Direct Bearing Network Resource

www.RiskManagementConsulting.ca

Contact Information
Publisher
Direct Bearing Incorporated
7466 River Road, RR1
Palmer Rapids, ON
K0J 2E0 Canada

Email: publisher@directbearing.ca

Accident Prevention

Backpacking, canoeing, cycling, skiing and introductory white water kayaking are all safe recreational pursuits in terms of the number and severity of accidents and injuries that occur. However, even when minor accidents do take place in the wilderness they may present serious problems. Environmental conditions, limited supplies and resources, as well as time and distance to definitive care are factors which can worsen a situation. Management and treatment of accidents cannot always be conducted in the normal or routine manner of an urban setting. It is for this reason that a basic understanding of common hazards and accident prevention is necessary prior to venturing into the great outdoors.

This chapter does not try to cover all the aspects of risk management. Rather, the focus is on establishing a basic understanding of how to approach risk and accident prevention from a hazard assessment point–of–view. Pay particular attention to the Tips from the Field – they serve as a 'cheat sheet' to staying out of trouble. The end of this section outlines some of the most common preventable and treatable issues that can come up on trip. Staying on top of these will ensure a good time for everyone. Staying safe is everyone's responsibility – yours, your group's and your leaders'.

In this chapter you will learn about the following:

- Situational awareness
- Hazards and accidents
- Hazard evaluation
- Keeping an eye out for yourselves and others

This chapter includes the following resources to make your trip planning successful:

- Hazards Identification Worksheet

Situational Awareness

"Being in the game" is a phrase sometimes used to describe someone who is on the ball, tuned into the environment around them and generally ready for whatever may come their way. In the context of risk management, situational awareness refers to paying attention to what's going on around you and being able to react to changing conditions. This is a fancy way of saying "Heads Up!" – watch where you're stepping, know where you're going and remember where you've been. Paying attention

to what's going on prevents accidents.

Hazards and Accidents

A hazard is something that can result in an accident or incident that causes loss (injury, equipment damage, etc.). Dealing with hazards is a three–part process. The first part is being able to identify a hazard. The second part is evaluating the consequences of your interaction with the specific hazard. The third part is to act in some way to either prevent the hazard from developing, control the hazard so that it becomes manageable or, in the event that an accident occurs, mitigate the situation to minimize loss (damage, injury). The following is an example.

Dealing With Hazards

Dealing with hazards is a three-part process:

Step One
Identify the hazard

Step Two
Evaluate the consequences of encountering the hazard(s)

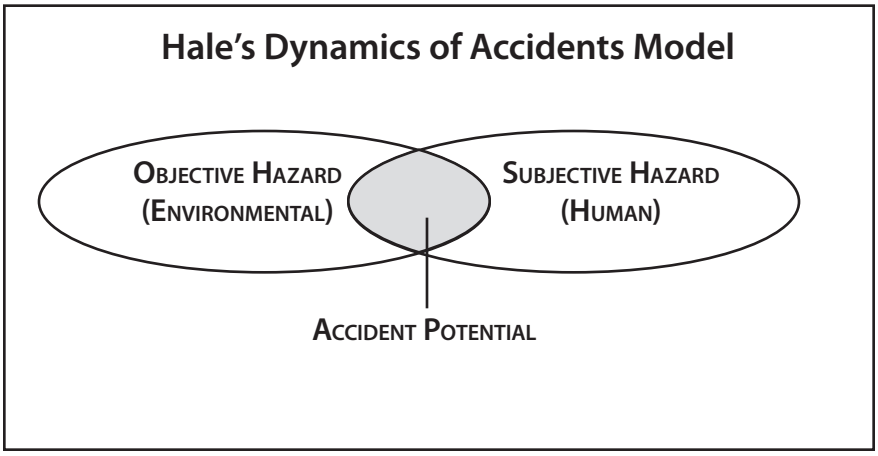
Step Three
Take action to prevent, control or mitigate the situation

A group is on a three day canoe trip following a route of medium-sized lakes and portages. The route potentially exposes the group to weather hazards if poor weather conditions occur. The weather report for the time you're out calls for hot, humid weather with a chance of thunderstorms developing in the afternoons. Applying the hazard evaluation process, you've done the following:

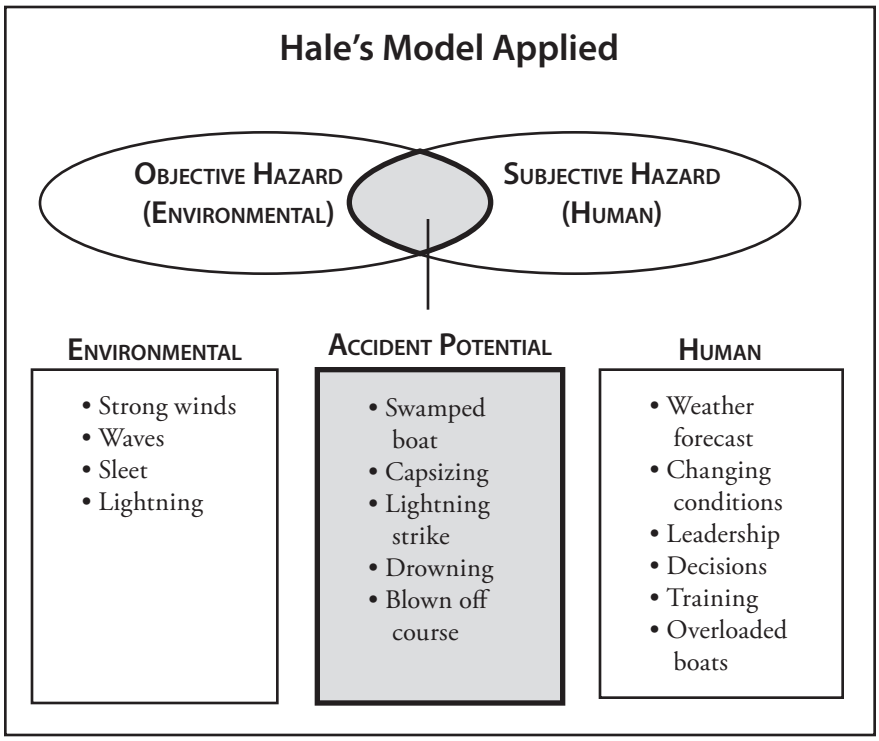
You've identified the potential for thunderstorms – step one – you're aware of the route's exposure to the elements – step two – and you've taken the preventive measure of checking the weather forecast – step three. Being a responsible participant on this trip you also know to get off the water in the event a storm develops and you're watching and listening for the first signs of changing weather.

