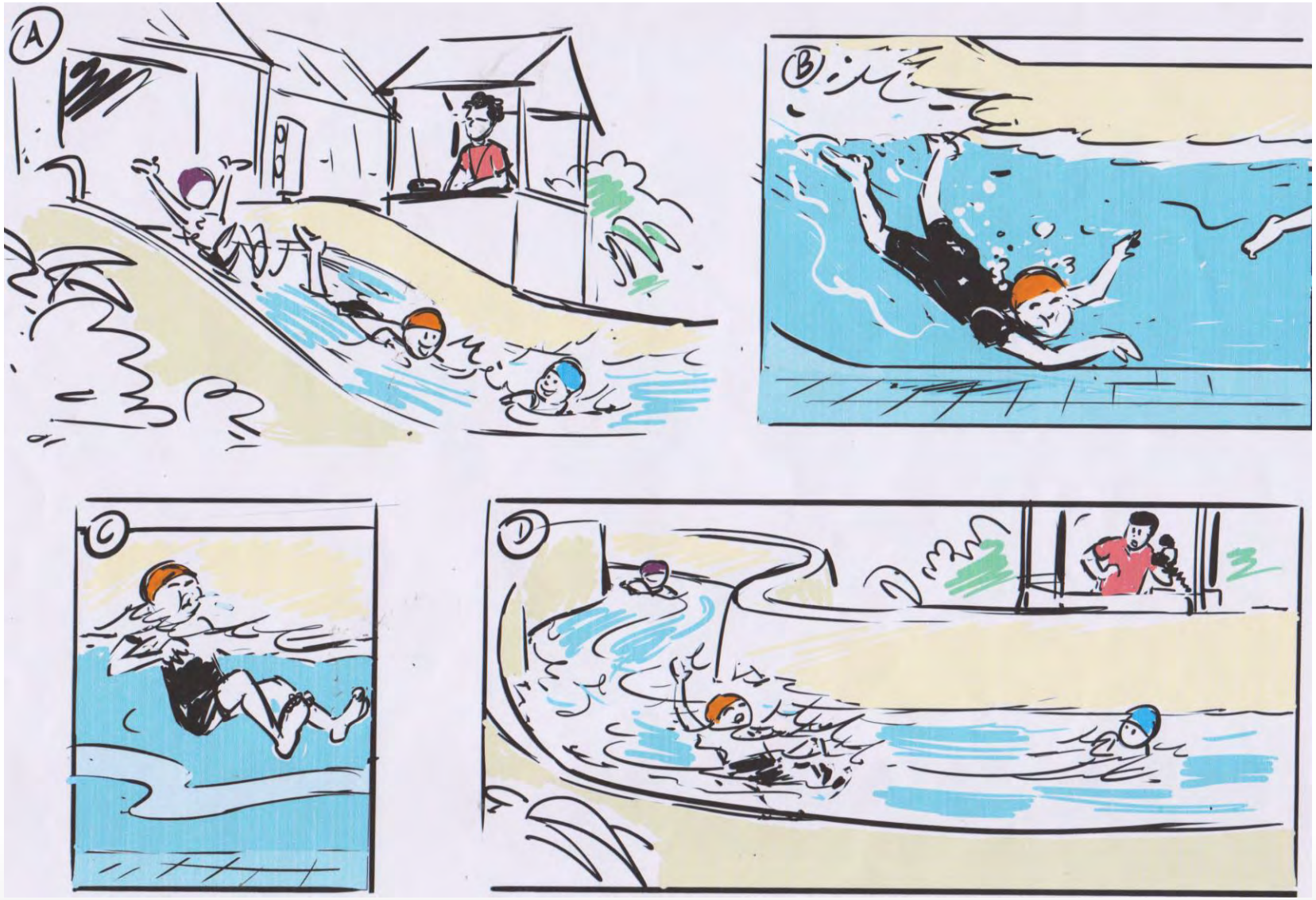
DEVELOPMENT OF TOOL: PHASE 2

- ✓ **Check validity**
- ✓ Testing tool in small group of (individual) children (N=22)
- ✓ Thinking out loud → feed back
- ✓ Write down remarks of the children
- ✓ Changes were made to the drawnings after discussion with the research group

