ATHLETE DEVELOPMENT MATRIX
SKILLS INVENTORY

Climbing Escalade Canada has created this Athlete Development Matrix – Skills Inventory as a road map to outline what climbers need to learn at each stage of Long-Term Development (LTD). While this document is not a comprehensive list of all the skills required or used in climbing, it does provide a good overview and recommended progression. Please send us your feedback so that we can continue to improve this tool.

The following skills inventory describes the optimal sequencing and timing of the skills required at each stage of development to help ensure that each new skill is built on a solid foundation of previously acquired skills. The CEC skills domains (or categories) are: Safety, Technical Skills, Tactical Skills, Athleticism (physical abilities and sport abilities), and Mental, Social and Emotional Skills.

Created for the long-term development of a climbing athlete, we recognize that athlete development is also based on skills developed in a variety of different sports, in physical education classes, and in recreational and life experiences.

DISCLAIMER
CEC encourages climbing coaches to be aware of their current limitations. While coaches may be experts in terms of technical climbing skills, they may possess gaps in other domains. CEC highly recommends that coaches seek guidance from relevant professionals prior to advising athletes in the domains of health and safety. This includes helping athletes seek appropriate medical attention for injuries, as well as redirecting athletes with disordered eating to qualified individuals.

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SKILLS INVENTORY - Definitions

Introduce: The athlete learns about and starts to practice the skill for the first time. This is when athletes are given the opportunity to get the idea of the skill, how it feels, what it looks like. Introduction can be formal instruction, or informal (introduced through play). For safety reasons, introduction of some skills may start with education about the skill and no training is done until later stages.

Develop: The athlete practices and is able to perform the skill inconsistently under stable conditions. At first, performance of the skill lacks precision, rhythm, and flow. Over time, performance of the skill starts to become more consistent and mechanically sound.
Development of physical abilities can occur through the development of sport specific skills.

Consolidate: The athlete is able to perform the skill with accuracy and consistency. Performance of the skill is mechanically correct, and becoming automated. The athlete is able to perform the skill when they are under pressure, conditions change, or demands increase.
Training of physical abilities becomes a focus.

Refine: Skill performance is very consistent, and precision is high under demanding conditions. The athlete is able to adjust the skill to rapidly changing circumstances and sub-optimal conditions. Performance of the skill is highly automated. Once certain skills are refined, other skills should be re-visited and further refined.
Training of physical abilities is maximized.

(*) Terms followed by an (*) are further defined in the Glossary at the end of this document.

LEGEND:

B	Bouldering
L	Roped Climbing (Lead, Top Rope)
S	Speed Climbing

I	Introduce
D	Develop
C	Consolidate
R	Refine

AS	Active Start
FUN	Fundamentals
L2T	Learn to Train
T2T	Train to Train
T2C	Train to Compete

Competitive Category:				N/A		D	C		B		A		Junior	
LTD Stage:				AS	FUN	L2T	L2T	L2T	L/T2T	T2T	T2T	T2C	T2C	T2C
Age:				<6	6-8	9-10	11	12	13	14	15	16	17	18+
SAFETY	**Discipline**													
Warming up	B	L	S	I	I	D	D	C	C	R	R	R	R	R
Use of personal protective equipment[1]		L	S	I	D	C	R	R	R	R	R	R	R	R
Partner check		L	S	I	D	C	C	R	R	R	R	R	R	R
Commands[2]		L		I	D	C	C	R	R	R	R	R	R	R
Use of general training equipment[3]	B	L	S	I	I	D	D	C	R	R	R	R	R	R
Climbing etiquette, use of facility	B	L	S	I	D	D	C	R	R	R	R	R	R	R
Facility awareness	B	L	S	I	D	D	C	R	R	R	R	R	R	R
Awareness of other climbers	B	L	S	I	D	D	C	R	R	R	R	R	R	R
Landing safely on matting	B	L	S	I	D	D	C	R	R	R	R	R	R	R
Respond to falling		L		I	D	C	R	R	R	R	R	R	R	R
Clipping[4]		L		N/A	I	I	D	D	C	R	R	R	R	R
Belaying and lowering (lead, top rope)[5]		L	S	N/A	I	D	D	C	R	R	R	R	R	R
Equipment safety check	B	L	S	N/A	I	D	C	R	R	R	R	R	R	R
Spotting	B	L		N/A	N/A	I	I	D	C	R	R	R	R	R
Training with Hang Board[6]	B	L	S	N/A	N/A	N/A	I	I	I	I	D	C	R	R
Training with Campus Board[6]	B	L	S	N/A	N/A	N/A	N/A	N/A	N/A	I	I	D	C	R

[1] Includes securing own harness, tying rope into harness, rope management

[2] Examples include: “on belay”, “climbing”, “take”, “tension”, “slack”, “falling”, “clipping”, “lower”, “off-belay”

[3] Examples include: rubber bands, wobble boards, jump mats, boxes

[4] Clipping is also a technical skill as well as a tactical skill.

