Validation of aquatic fundamentals sequence of development

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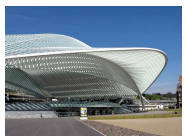

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Introduction

- **Aquatic competences** refer to all **fundamentals** that should be developed in order to get familiarized with the aquatic environment.
- **Assessing** aquatic competences is **critical during childhood** since this period is very favourable to the development of these fundamentals
- Fundamentals can be characterized by **sequences of development (SOD)**.
- Testing battery (TB) should include all fundamentals and consider the different steps of progression of the SOD.

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Aim of the study

- To develop a testing battery (TB) of aquatic competences
- **To validate with experts the fundamentals and associated sequence of development (SOD)**
- **To integrate SOD into aquatic competence testing battery.**

3

Methods : study design

Action –research methodology

Step 1	Step 2	Step 3	Step 4	Step 5
Initial version of the testing battery (TB) and of the SOD	Submission of the TB and SOD to 6 experts Questionnaires	Data analysis Improvement of TB and SOD according to experts opinion	Use of the TB with children in a swimming pool Improvement of TB and SOD following pre-test	Final version of the TB and SOD presented to experts for validation

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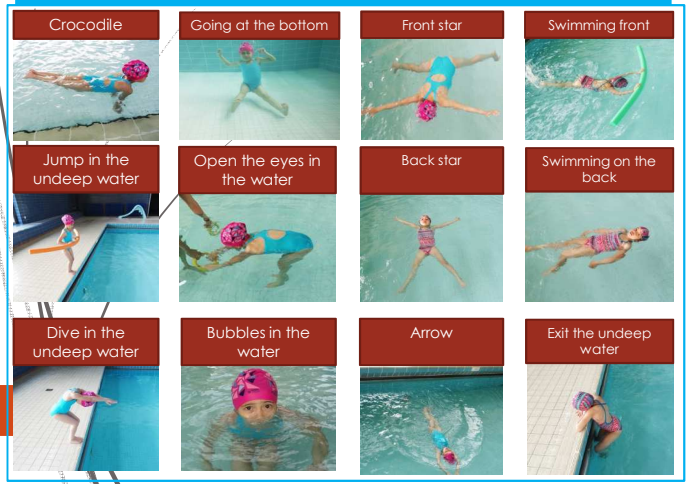
→ Experts were selected according to their practical and professional experience in swim learning with children

	Curriculum	Specific aquatic education	Experience in swim learning	Years of practice
Expert 1	→ PhD in PE	→ Entraineur « A » coachs sportifs.	→ Moniteur de natation. → Coordinateur d'une école de natation. → Professeur de didactique natation à la VUB et l'UGent.	15 yr
Expert 2	→ Master in PE → «Personal Trainer ».	→ Formation Niveau 1 et 2 à l'Adeps en Natation. → BSSA.	→ Moniteur de stages Espoirs organisés par la FFBN. → Entraineur des groupes niveaux régional et national. → Pratique du sauvetage sportif en compétition. → Nageur de niveau national et international.	13 yr
Expert 3	→ Master in PE, AESS. CAPAES.	→ Moniteur Adeps en natation et BSSA. → Formateur en premiers secours.	→ Athlète aux Jeux Olympiques en 1976. → Entraîneur pour la FFBN et en club niveau international. → Coordinateur d'une école de natation. → Conseiller pédagogique, formation des cadres ADEPS, pour la natation, la natation synchronisée, le water-polo et le plongeon.	31 yr
Expert 4	→ Master in PE	→ Educateur sportif des activités de natation.	→ Moniteur de natation et d'accoutumance à l'eau.	25 yr
Expert 5	→ Master in PE, AESS	→ Néant.	→ Moniteur au CEReKi. → Moniteur de natation.	25 yr
Expert 6	→ Master in PE	→ Néant.	→ Moniteur et responsable au CEReKi (création du jardin d'accoutumance). → Rédaction et publication d'articles sur l'accoutumance à l'eau.	12 yr

