

Exploring in a climbing task during a learning protocol: a complex sense-making process

Clément Ganachaud¹, Caroline Ganière², Guillaume Hacques¹, Nadège Rochat², Ludovic Seifert¹, and
David Adé¹

¹University of Rouen Normandy, Faculty of sport sciences, Mont-Saint-Aignan, France

²University of Clermont Auvergne, Faculty of sport sciences, Aubière, France

Supplementary material

Table 1 Thematic analysis of the climbers' intentions during the preview. The first column presents the first-order themes. The second column presents the second-order themes (i.e., merging of the first-order themes). The third column presents the general dimensions (i.e., merging of the second-order themes)

First order themes	Second order themes	General dimensions
Replacing handcrossings by hands-relaunching movements	Doing hands-relaunching movements	Designing sequences of actions
Doing as many hands-relaunching movements as possible		
Avoiding hands crossing		
Getting into the right arm position	Putting the right hand on the right handhold	
Placing the right hands on the right handholds		
Arriving on a given handhold with a given hand		
Finding wich hand to put on wich handhold		
Finding a hand-foot chaining	Searching for hand/foot sequences	
Matching a handhold with a foothold		
Considering the feet in relation to the hands		
Estimating the pose of the hands with regard to footholds		
Reproducing actions performed on the beginning of the route	Reproducing actions on a part of the route	Reproducing sequences of actions
Reproducing an improved passage on a previous trial		
Repeating the same start		
Validating the effective sequences at the beginning of the route		
Confirming the sequences of the lower and middle part	Reproducing the same sequences on the whole route	
Repeating the same sequence to make it more fluid		
Keeping the same sequence by improving the timing of the hands-feet coordination		
Keeping the same chaining		
Facilitating hands chaining thanks to feet	Improving hands-feet coordination	Climbing fluently
Improving hands-feet coordination to have as little lag as possible		
Facilitating the linking of the hands by raising the feet higher		
Limiting stops	Limiting/reducing stops	
Limiting stops with the feet		
Being in movement		
Avoiding mistakes with the hands	Avoiding repeating mistakes	
Avoiding mistakes on a part of the route		
Climbing dynamic		
Using lower holds to be more dynamic	Being dynamic on the holds	

Not being stopped on the holds		
Not spending too much time on the holds		
Anticipating unbalances		
Staying in the axis to be balanced	Avoiding losses of balance	
Keeping the pelvis as central as possible to the wall		
Avoiding rushing	Avoiding rushing	
Paying attention to the feet		
Placing the feet gently on the footholds	Being precise with the feet	
Ensuring safe positions with the feet		
Improving spatial fluidity		
Improving fluidity on a part of the route	Improving fluency	
Climbing fluently		
Climbing one hold after the other		
Not forgetting any handholds	Respecting the instructions for the capture of holds	
Taking all the handholds		
Do not place both hands on the same handhold		Respecting the instructions
Placing both hands on the starting handhold	Respecting the starting instructions	

Table 2 Thematic analysis of the climbers' perceptions during the preview. The first column presents the first-order themes. The second column presents the second-order themes (i.e., merging of the first-order themes). The third column presents the general dimensions (i.e., merging of the second-order themes)

First order themes	Second order themes	General dimensions
Remoteness of the holds	Distance between holds	Physical characteristics
Distance of the holds		
Open spaces		
Holds located at the same distance	Number of holds	
The amount of holds		
The lower number of foot holds		
Eccentric holds		
Aligned holds		
A parallelism in holds		
Symmetries		
Changes of direction of the holds		
Repeating patterns		
Identical parts		
Metaphorical forms		
The lack of repeating logic		
The loss of symetry	The spatial layout of holds	
Perceived difficulties in the hand-chainings (hands-relaunching movements and alternances)		
Perceived difficulties in the foot-chainings		
Perceived difficulties to be balanced on the route		
The feeling that the route promotes fluency		
The feeling that the route is easy		
The possibility of jumping off footholds	Difficulties induced by the route	Functionnal characteristics
The memory of errors in chainings		
The memory of imbalances		
The memory of slowing down or stopping	Previous disruptions	
The memory of unpleasant sensations		
The memory of good chainings on all or part of the route		
The memory of positive feelings	Previous successful actions	Previous climbs
The memory of a controlled imbalance		
Remembering of chainings	Recognition of chainings	
Remembering having already done this route		
Remembering of some parts of the route		Recognition of the route

Table 3 Thematic analysis of the climbers' actions during the preview. The first column presents the first-order themes. The second column presents the second-order themes (i.e., merging of the first-order themes). The third column presents the general dimensions (i.e., merging of the second-order themes)

First order themes	Second order themes	General dimensions	
Miming the beginning's chaining	Miming the beginning of the route	Miming one part of the route	
Miming to test a chaining at the beginning of the route			
Miming the end of the route	Miming the end of the route		
Miming with the hands from the start	Miming in hands from the bottom to the top	Miming the complete ascent	
Miming hands chainings all over the route			
Miming hold by hold testing several possibilities in going and return on the whole route			
Miming the hands chainings changing the rythm	Miming in hands integrating the changes of rythm		
Fixing the bottom of the route	Fixing the beginning or the end of the route	Focusing one part of the route	
Fixing the top of the route			
Fixing parts of the route where there were difficulties	Fixing difficult passages		
Fixing parts of the route to improve what has been done			
Fixing parts of the route requiring hand-foot coordination			
Fixing handholds	Fixing holds	Scanning the route	
Fixing footholds			
Looking at the whole route once	Looking at the whole route once		
Scanning the route once	Looking at the route several times		
Scanning the route several times			