[5] Intro to learning to belay varies greatly across Canada, from facility to facility. **Check with your facility before introducing belay skills** (should be refined by T2T).

[6] Safety consideration re: growth & development: Limit intensity, frequency, depth of position, # of fingers. Can introduce the concept of using training boards earlier, but use a graduated approach. Timing and progression of training should be tailored to each athlete according to stage of development and skeletal maturity (finger bone growth plates open v. closed). Progressing too early puts the athlete at risk of growth plate fractures in the fingers. X-ray evidence of growth plate closure is imperative.

Competitive Category:		N/A		D	C		B		A		Junior	
LTD Stage:		AS	FUN	L2T	L2T	L2T	L/T2T	T2T	T2T	T2C	T2C	T2C
Age:		<6	6-8	9-10	11	12	13	14	15	16	17	18+
TECHNICAL SKILLS	**Discipline**											
Footwork – inside edge, outside edge	B L S	I	I	D	C	R	R	R	R	R	R	R
Smearing section, front point/toe in	B L S	N/A	I	D	D	C	R	R	R	R	R	R
Active ankle (high, low)	B L	N/A	I	D	D	C	R	R	R	R	R	R
Foot placement	B L S	N/A	I	D	D	C	R	R	R	R	R	R
Foot matching	B L	N/A	I	I	D	D	C	R	R	R	R	R
Step through	B L	N/A	I	I	D	D	C	R	R	R	R	R
Inside edge smear while flagging	B L	N/A	N/A	I	D	C	C	R	R	R	R	R
Pivots	B L S	N/A	I	I	D	C	R	R	R	R	R	R
Adaptive ankle position	B L	N/A	N/A	I	I	D	C	C	R	R	R	R
Heel hooks, Toe hooks	B L	N/A	I	I	D	D	C	R	R	R	R	R
Bicycle	B L	N/A	N/A	I	I	D	C	C	R	R	R	R
Hips over feet	B L S	I	I	D	C	R	R	R	R	R	R	R
Three points of contact	B L	I	I	D	C	R	R	R	R	R	R	R
Flagging*	B L	N/A	I	I	D	C	R	R	R	R	R	R
Lateral weight transfer (no pivot)	B L S	N/A	I	D	C	R	R	R	R	R	R	R
Lateral weight transfer (with pivot)	B L S	N/A	I	I	D	C	R	R	R	R	R	R
Rock overs	B L S	N/A	N/A	I	D	D	C	R	R	R	R	R
Airplane (on slab)	B	N/A	I	I	D	C	R	R	R	R	R	R

Competitive Category:		N/A		D	C		B		A		Junior	
LTD Stage:		AS	FUN	L2T	L2T	L2T	L/T2T	T2T	T2T	T2C	T2C	T2C
Age:		<6	6-8	9-10	11	12	13	14	15	16	17	18+
TECHNICAL SKILLS	**Discipline**											
Scumming*	B L	N/A	I	I	D	D	C	R	R	R	R	R
Basic rest & recovery positions*	B L	N/A	I	D	C	R	R	R	R	R	R	R
Advanced rest & recovery (no hands)	B L	N/A	N/A	I	D	D	C	R	R	R	R	R
Dynamic flagging*	B L	N/A	N/A	I	D	C	C	R	R	R	R	R
Dynamic stability*	B L S	N/A	N/A	I	D	D	D	C	R	R	R	R
Force opposition*	B L S	N/A	I	I	D	C	C	R	R	R	R	R
Generating momentum*	B L S	N/A	I	I	D	D	C	R	R	R	R	R
Arresting momentum*	B L	N/A	I	I	D	D	C	C	R	R	R	R
Dead pointing	B L S	N/A	I	I	D	D	C	R	R	R	R	R
Climbing posture (stability)*	B L S	N/A	I	I	D	D	C	C	R	R	R	R
Hold orientations (use and understanding)*	B L S	N/A	I	D	C	R	R	R	R	R	R	R
Grip Positions	B L S	N/A	I	D	C	C	R	R	R	R	R	R
Grip attenuation*	B L S	N/A	I	I	D	D	C	R	R	R	R	R
Hand matching	B L S	N/A	I	D	C	R	R	R	R	R	R	R