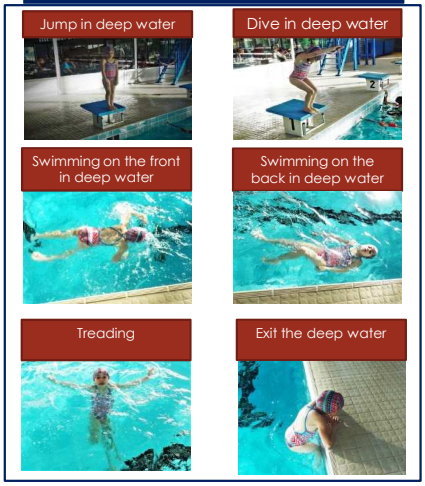
Andora Vidal

Results : testing battery (18 situations)

Undeep water



Deep water



Results : testing battery (18 situations)

Example : Exercice 6 = Bubbles in the water

L1	L2	L3	L4	L5	L6	L7	L8
							
Blow on a tennis table ball	Keep breathing mouth at water level	Blow shortly with mouth under water	Blow >3sec with mouth under water	Blow shortly with mouth and noise under water	Blow >3sec with mouth and noise under water	Blow shortly with full face under water	Blow >3sec with full face under water

Reduce level if child is not able

Start with the highest level

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Results : fundamentals

9 categories

- Entry in the water
- Exit the water
- Immersion
- Buoyancy
- Balance in the water
- Breath control
- Gliding
- Propulsion
- View

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Results : sequence of development

- Fundamental 1 : Entry in the water

Enter by the feet

Level	Water depth	Sequence of Development
0	Shal	The child refuses to enter the water.
1	Shal	The child enters walking in the water with the help of the instructor
2	Shal	The child enters by walking in the water alone.
3	Und	The child enters the water by the ladder.
4	Und	The child enters the water, starting sitting on the edge, with the help of the instructor
5	Und	The child enters the water, starting sitting on the edge, with the help of a floating object.
6	Und	The child enters the water without help, starting sitting on the edge.
7	Und	The child jumps into the water with the help of the instructor
8	Und	The child jumps into the water with the help of a floating object.
9	Und	The child jumps into the water alone, without help.
10	D	The child jumps into the water with the help of a floating object.
11	D	The child jumps into the water alone, without help.
12	D	The child jumps into the water alone from the starting pad.
13	D	The child jumps into the water alone, from the starting pad or a small springboard, and makes a figure.

Enter by the head

Level	Water depth	Sequence of Development
1	Shal	The child enter the water on all four with ands first.
2	Und	Sitstart, the child swings forward to enter the water by the head, with the help of the instructor.
3	Und	Leaving on his knees, the child enters the water by the head.
4	Und	Start standing, the child jumps from the edge with the arms forward. The entry by the head is not controlled.
5	Und	Standing start, the child jumps off the edge unassisted and enter by the head .
6	D	Standing start, the child jumps from the starting block without assistance and enter by the head .
7	D	The child jumps into the water from the starting block or a small springboard, and enter by the head with a figure.

Results : sequence of development

- Fundamental 2 : Exit the water

Level	Water depth	Sequence of Development
0	Shal	The child is not able to exit the shallow water on his own
1	Shal	The child exit the shallow water by walking and with the help of the instructor
2	Shal	The child exit the shallow water by walking on his own.
3	Und	The child exit the undeep water by the ladder.
4	Und	The child exit the undeep water from the edge of the pool
5	D	The child exit the deep water by the ladder
6	D	The child exit the deep water from the edge of the pool

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Results : sequence of development

- Fundamental 3 : Immersion

Level	Water depth	
0	Shower	The child refuses to get wet.
1	Shower	The child accepts the splashes on his body (shower).
2	Shal	The child agrees to stand in the shallow water (knee level).
3	Und	The child agrees to immerse himself in the undep water (navel level).
4	Und	The child agrees to immerse himself in the undep water (shoulder level).
5	Und	The child puts his mouth into the water.
6	Und	The child puts his mouth and nose into the water.
7	Und	The child immerses briefly his whole face (mouth, nose, eyes) into the water
8	Und	The child immerses briefly his his full head into the water briefly.
9	Und	The child immerses for 3 seconds his full head
10	Und	The child immerses his full head for 3 seconds and passes under an object
11	Und	The child sits in the bottom of the undeep water for at least 3 seconds
12	Und	The child lies in the bottom of the undeep water for at least 3 seconds.
13	D	The child descent into great depth (at least 2m) with the help of a pole
14	D	The child descent into great depth (at least 2m) on his own