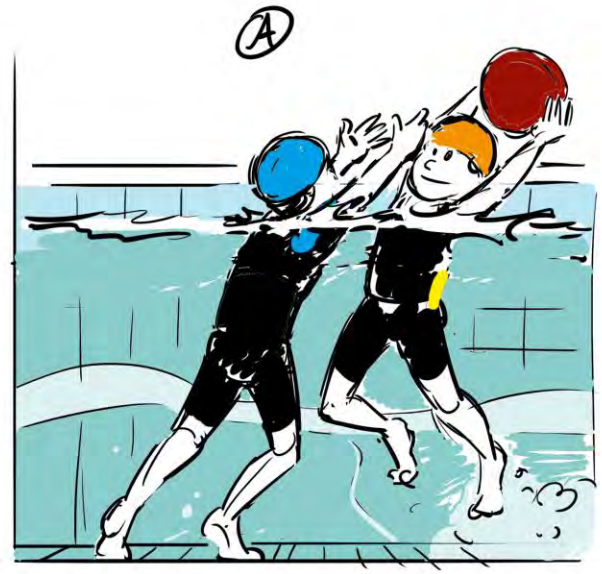
Examples of **adaptations to the pictures**:

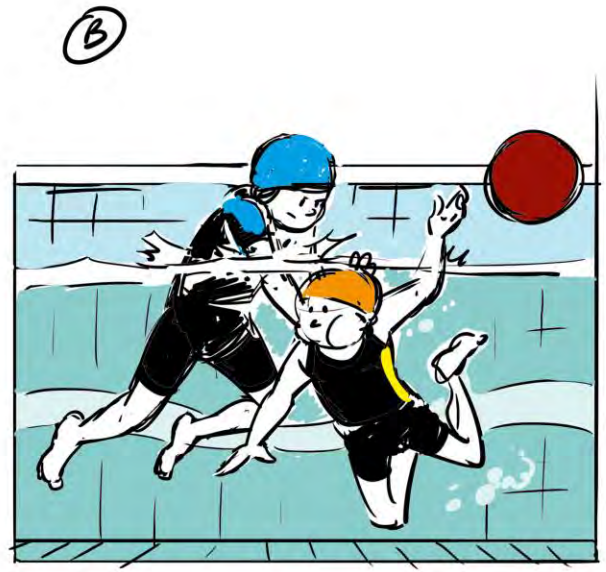
- unclear what was going on exactly
- the importance of the depth of the water
- confusion about which character in picture to look at → leading character identified by wearing the same clothes (Döring et al., 2010) → orange cap