Competitive Category:		N/A		D	C		B		A		Junior	
LTD Stage:		AS	FUN	L2T	L2T	L2T	L/T2T	T2T	T2T	T2C	T2C	T2C
Age:		<6	6-8	9-10	11	12	13	14	15	16	17	18+
TACTICAL SKILLS	**Discipline**											
Rehearsal of sequencing	B L S	N/A	I	D	D	D	C	C	C	C	R	R
Adaptive sequencing*	B L	N/A	I	I	D	D	D	C	C	C	C	R
Route reading, memorization	B L S	N/A	I	D	D	D	C	C	C	C	R	R
Visualization	B L S	N/A	I	D	D	D	C	C	C	R	R	R
Rest: mental recovery	B L S	N/A	N/A	I	D	D	C	R	R	R	R	R
Improving rest*	B L S	N/A	N/A	I	D	D	C	R	R	R	R	R
Rest during climb	B L	N/A	I	D	D	C	R	R	R	R	R	R
Rest between attempts and sessions	B L S	N/A	N/A	I	D	D	C	R	R	R	R	R
Knowing when to walk away	B	N/A	I	I	D	C	C	R	R	R	R	R
Clipping strategies*	L	N/A	N/A	N/A	I	D	C	R	R	R	R	R
Ability to shift intensity on route*	B L S	N/A	N/A	N/A	I	D	D	C	R	R	R	R
Selecting the right arousal level*	B L S	N/A	N/A	I	D	C	C	R	R	R	R	R
Assessing risk / reward*	B L S	N/A	I	I	D	D	C	R	R	R	R	R
Strategic brushing	B	N/A	N/A	I	D	C	R	R	R	R	R	R
Competitive Rules Comprehension*	B L S	N/A	N/A	I	D	D	D	C	C	R	R	R

Competitive Category:		N/A		D	C		B		A		Junior	
LTD Stage:		AS	FUN	L2T	L2T	L2T	L/T2T	T2T	T2T	T2C	T2C	T2C
Age:		<6	6-8	9-10	11	12	13	14	15	16	17	18+
ATHLETICISM – Physical Abilities[7]	**Discipline**											
Strength* (upper body, lower body)	B L S	I	I	D	D	D	D	C	C	R	R	R
Strength (core)	B L S	I	I	D	D	D	C	C	C	R	R	R
Power	B L S	I	I	D	D	D	C	C	C	R	R	R
Endurance*	B L S	I	I	D	C	C	C	R	R	R	R	R
Stamina*	B L S	I	I	I	I	D	D	C	C	R	R	R
Agility	B L S	I	I	D	D	C	C	R	R	R	R	R
Flexibility*	B L S	I	D	D	D	C	C	R	R	R	R	R
Mobility*	B L S	I	I	D	D	C	C	C	R	R	R	R
Balance	B L S	I	I	D	C	C	R	R	R	R	R	R
Coordination[8]	B L S	I	I	D	C	C	R	R	R	R	R	R
Spatial awareness	B L S	I	I	D	C	C	C	R	R	R	R	R
ATHLETICISM – Sport Abilities[9]	**Discipline**											
Finger Endurance	B L	I	I	D	C	C	C	R	R	R	R	R
Finger Stamina	B L	I	I	D	D	C	C	C	R	R	R	R
Finger Strength	B L S	I	I	D	D	D	C	C	C	C	R	R
Finger Contact strength	B L S	I	I	D	D	D	D	D	C	C	C	R
Pinching Strength	B L	I	I	D	D	D	C	C	C	C	R	R
Pulling Stamina	B L S	I	I	D	D	D	C	C	C	C	R	R
Pulling Strength	B L S	I	I	D	D	D	C	C	C	R	R	R
Pulling Power	B L S	I	I	D	D	D	C	C	C	C	R	R
Pushing Strength	B L S	I	I	D	D	D	C	C	C	C	R	R
Pushing Power	B L S	I	I	D	D	D	C	C	C	C	R	R
Whole Body Speed	B L S	I	I	D	D	C	C	C	C	R	R	R

[7] The Athleticism section is defined in more detail in the Glossary

[8] Includes whole body coordination, hand eye coordination, and foot eye coordination

[9] Finger strength, power, and stamina training should be based on each athlete's stage of development and skeletal maturity (finger bone growth plates open v. closed). Early introduction of finger training volume in general puts the athlete at risk of growth plate fractures in the fingers. X-ray evidence of growth plate closure is imperative.