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Results : sequence of development

- Fundamental 4 : Buoyancy

Level	Water depth	Position	Sequence of Development
0	Und		The child refuses to leave the feet from the floor
1	Und	F	The child lies on the front by clinging to the edge pool, or to bars
2	Und	B	The child lies down for 3 seconds on the back with the help of a monitor
2	Und	F	The child lies down for 3 seconds on the front with the help of a monitor
3	Und	B	The child lies down for 3 seconds on the back with the help of a floating object
3	Und	F	The child lies down for 3 seconds on the front with the help of a floating object
4	Und	B	The child lies down for 3 seconds on the back, arms and legs apart (dorsal star)
4	Und	F	The child lies down for 3 seconds on his front, arms and legs apart (ventral star)
5	Deep	Vert	The child is treading, head out of water, less than 5 seconds using the arms and legs.
6	Deep	Vert	The child is treading, head out of water, for 5 seconds using the arms and legs.
7	Deep	Vert	The child is treading, head out of water, for 5 seconds using the legs and keeping his hands above water for at least 5 seconds
8	Deep	Vert	The child is treading and turns on its own, head out of water, for at least 15 seconds using its arms and legs.
9	Deep	Vert	The child is treading and turns on its own, head out of the water, for at least 15 seconds using the legs and keeping the hands above the water for at least 5 seconds.

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Results : sequence of development

- Fundamental 5 : balance in the water

Level	Water depth	Sequence of Development
0	Shal	The child refuses to enter the water.
1	Shal	The child moves on all fours in a depth below the knee.
2	Shal	The child lies on his stomach with the support of his hands on the ground. The legs are stretched behind and touch the ground.
3	Shal	Child moves from prone to dorsal position with hands on the ground
4	Und	The child goes from the ventral position to the dorsal position by putting his feet on the ground
5	Und	The child moves from the ventral position to the dorsal position from a rotation and with the help of a floating object
6	Und	Child moves from ventral to back position from unassisted rotation

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Results : sequence of development

- Fundamental 6 : Breath control

Level	Water depth	Sequence of development
0	Und	The child does not dare to blow on a small floating ball.
1	Und	The child blows on a floating ball mouth out of the water
2	Und	The mouth is submerged, not the nose. The child briefly blows (<3 seconds) into the water.
3	Und	The mouth is submerged, not the nose. Child blows in water for 3 seconds
4	Und	The mouth and nose are submerged. The child briefly blows (<3 seconds) into the water.
5	Und	The mouth and nose are submerged. The child blows in the water for 3 seconds.
6	Und	The child performs 5 cycles of aquatic breathing in a row: breathe out 3 seconds - breath in 1 second
7	Und	The child performs 5 cycles of aquatic breathing in a row: breathe out 7seconds - breath in 1 second

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Results : sequence of development

- Fundamental 7 : Gliding

Level	Water Depth	Position	Sequence of development
0	Und		The child fails to push on the wall in order to glide on the water.
1	Und	F	The child pushes on the wall and glides briefly on the water in a prone position. Arms and body are not perfectly aligned
2	Und	B	The child pushes on the wall and glides briefly on the water in the back position. Arms and body are not perfectly aligned
3	Und	F	The child pushes on the wall and glides on the water for 3 seconds in the prone position. Arms and body stay aligned
4	Und	B	The child pushes on the wall and glides on the water for 3 seconds in the back position. Arms and body stay aligned
5	Und	F-B	The child pushes on the wall and glides on the water for 3 seconds and turns from the ventral position to the dorsal position. Arms and body stay aligned
6	Und	B-F	The child pushes on the wall and slides on the water for 3 seconds and turns from the dorsal position to the ventral position. Arms and body stay aligned

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Results : sequence of development