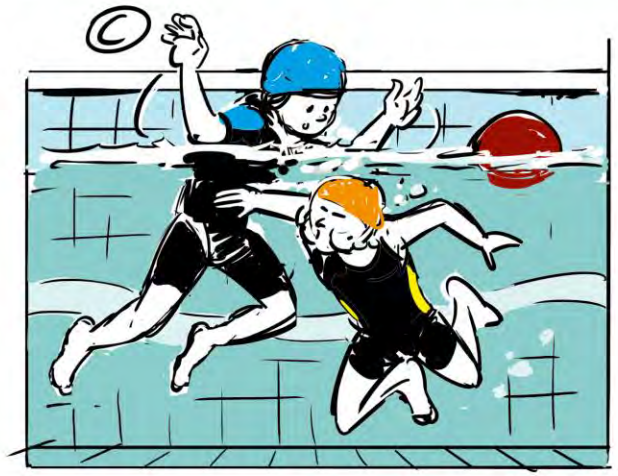
Water slide with accelerations



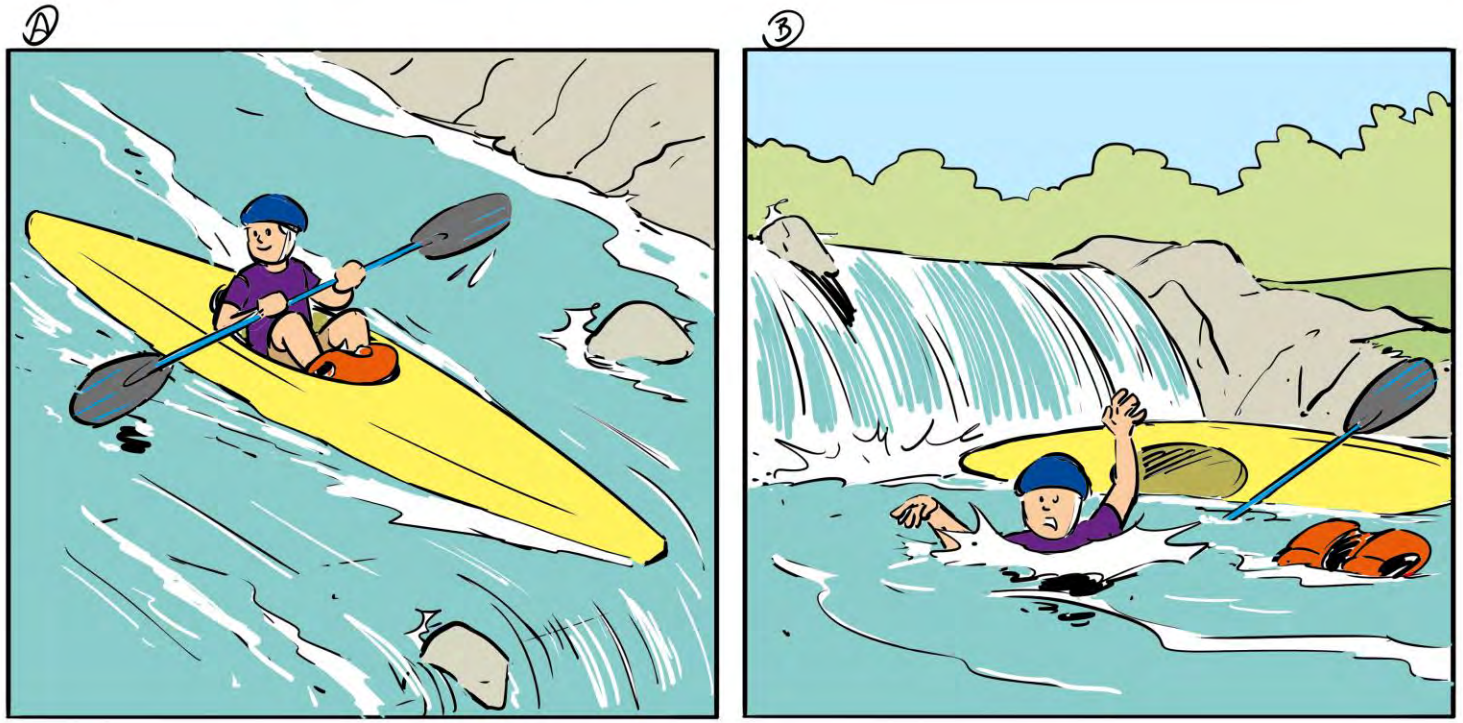
Risky play wit a ball, being pushed under water & trouble breathing