Competitive Category:		N/A		D	C		B		A		Junior	
LTD Stage:		AS	FUN	L2T	L2T	L2T	L/T2T	T2T	T2T	T2C	T2C	T2C
Age:		<6	6-8	9-10	11	12	13	14	15	16	17	18+
MENTAL, SOCIAL, EMOTIONAL SKILLS	**Discipline**											
Positive attitude, growth mindset	B L S	I	D	D	C	C	R	R	R	R	R	R
Self-awareness*	B L S	I	I	D	D	D	C	C	R	R	R	R
Attentional control*	B L S	I	I	D	D	C	C	R	R	R	R	R
Emotional control*	B L S	I	I	D	D	C	C	R	R	R	R	R
Persistence*	B L S	I	D	D	D	C	C	R	R	R	R	R
Resilience*[10]	B L S	I	D	D	D	C	C	C	R	R	R	R
Comfort with climbing to height	B L S	I	D	D	C	C	C	R	R	R	R	R
Hold terminology*[11]	B L S	N/A	I	D	C	R	R	R	R	R	R	R
Goal setting*	B L S	I	I	D	D	C	C	R	R	R	R	R
Nutrition, energy management*	B L S	I	I	D	D	D	C	C	R	R	R	R
Maintenance of well-being*	B L S	I	I	D	D	D	C	C	R	R	R	R
Getting help when needed	B L S	I	I	D	D	C	C	C	R	R	R	R
Community involvement	B L S	I	I	I	I	D	D	C	C	R	R	R
Climbing for life*	B L S	N/A	N/A	N/A	N/A	N/A	I	D	C	R	R	R

[10] Includes knowing when to walk away.

[11] Pockets: be aware of the importance of being mindful about one finger pocket safety, which should be trained in a controlled and gradually progressive manner, following many years of static/isometric one finger pocket training before introducing dynamic/eccentric one finger pocket loading.

SKILLS INVENTORY – Learn More

Sport for Life (S4L)
S4L is a nationally recognized not for profit organization consisting of sport and physical literacy experts with the long-term vision necessary to be catalysts for lasting change within the sport and physical activity ecosystem and beyond. By bridging gaps between sectors, creating new collaborations with Canadian institutions, and mobilizing knowledge to communities across the country, S4L aims to create a future in which absolutely everyone has access to quality sport and physical literacy experiences.

Visit S4L Website: https://sportforlife.ca/

Long-Term Development (LTD)
Children, youth, and adults need to do the right things at the right time to develop in their sport or activity. Long-Term Development describes what athletes need to be doing at specific ages and stages.

Generic LTAD 3.0: https://sportforlife.ca/portfolio-view/long-term-development-in-sport-and-physical-activity-3-0/

Gold Medal Profile (GMP)
Based on validate metrics with clear benchmarks, the GMP is a collection of skills and attributes required of an athlete capable of podium performances.

In 2018, CEC published Sport Climbing for Sport, For Life.
Visit CEC Website: https://www.climbingcanada.ca/long-term-athlete-development/

Coaching Association of Canada (CAC)
The CAC educates and certifies coaches and celebrates their achievements at all levels of sport. Through its coaching education, research, and advocacy programs, the CAC promotes safety in sport, works to increase diversity and inclusion within Canada's coaching community, and strives to enhance the sport experiences of participants across the country.

Visit CAC Website: https://coach.ca/

National Coaching Certification Program (NCCP)
The NCCP provides standardized, inclusive, and sport safety education to coaches and coach developers across 65 sports in Canada. Coaches complete NCCP training to develop their own coaching skills and to help improve the performance of participants at all levels of sport.

SKILLS INVENTORY – Glossary

TECHNICAL SKILLS

Arresting momentum: Absorbing and stopping momentum in order to control a dynamic movement. Example: after a pogo/moonkick, a climber will rotate outwards from the wall and risk falling unless they engage their core to fight the rotation.

Basic rest & recovery positions: There are many ways to achieve rest while climbing. Generally, the climber wants to achieve the following: 1. hang from a straight arm, 2. ensure weight is over the feet, 3. be in a balanced or stable position. When these 3 elements are achieved, rest can occur because most of the body weight is placed in the feet rather than hands. To stay close to the wall, the climber may use a back step, a drop knee, stemming, a high step with a flag or a frog position. Stability is achieved when the climber uses a wide foot stance or a flag with one leg and the majority of body weight rests on the other foot, while hips are stabilized between the hold the hand is hanging onto and the weight bearing foothold. Climbers can make small adjustments by switching grip positions or muscular engagement to rest as many muscles as possible. As another example, switching back and forth from a normal grip position to an undercling position during a rest on a lead route may increase recovery. Climbers can also increase blood flow and recovery of the forearms by shaking them, or lightly stretching them while on the wall. Learning not to overgrip the holds is essential.