- Fundamental 8 : propulsion

Level	Water depth	Position	Sequence of development
0	Shal		Child fails to, crawl four feet deep below the knee.
1	Shal	Vert	The child walks a depth below the knee.
2	Shal	F	The child moves forward on all fours in a depth below the knee.
2	Shal	B	The child moves on all fours in the back position, in a depth below the knee.
3	Shal	F	The child moves to the prone position with his hands, in a depth below the knee.
3	Shal	B	The child moves in the back position with his hands, in a depth below the knee.
4	Und	F	The child swims 5 meters in the prone position with the help of a floating object
4	Und	B	The child swims 5 meters in the back position with the help of a floating object
5	Und	F	The child swims 5 meters in the prone position without help but uncoordinated movement of the arms and legs
5	Und	B	The child swims 5 meters in the back position without help but uncoordinated movement of the arms and legs
6	Und	F	The child swims 5 meters in the prone position without help and with a coordinated movement of the arms and legs
6	Und	B	The child swims 5 meters in the back position without help and with a coordinated movement of the arms and legs

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Results : sequence of development

- Fundamental 9 : vision

Level	Water Depth	Sequence of development
0	Und	The child does not open their eyes in the water.
1	Und	The child briefly opens his eyes in the water.
2	Und	The child opens his eyes in the water for a long time.

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Results : example with a subject

1. Crocodile Test : L3

13			14							
12			13							
11			12							
10			11							
9			10							
8			9	9						
7	7		8	8			7			
6	6	6	7	7		6	6	6	6	6
5	5	5	6	6		5	5	5	5	5
4	4	4	5	5		4	4	4	4	4
3	3	3	4	4	4	3	3	3	3	3
2	2	2	3	3	3	2	2	2	2	2
1	1	1	2	2	2	1	1	1	1	1
0	0	0	1	1	1	0	0	0	1	1
			0	0	0	0	0	0	0	0
Entry by F	Entry by H	Exit	Immersion	Buoyancy F	Buoyancy B	Balance	Breath	Propulsion F	Propulsion B	Gliding	Vision
Entry				Buoyancy				Propulsion			

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Results : example with a subject

1. Crocodile Test : L3

2. Entry / feet : L8

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	Entry by F	Entry by H	Exit	Immersion	Buoyancy F	Buoyancy B	Balance	Breath	Propulsion F	Propulsion B	Gliding	Vision
	Entry				Buoyancy				Propulsion			
14				14								
13	13			13								
12	12			12								
11	11			11								
10	10			10								
9	9			9	9							
8	8			8	8							
7	7	7		7	7			7				
6	6	6	6	6	6		6	6	6	6	6	
5	5	5	5	5	5		5	5	5	5	5	
4	4	4	4	4	4	4	4	4	4	4	4	
3	3	3	3	3	3	3	3	3	3	3	3	
2	2	2	2	2	2	2	2	2	2	2	2	2
1	1	1	1	1	1		1	1	1		1	1
0	0	0	0	0	0		0	0	0		0	0

Results : example with a subject

1. Crocodile Test : L3

2. Entry / feet : L8

3. Entry / head : L2

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	Entry by F	Entry by H	Exit	Immersion	Buoyancy F	Buoyancy B	Balance	Breath	Propulsion F	Propulsion B	Gliding	Vision
	Entry				Buoyancy				Propulsion			
14				14								
13	13			13								
12	12			12								
11	11			11								
10	10			10								
9	9			9	9							
8	8			8	8							
7	7	7		7	7			7				
6	6	6	6	6	6		6	6	6	6	6	
5	5	5	5	5	5		5	5	5	5	5	
4	4	4	4	4	4	4	4	4	4	4	4	
3	3	3	3	3	3	3	3	3	3	3	3	
2	2	2	2	2	2	2	2	2	2	2	2	2
1	1	1	1	1	1		1	1	1		1	1
0	0	0	0	0	0		0	0	0		0	0

Results : example with a subject

4. immersion: L3

21

			14								
13			13								
12			12								
11			11								
10			10								
9			9	9							
8			8	8							
7	7		7	7			7				
6	6	6	6	6		6	6	6	6	6	
5	5	5	5	5		5	5	5	5	5	
4	4	4	4	4	4	4	4	4	4	4	
3	3	3	3	3	3	3	3	3	3	3	
2	2	2	2	2	2	2	2	2	2	2	2
1	1	1	1	1		1	1	1		1	1
0	0	0	0	0		0	0	0		0	0
Entry by F	Entry by H	Exit	Immersion	Buoyancy F	Buoyancy B	Balance	Breath	Propulsion F	Propulsion B	Gliding	Vision
Entry				Buoyancy				Propulsion			