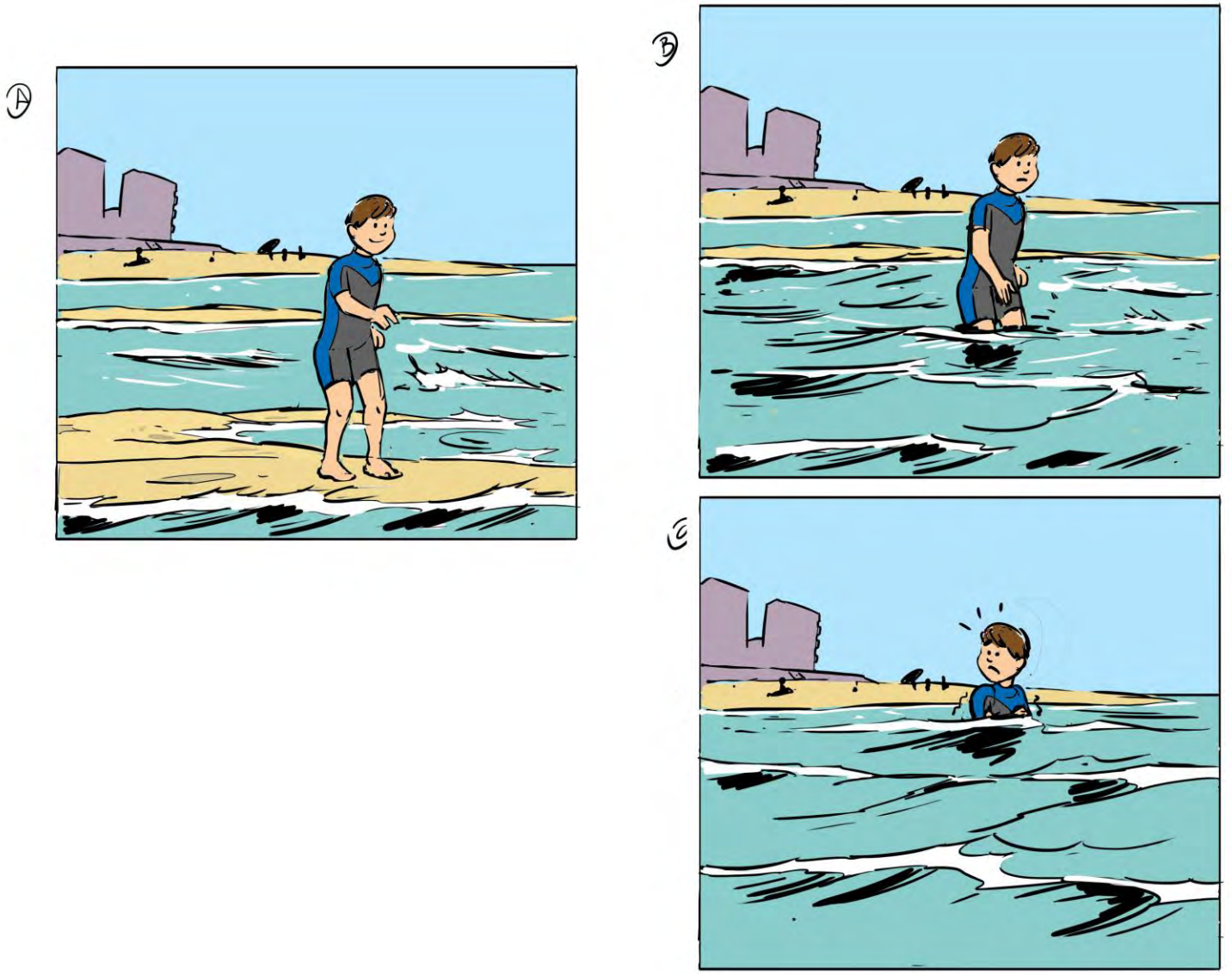




Canoeing in river, not wearing life jacket



Sandbanck in the sea



Methods

DEVELOPMENT OF TOOL: PHASE 3

Cross-sectional study with 70 children (mean age of 8,9 ±2 years; 35 girls & 35 boys)

- 6 years (n=10)
- 7 years (n=12)
- 8 years (n=9)
- 9 years (n=10)
- 10 years (n=10)
- 11 years (n=10)
- 12 years (n=9)

Recruited in ≠ swimming schools in Brussels (convenience sampling)