Climbing posture (stability): Joint alignment control (stability) is a critical element of ideal climbing posture and can help reduce the risk of injury. This can be trained on and off the wall by doing controlled articular rotations, or by breaking down movements. For example, athletes can perform band-assisted pull-ups while focusing solely on scapular positioning, as opposed to focusing on sets and reps. This movement training is extremely beneficial for newer athletes who are in a critical stage of motor pattern development, and can be performed at a low intensity (such as during warm up).

Dynamic flagging: While flagging can be used to move in a static manner, it can also be used dynamically, such as a pogo/moonkick.
Example: dynamically back flagging and pressing that foot into the wall in order to stop momentum.

Dynamic stability: The ability to perform dynamic movements in a controlled manner. Example: when deadpointing to a hold, the climber maintains stability of the shoulder complex to prevent the body from pulling out and down from the hold.

Flagging: Involves the use of a leg to counterbalance an arm movement, which allows the climber to keep their center of mass over their other foot. There are many nuances to flagging and the key advantage is that no foothold is required for the flagging leg. The climber may use the wall for pressure or a movement of the leg when in motion to maintain balance. In terms of static climbing, the climber may use an inside flag, an outside flag, or a back flag.

Force opposition: Creating opposing forces with different body parts to create overall stability.
Example: pulling upwards on an undercling and pushing downwards into the feet.

Generating momentum: Momentum is a useful tool as it decreases the required muscular force output, however it comes at the cost of precision and additional energy expenditure when arresting the momentum. Momentum can be generated in many ways, but is most commonly generated from the hips (such as swinging the hips back and forth in a pendulum, or dynamically extending the hips to move the center of mass over the feet to feel weightless during a deadpoint). Other examples involving different body parts are arm throws, pogos/moonkicks, extending the elbows before rapidly flexing them, and turtle head.

Grip attenuation: Effective gripping does not involve over gripping or readjusting. This is a technical skill that requires mindful attention and practice. Mental skills training can impact success in the development of this skill.

Hold orientations (use and understanding): Positioning the body in order to create adequate force opposition between holds, which keeps the climber stable. Pulling/pushing in the orientation of the hold ensures that the climber's force output is optimized.
Example: laying back on an arete allows the climber to keep their wrists, elbows and shoulders in a straight line, which minimizes required force output.

Scumming: Creatively using a body part other than the hands or feet to progress up the wall.
Example: climbing a chimney by pressing a hip against the wall in order to move up the feet, or pressing the side of a leg against a volume to stabilize.

TACTICAL SKILLS

Assessing risk / reward: When evaluating boulders in competition, climbers should consider their current health status as well as their position in the competitive field. Climbers who are recovering from injuries should be aware of problematic movements, and have a plan if they encounter one (such as alternate beta or to walk away). In qualifiers and semi-finals, climbers may decide to limit attempts in order to limit fatigue, thereby accepting the risk of not making it to the next round, or losing on countback. Assessing risk / reward is an important skill, especially for climbers who become routesetters or who climb outdoors.

Ability to shift intensity on route: Activation level should change based on the demands of each section of a route (see Selecting Arousal Level). For example, climbers may attempt to move quickly through overhung sections, and to slow down on less steep terrain where more weight is on the feet and precision is more often required. A climber's intensity on a route is both physical and mental. Climbers should prepare themselves psychologically for a crux section, and have expected rest positions prior to climbing.

Adaptive sequencing: The ability to rapidly change *beta* (plan for moving between holds) on the wall.

Improving rest: Optimizing resting technique to go from a basic rest and recovery position (ie, not climbing) to a more active and tactical rest (ie, stretching, breathwork, hand shakes, etc)).

Clipping strategies: During the sequencing process, climbers should look for optimal clipping positions based on hold size, body position, and height relative to clip (ideally clipping with the quickdraw between the shoulders and the groin level). Clipping strategies in competition include 1. the ability to identify the best hold from which to clip each quickdraw, 2. the ability to find an appropriate clipping position, 3. the ability to clip quickly and effectively and with low risk of injury in a fall, 4. the ability to identify when it is no longer safe or appropriate to clip a quickdraw and when it is a better option to continue climbing (e.g.: too pumped to clip and low risk of injury in a fall).