Results : example with a subject

4. immersion: L3

5. vision: L0

22

			14								
13			13								
12			12								
11			11								
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9			9	9							
8			8	8							
7	7		7	7			7				
6	6	6	6	6		6	6	6	6	6	
5	5	5	5	5		5	5	5	5	5	
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1	1	1	1	1		1	1	1		1	1
0	0	0	0	0		0	0	0		0	0
Entry by F	Entry by H	Exit	Immersion	Buoyancy F	Buoyancy B	Balance	Breath	Propulsion F	Propulsion B	Gliding	Vision
Entry				Buoyancy				Propulsion			

Results : example with a subject

4. immersion: L8

5. vision: L0

6. Bubbles: L3

13			14								
12			13								
11			12								
10			11								
9			10								
8			9	9							
7	7		8	8							
6	6	6	7	7		6	7				
5	5	5	6	6		6	6	6	6	6	
4	4	4	5	5		5	5	5	5	5	
3	3	3	4	4	4	4	4	4	4	4	
2	2	2	3	3	3	3	3	3	3	3	
1	1	1	2	2	2	2	2	2	2	2	2
0	0	0	1	1		1	1	1		1	1
			0	0		0	0	0		0	0
Entry by F	Entry by H	Exit	Immersion	Buoyancy F	Buoyancy B	Balance	Breath	Propulsion F	Propulsion B	Gliding	Vision
Entry				Buoyancy				Propulsion			

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Results : example with a subject

4. immersion: L8

5. vision: L0

6. Bubbles: L3

7. Front star: L3

8. Back star: L3

13			14								
12			13								
11			12								
10			11								
9			10								
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2	2	2	3	3	3	3	3	3	3	3	
1	1	1	2	2	2	2	2	2	2	2	2
0	0	0	1	1		1	1	1		1	1
			0	0		0	0	0		0	0
Entry by F	Entry by H	Exit	Immersion	Buoyancy F	Buoyancy B	Balance	Breath	Propulsion F	Propulsion B	Gliding	Vision
Entry				Buoyancy				Propulsion			

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Results : example with a subject

9. Arrow: L0

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	Entry by F	Entry by H	Exit	Immersion	Buoyancy F	Buoyancy B	Balance	Breath	Propulsion F	Propulsion B	Gliding	Vision
	Entry				Buoyancy				Propulsion			
14				14								
13	13			13								
12	12			12								
11	11			11								
10	10			10								
9	9			9	9							
8	8			8	8							
7	7	7		7	7			7				
6	6	6	6	6	6		6	6	6	6	6	
5	5	5	5	5	5		5	5	5	5	5	
4	4	4	4	4	4	4	4	4	4	4	4	
3	3	3	3	3	3	3	3	3	3	3	3	
2	2	2	2	2	2	2	2	2	2	2	2	2
1	1	1	1	1	1		1	1	1		1	1
0	0	0	0	0	0		0	0	0		0	0

Results : example with a subject

9. Arrow: L0

10. Swim Ft UW : L4

11. Swim Bk UW : L4

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	Entry by F	Entry by H	Exit	Immersion	Buoyancy F	Buoyancy B	Balance	Breath	Propulsion F	Propulsion B	Gliding	Vision
	Entry				Buoyancy				Propulsion			
14				14								
13	13			13								
12	12			12								
11	11			11								
10	10			10								
9	9			9	9							
8	8			8	8							
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4	4	4	4	4	4	4	4	4	4	4	4	
3	3	3	3	3	3	3	3	3	3	3	3	
2	2	2	2	2	2	2	2	2	2	2	2	2
1	1	1	1	1	1		1	1	1		1	1
0	0	0	0	0	0		0	0	0		0	0

Results : example with a subject

9. Arrow: L0 10. Swim Ft UW : L4 11. Swim Bk UW : L4 12. Exit UW : L4




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0	0	0	0	0		0	0	0		0	0
Entry by F	Entry by H	Exit	Immersion	Buoyancy F	Buoyancy B	Balance	Breath	Propulsion F	Propulsion B	Gliding	Vision
Entry				Buoyancy				Propulsion			