Written informed consent parents/guardians

Explanation of procedure to children

Showing 10 pictures (as comic strip) one by one, followed by questions on risk competence
One-on-one interview: (A) risk perception, (B) risk assessment & (C) decision making

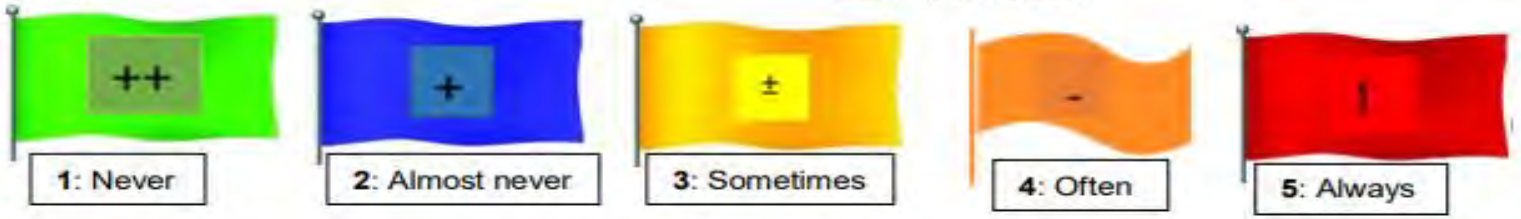
Method

A

B

C

Child	Parent
Risk perception	
1) What do you see in the drawing?	/
Risk assessment	
2a) How do you feel when this happens with you? (Smiley-scale)	2a) How do you feel when this happens to your child? (Smiley-scale)
2b) What is the likelihood this happens to you? (Flag-scale)	2b) What is the probability of this happening to your child? (Flag-scale)
Decision making	
3a) How do you fix this situation for yourself? 3b) What do you expect of other children? * 3c) What do you expect of adults ? *	3a) What do you expect to happen to your child in this situation? 3b) What do you expect from other children? * 3c) What can you do as a parent? 3d) What can/should other adults do? *



*only if they are seen in the drawing

Results

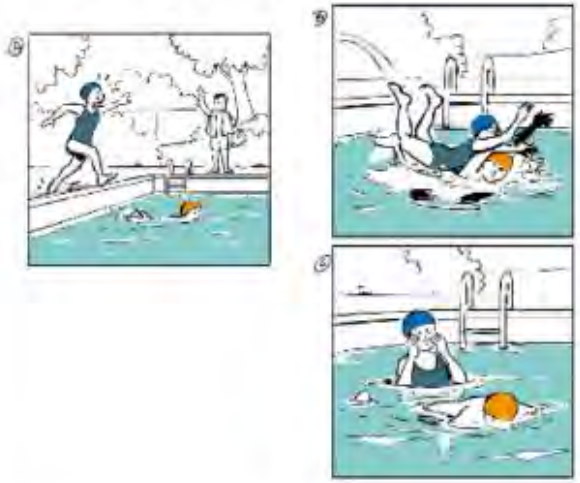
(A) risk perception

Aquatic risk situation	Description drawing *What do you see?* Correct **risk perception** in %
1. **Water slide with rapids** 	The child (with the orange cap) plays in water slide with 2 other children, falls in water/dives on belly, swallows up water & chokes when coming back up (panic). 86%
2. **Risky ball play** 	The child (with the orange cap) plays with the ball, another child tries to steel it, resulting in being pushed under water & getting troubles with breathing 83%
3. **Diving board** 	The child (with the orange cap) tries to dive (wrongly), hurts belly, and has stomach pain 94%

Results

(A) risk perception

SWIMMING POOL ICON

4. Indoor playing castle 	The child (with the orange cap) jumps off floatable playing castle & gets under it, bumps, and hurts head, gets troubles with breathing 89%
5. Falling on someone 	The child runs without paying attention to the pool, falls into the water on another child (with the orange cap) who falls unconscious 60%