Competitive rules comprehension: Knowing and understanding the rules of climbing competitions.

Selecting the right arousal level: The arousal scale describes how alert an athlete is, both psychologically and physiologically. A 1 represents a very low level of alertness, such as before falling asleep. A 10 represents a maximal level of arousal, such as when running away from a danger. Generally speaking, a lower arousal level will optimize motor control while sacrificing physical intensity and vice versa.

The appropriate activation level depends on the required movements and the individual. The arousal level can be heavily impacted by stress, wakefulness, self-talk, music, blood glucose levels, breathing, etc. The optimal level of arousal to adopt depends on the athlete, the moment (during warm-up, between boulders, before a speed run), the specific incoming climb and the competition event.

ATHLETICISM

Endurance: The ability to sustain an effort of constant (or intermittent) and maximal intensity lasting over 3 minutes. The energy production for these longer endurance intensive efforts is sustained mostly by the oxidative system's pathway (60% and up as time goes on) and secondarily by the glycolytic system's pathway (35% and down as time goes on).

> Climbing specific training example: aerobic energy restoration and capillarity (ARC) training
>
> Other training examples for this energy pathway: 20+RM (weight training), interval training (running a 60+''/60+'' protocol).
>
> Commonly associated terms include: work capacity, energy reserves, long duration, feeling "tired" after an effort, etc.

Finger endurance: See "endurance" applied to the finger and wrist flexors.

Finger stamina: See "stamina" applied to the finger and wrist flexors.

Finger strength: See “strength” applied to the finger and wrist flexors.

Finger contact strength: See “power and contact strength” applied to the finger and wrist flexors.

Flexibility: The passive range of motion (ROM) of an articulation. It can be divided further into 1. the ROM provided by the articulation’s structure (bone structure, ligament pliancy, etc.) and 2. the muscle’s ability to stretch.

Mobility: The active range of motion (ROM) of an articulation. It can be divided further into 1. the end of ROM stability, or the ability to keep postural alignment in extreme ranges of motion and 2. the muscle’s ability to reach its end ROM using its own strength.

Pinching strength: See “finger strength,” applied to a pinch grip, with the thumb engaged and the wrist in slight extension.

Power and contact strength (rate of force development): The ability to sustain an explosive effort of constant and maximal intensity lasting up to 6 seconds. The energy production for these shorter strength intensive efforts is sustained mostly by the phosphagen system’s pathway (95+% at 0 seconds down to 70% at 6 seconds) and secondarily by the glycolytic system’s pathway (up to 20% at 6 seconds).

> Climbing specific training example: maximal hang, working a maximal level boulder, campus boarding.
>
> Other training examples for this energy pathway: 1 to 3 RM (weight training), 50m sprint (running), plyometrics.
>
> Commonly associated terms include: maximal power, maximal strength, explosiveness, rate of force development, etc.

Pulling stamina: See “stamina” applied to the upper body muscles activated by a pulling motion (scapular retraction and extension, elbow flexion, finger flexion).

> Climbing specific example: sustained pulling performance on a long overhanging route.

Pulling strength: See “strength” applied to the upper body muscles activated by a pulling motion (scapular retraction and extension, elbow flexion, finger flexion).

> Climbing specific example: performing a difficult lock-off on a boulder.

Pulling power: See “power and contact strength” applied to the upper body muscles activated by a pulling motion (scapular retraction and extension, elbow flexion, finger flexion).

Climbing specific example: performing a dyno.

Pushing power: See "power and contact strength" applied to the upper body muscles activated by a pushing motion (scapular protraction, elbow extension).

Climbing specific example: performing a dynamic movement to the side from a pressing position.

Pushing strength: see "strength" applied to the upper body muscles activated by a pushing motion (scapular protraction, elbow extension).

Climbing specific example: performing a mantle or pushing on opposing walls in a dihedral.

Stamina: The ability to sustain an effort of constant (or intermittent) and maximal intensity lasting between 20 seconds and 3 minutes. This category can be divided further: long duration finger stamina (60 sec - 3min) and short duration finger stamina (20sec - 60sec).

Long duration stamina: The energy production for these endurance intensive efforts is sustained mostly by the oxidative (30% at 60 seconds up to 60% at 3 minutes) and glycolytic (60% at 60 seconds down to 35% at 3 minutes) system's pathways.

