"Going up" Understanding and developing efficient uphill walking

by Richard Ensoll

The steep and uneven paths, the wild places and hillsides may prove disconcerting to people who's walking experience has involved mainly the surfaces typical of our towns and cities. How can we, as outdoor leaders, help our students gain mastery of their walking and enjoy moving uphill? Obviously most people can walk uphill, however, there is great variation between walkers in the number of calories burnt per step, and how often they fall over. This article identifies some reasons for these differences and suggests activities through which we might hope to improve our student's efficiency and stability when walking outdoors.

Studies of people who transport heavy loads routinely (e.g. Himalayan porters) suggest that they are much more efficient than their Caucasian counterparts, expending substantially less metabolic energy while travelling uphill 60% faster! (Minetti et al, 2006). A significant factor for this is their ability to maintain balance and control of the walking movement. A more stable upper body posture reduces unnecessary movement and leads to less muscular co-contraction;

decreasing the metabolic cost of walking. In other words, most of us waste much energy in unnecessary lateral and vertical movements during walking so if we can walk in a more aligned and fluid style we can expect to burn 'less miles per cookie'.

Why Develop Walking Skills?

Developing our own walking skills can help by improving our own endurance and enhancing our ability to coach the skills while also improving the physical platform from which we provide support to others (e.g. confidence roping or spotting). With regard to our students we can hope to influence walking technique with the aim of increasing stability, efficiency and improve their decision-making. Walkers who are stable, efficient and feel under control:

- stay on their feet more of the time and are less prone to injury
- exert less effort per mile covered
- (potentially) have more fun in the hills!

Beyond these reasons there are also benefits to be gained from time spent coaching our students walking skills. Observing your student while they attempt a simple task (e.g. walking over boulders; see below for more) can reveal a wealth of information about your student's skill level, their openness to learning and attitude to risk taking/ exposure. This information can then be used to support you in a range of decision-making including what further coaching may be appropriate and, significantly, what route should be attempted that day.

The 'Problem' of Coaching Walking Skills

Most of your students can already walk! As a result they may see no need to work on this area especially since the first stage of the learning process is likely to involve decay in performance. Clearly we should avoid spending time coaching when this does not relate to student goals; however students may not see a connection between fun, staying on their feet, feeling in control and walking technique unless you make it for them. Novice walkers are usually 'experts' at walking short distances in an urban environment but how many high streets are adorned with steep grassy slopes? The issue seems to be mostly one of skill transfer between environments (high street to hillside) and helping the student to adapt their existing skills to the combination of steepness, ambiguous footing and exposure often found in the outdoors.

Key areas in coaching walking skills not addressed here are the role played by exposure and aspects of the coaching process, this article focuses on the movement principles behind efficient walking and how these might be explored by your students.

Movement Principles

Some principles behind efficient and stable movement in the mountains include:

Centre of Gravity: typically located behind the navel it is "the point around which a body's weight is equally balanced in all directions." (AAS 2003)

Base of support – when standing the shape and size of your base of support is determined by the distance between your feet. Feet together create a narrow base and wide apart a wide base. (Lees & Sheddon 1984).

In essence the wider the base of support and lower the centre of gravity the greater the stability (but the less agility) e.g. feet wide apart and crouched over like a sumo wrestler versus balancing on the ball of one foot while reaching up with your hands like a ballerina. For movement to take place the centre of gravity has to go beyond the base of support so in a real sense each step we take is a 'step of faith' as we have to lose balance to initiate movement. So when a frightened walker goes on all fours this

Different solutions will work for different individuals and different environments

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is (at least in part!) a logical response to a feeling of instability as the most stable position is to lie down. However the cost of stability is reduced agility making movement harder and since as walkers we are usually seeking to travel through the environment the overall outcome is often negative.