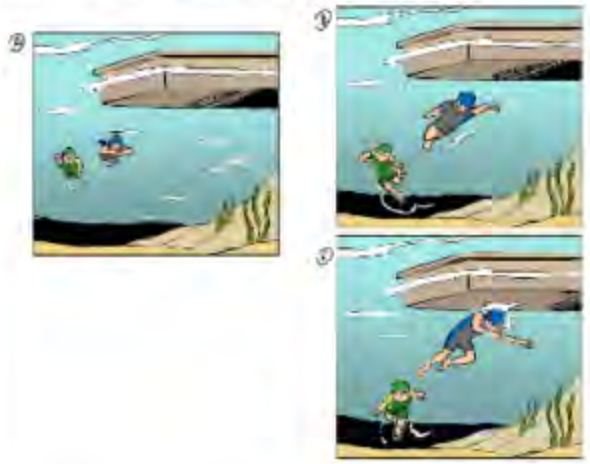
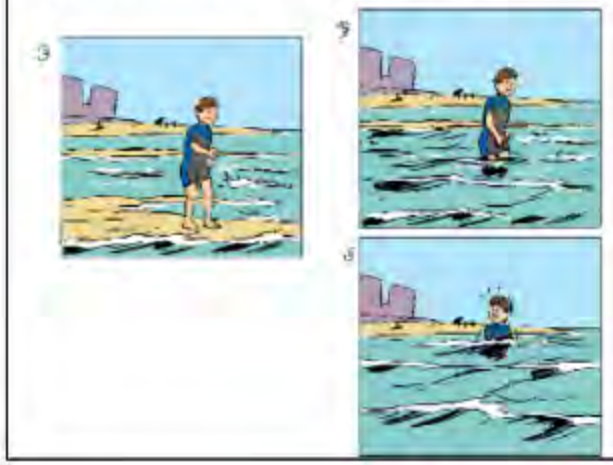
Results

(A) risk perception

Aquatic risk situation	Description drawing *What do you see?* Correct **risk perception** in %
6. **Cold water immersion** 	The child (with the orange cap) holds his leg, gets cramps, back of leg muscles hurt, cold, deep water, child almost drowns 86%
7. **Canoeing without life jacket** 	The child is canoeing, does not pay attention, boat tilts, lot of current, not wearing life jacket 81%
8. **Warning (yellow) flag** 	The child (with the orange cap) sees a child playing in the see not expecting high waves, putting pressure to come in the water too, another child is afraid, yellow flag as warning 50%

Results

(A) risk perception

9. Dangerous object 	The child is swimming in open water, racing against another child, not looking well ahead, bumping head against something big (e.g., boat, ponton) 49%
10. Sandbank in the sea 	Sea, sand, water is not deep, but becomes deeper because of the tide (current) & fast change of water level 54%

Results

(B) Risk assessment

Table 5: Risk assessment of children in the 10 aquatic risk situations (i.e. 1-5 in the swimming pool vs. 6-10 in open water).

Aquatic risk situation	*How do you feel when this happens to you? (in %)*					*What is the likelihood this happens to you? (in %)*				
1.	30	49	20	0	1	14	43	34	9	0
2.	43	49	9	0	0	37	13	26	24	0
3.	19	33	49	0	0	13	21	43	23	0
4.	44	51	4	0	0	29	46	26	0	0
5.	59	23	19	0	0	29	44	26	1	0
6.	9	33	59	0	0	34	34	31	0	0
7.	23	43	34	0	0	30	27	37	6	0
8.	10	17	54	13	6	40	24	21	14	0
9.	41	40	19	0	0	33	61	3	3	0
10.	26	36	36	0	3	17	41	27	14	0