Climbing specific training example: aerobic energy restoration and capillarity (ARC) training, lapping on a route 2 letters below onsight, hangboard repeaters, 4 by 4 bouldering, etc.

Other training examples for this energy pathway: 15 to 20 RM (weight training), 400m to 1000m sprints (running), interval training (running a 15''/15'' up to 60''/60'' protocol), Crossfit training.

Commonly associated terms include: long duration (quantitative) power endurance, lactic management, feeling "pumped" after an effort, etc.

Short duration stamina: The energy production for the efforts within this endurance and strength middleground is sustained mostly by the glycolytic system's pathway (55% at 20 seconds, peaking at about 70% between 30-40 seconds and down to 60% at 60 seconds) and secondarily by both the phosphagen (30% at 20 seconds down to 10% at 60 seconds) and oxidative (15% at 20 seconds up to 30% at 60 seconds) system's pathways.

Climbing specific training example: hangboard repeaters, working a route above onsight level, bouldering at onsight level.

Other training examples for this energy pathway: 8-15 RM (weight training), 200m to 400m sprint (running), short interval training (running a 10''/10'' protocol).

Commonly associated terms include: power endurance, neurometabolic plyometrics, feeling "pumped" after effort, etc.

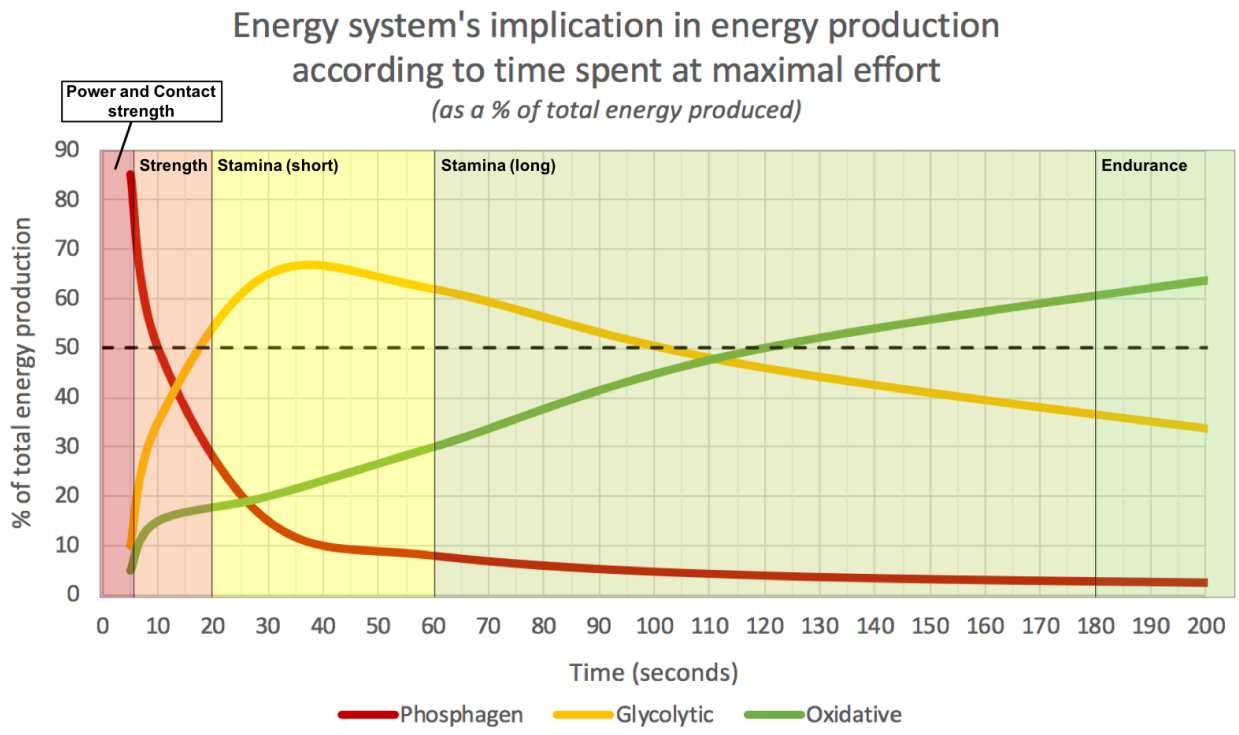
Strength: The ability to sustain an effort of constant and maximal intensity lasting between 6 seconds and 20 seconds. The energy production for these strength intensive efforts is sustained mostly by the phosphagen (70% at 6 seconds down to 30% at 20 seconds) and glycolytic (20% at 6 seconds up to 55% at 20 seconds) system's pathways.