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Results : example with a subject

13. Entry DW/ F: L0 14. Entry DW/ H: L0 15. Swim Ft DW: L4 16. Swim Bk DW: L4




			14								
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3	3	3	3	3	3	3	3	3	3	3	
2	2	2	2	2	2	2	2	2	2	2	2
1	1	1	1	1		1	1	1		1	1
0	0	0	0	0		0	0	0		0	0
Entry by F	Entry by H	Exit	Immersion	Buoyancy F	Buoyancy B	Balance	Breath	Propulsion F	Propulsion B	Gliding	Vision
Entry				Buoyancy				Propulsion			

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Results : example with a subject

17. Treading : L0 18. Exit DW : L6

Entry by F	Entry by H	Exit	Immersion	Buoyancy F	Buoyancy B	Balance	Breath	Propulsion F	Propulsion B	Gliding	Vision
Entry				Buoyancy				Propulsion			
13			14								
12			13								
11			12								
10			11								
9			10	9							
8			9	8							
7	7		8	7			7				
6	6	6	7	6		6	6	6	6	6	
5	5	5	6	5		5	5	5	5	5	
4	4	4	5	4	4	4	4	4	4	4	
3	3	3	4	3	3	3	3	3	3	3	
2	2	2	3	2	2	2	2	2	2	2	2
1	1	1	2	1		1	1	1		1	1
0	0	0	1	0		0	0	0		0	0
			0								

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Perspectives : adaptative test

- SOD => classify children in a continuum for each fundamental
- Results in some situations could be predicted from other situations
- Determine the best "entry situation" according to children profile (age ? Perceived competence?)
- Following situations would depend on children results

Dive in the deep water front a block
And take the ring at the bottom of the pool

Entry by F	Entry by H	Exit	Immersion	Buoyancy F	Buoyancy B	Balance	Breath	Propulsion F	Propulsion B	Gliding	Vision
Entry				Buoyancy				Propulsion			
13			14								
12			13								
11			12								
10			11								
9			10	9							
8			9	8							
7	7		8	7			7				
6	6	6	7	6		6	6	6	6	6	
5	5	5	6	5		5	5	5	5	5	
4	4	4	5	4	4	4	4	4	4	4	
3	3	3	4	3	3	3	3	3	3	3	
2	2	2	3	2	2	2	2	2	2	2	2
1	1	1	2	1		1	1	1		1	1
0	0	0	1	0		0	0	0		0	0
			0								

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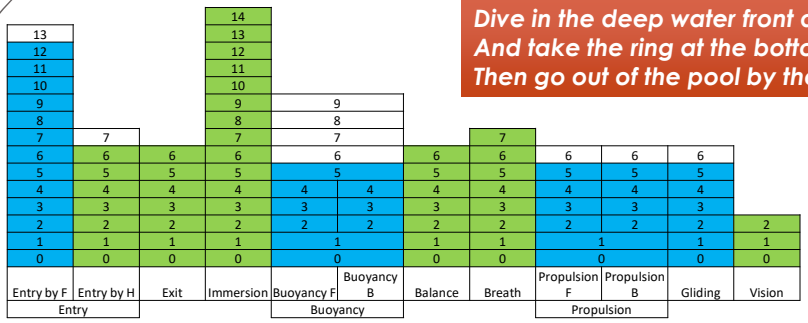
Perspectives : adaptative test

- SOD => classify children in a continuum for each fundamental
- Results in some situations could be predicted from other situations
- Determine the best "entry situation" according to children profile (age ? Perceived competence?)
- Following situations would depend on children results



Dive in the deep water front a block
And take the ring at the bottom of the pool
Then go out of the pool by the edge

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Conclusion

- Validated **fundamentals** and **sequence of development**
- SOD should be paired to each tested situation in order to determine accurately children level and needs in each of the identified fundamentals.
- Developent of an adaptative test
- Such approach could be helpful to develop a more accurate pedagogical approach.

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LIÈGE université
CEREKI
Université de Liège
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3E SEMAINE
DE L'ÉDUCATION PHYSIQUE,
DE L'ACTIVITÉ PHYSIQUE
ET DU SPORT
Programme
Thank you for your attention
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