Table 4 Thematic analysis of the climbers' intentions during the climb. The first column presents the first-order themes. The second column presents the second-order themes (i.e., merging of the first-order themes). The third column presents the general dimensions (i.e., merging of the second-order themes)

First-order themes	Second-order themes	General dimensions
Finding a correct hand chaining	Correctly performing planned hand chaining	Ensuring the correct execution of actions chaining
Avoiding errors with the hands		
Performing the correct hand chaining		
Reciting the known hand chaining		
Performing the correct hand-foot chaining	Correctly performing the planned hand-foot chaining	Improving the timing of the climb
Positioningthe feet correctly	Correctly performing the foot chaining	
Avoiding stops	Avoiding stops and saccades	
Avoiding saccades		
Climbing fast		
Moving the body constantly		
Improving the fluency	Pacing the climb with a dynamic hand chaining	
Keeping a rythmed hand chaining		
Keeping the hand chaining dynamics		
Spending little time on the holds	Synchronizing hands and feet	
Climbing like on a ladder		
Synchronizing hands and feet	Maintaining balance of the body	
Seeking balance and stability of the body		
Maintaining body orientation along the vertical axis		
Avoiding losses of balance		
Seeking stability of the feet		
Maintaining balance using the feet	Seeking balance via the feet	Maintaining balance while climbing
Taking every handhold	Respecting the instructions done by the experimenter	
Avoiding putting both hands on the same handhold		
		Respecting the instructions

Table 5 Thematic analysis of the climbers' perceptions during the climb. The first column presents the first-order themes. The second column presents the second-order themes (i.e., merging of the first-order themes). The third column presents the general dimensions (i.e., merging of the second-order themes)

First order themes	Second order themes	General dimensions
Uncomfortable and unstable positions	Losing the body balance	Sensation of being unbalanced
Loss of balance		
Sensation of falling		
Uncomfortable/unbalanced hand-foot coordination		
Sensation of slippery feet	Sensation of unstable feet	
Sensation of unreliable and unstable feet		
Sensation of uncomfortable/unbalanced hand holding		
Sensation of uncomfortable/unbalanced crossed in hand	Sensation of unbalance/uncomfortable hand movements	
Sensation of spatial balance	Sensation of body balance	
Sensation of being balanced		
Sensation of climbing with aligned body		
Sensation of being balanced during hands-relaunching movements		
Sensation of being balanced while crossing hands	Sensation of being balanced during hand chaining	Sensation of being balanced
Sensation that the feet are stable		
Sensation of balance via the feet		
No disturbance when the foot slips	Sensation of being balanced on the feet	
Absence of stops and saccades	Sensation of efficient movement of the body	
Sensation of being in constant movement		
Sensation of speed		
Sensation of a dynamic hand foot chaining	Sensation of efficient hand foot chaining	Sensation of efficient timing
Sensation of power between hands and feet		
Sensation of synchronization between hands and feet		
Sensation of saccades and stops	Sensation of perturbed timing fluency	
Sensation of slowness		
Sensation of inefficient grasping handholds	Sensation of an inefficient timing in the hand chaining	
Sensation of perturbed timing while handcrossings		
Sensation of not being able to coordinate the hands with the feet	Sensation of an inefficient timing in the hand-foot coordinations	Sensation of perturbed timing
Sensation of inefficiency when the feet have been mounted too high	Sensation of an inefficient timing in the foot chaining	
Sensation of disturbed timing by the impossibility of adhesions with the feet		

Table 6 Thematic analysis of the climbers' actions during the climb. The first column presents the first-order themes. The second column presents the second-order themes (i.e., merging of the first-order themes). The third column presents the general dimensions (i.e., merging of the second-order themes)

First-order themes	Second-order themes	General dimensions
Foot slipping	Making errors in the foot chaining	Making errors
Taking the wrong foothold		
Doing a wall support with the foot		
Taking the same hold with both hands		
Taking the wrong handhold	Making errors in the hand chaining	Making errors
Forgetting a handhold		
Carrying out the planned hand chaining		
Forcing himself to respect the planned hand chaining		
Carrying out the planned hand chaining	Carrying out the planned hand chaining	Carrying out the planned actions
Forcing himself to respect the planned hand chaining		
Carrying out the planned hand-foot chaining	Carrying out the planned hand-foot chaining	
Hesitating before chosing footholds	Improvising foot chaining while climbing	
Monitoring the unfolding foot chaining		
Improvising foot chaining while climbing		
Hesitatesto take some footholds		
Improvising the hand chaining while climbing	Improvising hand chaining while climbing	
Hesitates with the hands while climbing		
Taking a hold with the other hand	Modifying the hand chaining	Modifying the planned actions
Taking two successive handholds with the same hand		
Using intermediary footholds		
Chosing higher footholds	Modifying the foot chaining	
Using less footholds		