Climbing specific training example: maximal hang, sending a maximal level boulder.

Other training examples for this energy pathway: 4 to 8 RM (weight training), 50 to 100m sprint (running), plyometrics.

Commonly associated terms include: short duration (qualitative) power endurance, repeated sprint ability, feeling "powered out" after effort, etc.

Whole body speed: The ability to move the entire body in an explosive and coordinated manner. Highly relevant for speed climbing, as well as powerful bouldering.



Physical Capacities & Energy System Continuum		Duration *Constant & Maximal Effort*	Associated Concepts & Terms	Climbing Specific Examples	Other Training Examples
Endurance intensive	(Mostly) Oxidative System	More than 3 minutes	Work capacity, Energy reserves, Long duration, Feeling «tired»	ARC training	20+RM (weight training), 1000+m sprint
		3 minutes to 60 seconds	Quantitative P-endurance, Lactic management, Feeling «pumped»	ARC training, Laps on a OS-2 route, 4x4 bouldering	15 - 20RM (weight training), 400m - 1000m sprints, 15" - 60" interval protocol, Crossfit
	(Mostly) Glycolytic System	60 seconds to 20 seconds	Power endurance, Neurometabo. plyometrics, Feeling «pumped»	Hangboard repeaters, Working route above OS, Bouldering at OS	8-15RM (weight training), 200m - 400m sprint, 10" interval protocol
		20 seconds to 6 seconds	Qualitative P-endurance, Repeated sprint ability, Feeling «powered out»	Maximal hang, Bouldering at maximum	4 - 8 RM (weight training), 50 - 100m sprint (running), Plyometrics
Strength intensive	(Mostly) Phosphagen System	6 seconds and less	Maximal power, Maximal strength, Explosiveness, Rate of force development	Maximal hang, Bouldering at maximum, Campus boarding	1 - 3RM (weight training), 50m sprint, Plyometrics

MENTAL, SOCIAL, EMOTIONAL SKILLS

Attentional control: The ability to focus on the task at hand for a sustained period of time.

Climbing for life: Includes transition to a more recreational approach to climbing, retirement, and transition to other roles in climbing (coach, official, route setter, etc.). In addition, some coaches may be assisting the development of climbers who come into the sport later in life and compete more recreationally or simply seek improved performance. This scope of knowledge includes assisting climbers who have to adapt their climbing expectations and activities as the result of injury or aging.

Emotional control: The ability to manage anxiety, fear, negativity, and reactions in training and in competition. This has three steps: 1. become aware of the emotions and the thoughts provoking these emotions; 2. implement strategies to process the emotions; 3. regain focus on the task.

Goal setting: Involves setting SMART (specific, measurable, attainable, realistic and time-bound) goals, as well as outcome, performance and process goals. Good goal setting requires self-awareness, which can be facilitated via coach evaluation and feedback.

Hold terminology (knowledge): Knowing the names of holds (slopers, crimpers, pockets, etc.) and hold orientation terminology (gaston, underclings, sidepull, etc.).

Maintenance of well-being: Includes sleep, body image, injury recovery and management, psychological hygiene, relationships (family, peers, coaches).

Nutrition, energy management: Sufficient caloric and nutritional intake to maximize training adaptations and to optimize health and growth, based on the athlete's specific needs. Coaches are encouraged to look for signs of disordered eating and to refer the athletes to the appropriate authority should they have any concerns (parents, health professionals, etc.).

Persistence: Maintaining maximal effort during a difficult or surprising attempt. This includes sticking to an appropriate training plan and a willingness to repeatedly fail and learn from the failure.

Resilience: The ability to recover, or spring back. Failure is inherent in climbing when pushing one's limit. Resilience is the willingness to continually try again. It requires knowing one's limits and being able to appropriately distinguish when to leave something in order to maintain the capacity to adapt, learn and perform in other ways.

Persistence and Resilience may feel as though they are the same thing, but they are slightly different. Look at it this way: persistence is short-term, it happens when the athlete is in action; while resilience is long-term, it drives the athlete to come back to the wall despite feelings of failure.

Self-awareness: The ability to accurately evaluate the impact of one's thoughts, emotions and behaviour on oneself and others. Involves gratitude for volunteers, gym owners, and parents who make training and competitions possible. Self-awareness is the foundation of emotional and behavioural control.
Example: becoming more aware of one's beliefs, values, attitudes, fears and motivations.