Use joints in the best order: The first stage of the walking process (gait cycle) usually involves three aspects, "heel strike, mid stance" then "toe-off" (Berg, 1999) which occur while the centre of gravity pivots over the top. As the slope steepens the walker is inclined to pivot over the ball of the foot only, increasing muscular activity and therefore energy expenditure. Efficient foot placement technique will seek to maintain the ideal sequence where circumstances are less than ideal.

In summary walking requires a shift of our centre of gravity (balance) over one foot at first then forward of it. Weighting one foot frees the other to be swung forward before it is weighted once more, freeing the other foot and so on. A narrow gait making moderate length steps will make weight shifting over each successive foot easier than a long, 'swaggering' gait allowing smoother forward progress and reducing energy consumption. So gait efficiency should lead to a smooth, stable upper body with little effort involved in maintaining balance.

Some Coaching Ideas

The number of potential ideas is only limited only by your imagination but here are a few ideas that have worked for us and can be used as activities to break up a walk in themselves or to illustrate some of the theoretical principles outlined above.

'Good' and 'Bad' walking (Raising awareness)
Walk on a range of surfaces/slope angles and ask your students a series of questions to help them reflect on walking and their performance of it taking what is usually unconscious into the conscious domain.

Walkers who are stable, efficient and feel under control...

For example:
1. Ask your students to think about walking. How would they explain to a Martian visitor what it involves?
2. What does 'good' (or efficient or stable) walking look, sound and feel like?
3. Walk in a 'bad' (inefficient/ unstable) way?
4. Consider their own walking style and ask if them to identify one change which might make a 5% improvement to an aspect of their performance (e.g. efficiency or stability)

'Navel Gazing' (A stable upper body)
1. Identify the position of the centre of gravity as being roughly behind the navel and that its position may be controlled by shifting the hips forward/backward or side to side. Stand with feet a little wider than shoulder width apart, bend one knee and feel (sometimes better with the eyes closed) the pressure increase through the weighted foot, repeat over the other foot. When they can feel and control this weight shift smoothly try it with a wider stance. A key challenge here is to ensure your students only lift one foot when it is fully un-weighted by shifting the hips, rather than shoving their weight over through pushing with the opposite foot/ leg. Move like a ninja not a sumo.
2. The principle of 'hip shift' rather than 'shoving' can be further developed by asking the students to walk silently (ninja walking) by weighting and un-weighting each step gradually. This may be developed into a paired activity where one blindfolded person is lead (with a minimum of contact) smoothly through a number of planes forward, backward, up, down, twisting with the blindfolded participant seeking to focus on smooth silent, hip-shift first movements.
3. Moving over a range of terrains the student can imagine they have a torch inserted in their belly button on a dark night, their aim is to move over steps/ boulders and keep the beam moving steadily by leading with a hip shift and minimising any 'shoving'.

Boulder Exploration (Balance point)
1. Find a boulder/rock and balance on each point asking your students to explore the difference that height above the balance point makes.
2. Find a smear which is close to the limit of friction and rock forward and back feeling the weight distribution change shift along the foot – is there a difference in stability and grip? What about height over the smear?
3. Jump between boulders using a range of hold types and seeking to weight shift to aid smooth/ controlled movements.

Measuring Strides (Stride pattern)
Mark out an area of steep ground over approximately 3 metres and ask the students to walk between the two points in a variety of ways
e.g.
- Minimum/maximum number of steps then compare how each felt and find a 'happy medium'
- Use as many different step techniques as they can then evaluate each one.

The nature and angle of ground chosen will vary depending on the point desired with regard to foot placement techniques (edging, sawing the boot, flat footing) e.g. slabby rock or hard snow.

A final point

Adaptations of a skill performance should be both individualised and context specific.

Individualised

e.g. many skills will require different adaptations for short students wearing soft boots as opposed to tall students wearing stiff/high ankle boots

Context specific

e.g. mountain walking performance environments vary widely but may be divided into two categories

- hard surface (solid rock, firm grass, rocky path, icy snow)
- soft surface (heather, deep moss, loose scree, soft snow)

Different solutions will work for different individuals and different environments. ■

About the author

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