

Aquatic Competencies and Drowning Prevention in Children 2–4 Years: A Systematic Review

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Table S1. Search methodology including databases and search terms used.

Search Number	Search Term
Medline	
1	Drown* (no limits)
2	Drown* with limits of English language, human, 1930-2019
3	Competency* (no limits)
4	Skill* (no limits)
5	Intervention (no limits)
6	Prevention (no limits)
7	Swim* (no limits)
8	Combined 2–7 OR
9	Combined 8 AND 2
PUBMED	
1	Drown* (no limits)
2	Drown* with limits of English language, human, 1930-2019
3	Competency* (no limits)

- 4 Skill* (no limits)
- 5 Intervention (no limits)
- 6 Prevention (no limits)
- 7 Swim* (no limits)
- 8 Combined 2–7 OR
- 9 Combined 8 AND 2

Scopus

TITLE-ABS-KEY (drown*) AND PUBYEAR > 1930 AND PUBYEAR < 2019 AND (TITLE-ABS-KEY (competency*) OR TITLE-ABS-KEY (skill*) OR TITLE-ABS-KEY (intervention) OR TITLE-ABS-KEY (prevention) OR TITLE-ABS-KEY (swim*))

PsychInfo

Drown* and competency* OR skill* OR intervention* OR prevention OR swim* (no limits)

Drown* and competency* OR skill* OR intervention* OR prevention OR swim* (limited to Peer reviewed and 1 January 1930 to 31 July 2019)

Drown* and competency* OR skill* OR intervention* OR prevention OR swim* (limited to Peer reviewed and 1 January 1930 to 31 July 2019 and human and English language)
OR Drown* AND (child* OR swim* OR skill* OR prevention)

Sports Discus

Drown* (TX All Text) AND competency* OR skill* OR intervention* OR prevention* OR swim*(TX All Text) limits to (1 January 1930 to 31 July 2019). Language English. Search modes—BooleanPhrase

Cochrane.org

The term swim was entered which produced 21 papers, and the term swim was entered which produced 28 papers.

Embase

Drown* (TX All Text) AND competency* OR skill* OR intervention* OR prevention* OR swim*(TX All Text) limits to (1 January 1930 to 31 July 2019). Language English. Search modes—BooleanPhrase

* include all derivatives of a word for search string results.

Table S2. List of references deemed relevant to study design of systematic literature review.

Reference

Anderson, D.I.; Rodriguez, A. Is There an Optimal Age for Learning to Swim? *J. Mot. Learn. Dev.* **2014**, *2*, 80–89. [52]

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Table S3: Detailed Water Competencies.

Water Competency	Anderson & Rodriguez [53]	Asher et al. [59]	Blanksby et al. [60]	Brenner et al. [56]	Bugeja & Franklin [54]	Costa et al. [55]	Erbaugh [62]	McGraw [63]	Olaisen et al. [52]	Parker & Blanksby [58]
Deck behaviour		X								
Out of water safety behaviour (deck behaviour—e.g., running around pool, pushing others, entering water without an adult).										
Jump and swim		X								
Water recover		X								
Swimming ability		X								
(face underwater, recover from prone, roll back to front, propulsive kicking, beginner stroke, independently enter and exit pool, jump into pool independently).										
In-water safety skills		X								
(water recovery ability to stand up when dropped from above water and ability to jump in and swim to edge of pool).										
Safety skills									X	

Bounces off pool bottom in 3 feet of water at least 2 times in a row								X
Listens + waits + shows respects for all students and teachers								X
Bobs bouncing controlled off pool bottom, 10 x 3 feet depth, arms at sides								X
Demonstrates simple rescue: identifies urgency, exits pool, finds noodle, and reach assist								X
Bobs bouncing controlled off pool bottom 10 x 5 feet depth in streamline glide arms overhead								X
Goes willingly with teacher without parents' assistance								X
Entry	X	X		X		X	X	X
Water entry						X		
Feet-first entry						X		
Head-first entry						X		
Jump into water	X							
Can jump in by means of pencil dive (feet first- held together)	X							X
Dive head first into water from pool deck	X							
Jump: enter pool foot first by climbing down ladder or jumping into the water and propelling self to examiner, 18 tasks		X					X	