DISCUSSION

STRENGHTS & LIMITATIONS

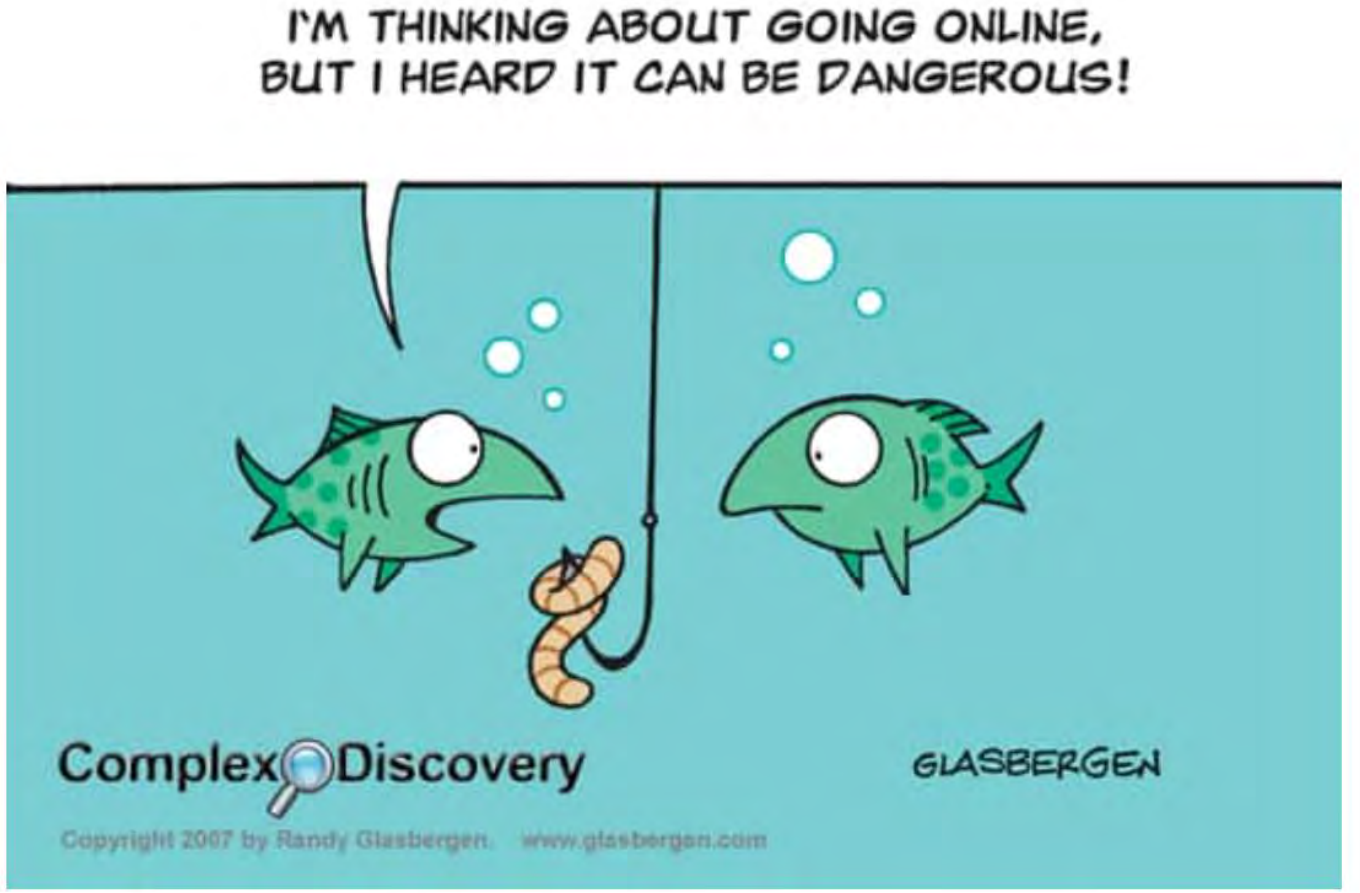
- Tool to identify risks & easy communication
- Small sample with selection bias
- Influence local aquatic context

FUTURE RESEARCH

- More (diverse) groups
- Compare international, intercultural
- study effect of interventions
- APPs, VR, …

PRACTICAL IMPLICATIONS

- Using pictures in (swimming) education
- Child & family-based



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