Enters wading pool (<2 feet) on own will							X		
Enters pool safely no diving at all times							X		
Enters big pool safely 25 yards, 6 lanes on own will							X		
In 6 feet depth demonstrates kneeling dive with hands above head interlocked							X		
Diving: Enter pool head first and propel self to instructor		X				X		X	
Exit		X						X	
Exit pool without assistance using ladder								X	
Demonstrates ability to pull themselves out of water to exit (not using ladder to exit)								X	
Submersion	X	X	X	X				X	X X
Breath control - immersion of the face and eye opening						X			
Deepwater immersion						X			
Submerging:complete submersion with or without hesitation			X						X
Swim underwater for 16 ft	X								
Swim underwater and retrieve rings from depth of 6 ft	X								
Ring pick-up: Stand independently in shallow (chest deep) water and grasp a ring placed near the feet		X						X	

Hold breath for 3 seconds with entire head submerged										X	
Demonstrates comfort with keeping face below water surface for 15 seconds										X	
Holds breath fully submerged body and head 10 seconds										X	
Submerged in prone position without support									X		
Submerged supine position without support									X		
Water familiarisation	X	X	X	X	X	X	X	X	X	X	X
Water orientation and adjustment at vertical position							X		X		
Water teaching confidence, be totally happy in water			X								X
Put head in water without goggles	X										
Breath control	X	X	X					X		X	X
Blows bubbles with mouth and chin below water surface										X	
Blowing bubbles with whole face below water surface			X								X
Body position		X	X			X	X	X	X		
Body position at ventral gliding						X					
Body position at dorsal gliding						X					
Body position at longitudinal rotation in gliding						X					

Body position at front and back somersaults						X			
Locomotion back float: stretched body			X						X
Front float: stretched body			X						X
Tread ater	X							X	
Tread water for 1 min	X								
Sculling movements with hands/arms while floating on back	X								
Buoyancy/Flotation		X	X	X		X	X		X
Horizontal buoyancy									
vertical buoyancy at deep water						X			
Buoyancy: able to kick with kickboard by self with or without bubble						X			
Pencil glide (feet together, arms over head), assisted, face down, with push-off from wall				X					X
Flutter kick on back, back of head resting in water, with feet in water (assisted)								X	
Demonstrating parallel position with hands at waist (aka dolphin pulls), on tummy								X	
Floating on back, head rested parallel, 5 seconds assisted								X	
Straddling noodle, feet off pool bottom, and balancing for 15 sec								X	

Glide off wall, face down, streamline, until no more forward movement min 4 yards	X
Demonstrate flutter kicking with kickboard, on tummy, in streamline position with face down, 10 yards	X
Scullinghand propeller movement, arms at side 10 yards from shallow to deep end	X
10 arms rotations, with choice of freestyle or backstroke with or without breathing	X
Demonstrates ability to float on tummy face down, for 20 sec minimum	X
Vertically floating with kickboard at chest 20 seconds	X
Floats on back without forward motion minimal use of arms and legs for 30 seconds	X
From push off streamline with flutter kick past 5 yards kicking to surface and swims freestyle	X
Initiates body roll: <ul style="list-style-type: none"> rotation from tummy to back using flutter kick floating horizontally 	X

Asynchronous sculling with arms at waist, face down aka propeller hands 10 yards min									X	
Rotates from face down to face up pauses and reverse floating horizontally									X	
Treads water for 15 seconds in 6 feet depth, not using arms at any point									X	
Kicking	X	X	X			X	X		X	X
Leg kick with breath						X				
Control at ventral body position, with flutter										
Boards										
Without flutter boards						X				
leg kick with breath control at dorsal						X				
body position with flutter boards										
Without flutter boards						X				
Kicking with board 10m:			X							X
• back and front										
• on front and incorporating breathing										
• lifting head up and down, while keeping shoulders in water										
Kicking on back (10m), Good body position, arms by side			X							

Breaststroke on back with board (5m) - Looking for feet turned out feet than propulsion.	X			
Make forward progress in prone while approximating butterfly kick	X			
Endurance	X	X		X
Flutter kicking on back with kickboard assisted at chest, 5 yards				X
Demonstrating 5 big arm rotations on tummy (arms fully out of water) – face down				X
From centre of pool swims back any stroke to wall mini 10 yards				X
5 feet depth swims underrate along pool bottom 10 feet minimum				X
While swimming freestyle demonstrates appropriate hip and shoulder roll with side breathing 3 x min				X
Demonstrates 20 yards freestyle with finger /writs a forearm entry in front of head				X
Horizontal supported in water head above water level				X
Locomotion: Front maintain a prone position and propel self with or without	X		X	

Preferred side breathing (ear parallel
with shoulder blade)

Swim front crawl for 38 ft with better
control than Level 2

X

Swim backstroke for 38 ft

X