It is impossible to list all of the potential hazards that may be encountered on an outdoor trip (or in life in general). The interaction of multiple hazards creates the potential for accidents. Accidents occur when two of more hazards overlap.

Alan Hale of the National Safety Network developed the Dynamics of Accidents Theory. Hale's theory helps to explain why accidents happen. He categorizes hazards as either objective (environmental) or subjective (human). Each set of hazards is represented in a sphere. Where the two spheres overlap a potential accident can occur.



The greater the overlap of the objective and subjective hazards, the greater potential there is for an accident. Back to our canoe trip example where our group is not so prepared, if a storm blew in and caught the group on an exposed lake the model might look like this.



In this case the objective hazards are strong winds, waves, sleet, lightning – a bad situation to be in. Compounding this situation are the subjective hazards of being unaware of the weather forecast, being unable to identify changing weather conditions, lack of leadership/decision making ability, inadequate training, overloaded boats – now a much worse situation to be in.

The accident potential in this situation is rather large. A boat could swamp and capsize, the group could be struck by lightning, they could be blown off course; there are many potentially bad things that could happen. But, nothing could happen as well. They could ride out the storm completely unscathed, without an accident occurring. In which case, one could say they got lucky.

Whether the group escapes unharmed or they have a major disaster, the Accident Potential model remains the same. If an accident did occur, we could look at the model and say "Oh, sure look at all those problems developing", if an accident didn't occur we'd get a great story and depending on who was involved they may or may not have learned something for next time.

All accidents are a mixture of both objective and subjective hazards. Understanding some of these common hazards will help you to develop a stronger situational awareness and gain a better sense of your responsibilities for preventing, avoiding and minimizing accidents.

Lightning & The 30/30 Rule

- You are in the strike danger zone when the storm is closer than 10km from your location. Storms can move at a speed of 60km per hour, so lightning can be over you in minutes. To determine how far a storm is from you divide the time interval between the flash of lightning and sound of thunder by three e.g. 30 seconds/3=10 km distance.
- Take immediate precautions when thunder is heard within 30 seconds of a lightning flash. Wait for 30 minutes after the last thunder is heard.

Check the Forecast

Call the weather bureau for the most up-to-date weather information for the area you are planning to visit and listen to the radio for any last minute changes.

Hazard Evaluation

The accidents associated with outdoor activities are generally a product to two types of hazards:

Objective hazards – (Environmental Hazards) Hazards or risks that are beyond your control because they exist as a result of environmental conditions such as weather and terrain.

Subjective hazards – (Human Hazards) Hazards or risks that you can exercise control over because they exist as a result of human behaviour such as carelessness, lack of proper preparation, etc.

Accidents can be minimized by constantly monitoring the environment, the group, and ourselves and acting responsibly to changing conditions and behaviour. The following section will explore some of the common hazards and conditions encountered on outdoor trips and will outline your basic set of responsibilities in keeping yourself and your group safe.

Clothing & Shelter

Although you hope for the best weather, you should always plan for the worst. Bring adequate clothing and shelter to cover all weather events for the time of year even if you are fairly certain they will not be needed.

Objective Hazard – Weather

Shivering on top of a mountain after hiking on a rainy day or paddling furiously to shore as lightning flashes above are all too common occurrences. Even the perfect day of sun and high temperatures can result in serious sunburn, dehydration, heat exhaustion or heat stroke. These situations can be avoided by monitoring the surrounding environment, recognizing hazards, and taking action to minimize potential risks.

The following table highlights some common examples of weather hazards:

Weather Hazards	Specific Objective Hazard	Participant Responsibility
Sunny & Hot	Sunburn	Use sun screen, wear a hat, cover up
	Heat exhaustion	Hydrate, reduce activity, wear a hat, find shade
Windy & Cold	Hypothermia	Layer clothing to maintain heat. Remove wet clothing & replace with dry. Use shell layer to prevent convective heat loss. Hydrate and snack.
	Frostbite	Cover exposed skin surfaces. Check each other for signs of frostbite.
Rain or snow	Hypothermia	As above. React quickly to keep under layers dry for the balance of the trip.
Lightning	Strike	Move off water or summit of mountain. Spread the group out. Stay low and stand on an insulating surface.

Objective Hazard – Terrain

Usually accidents happen at the end of the day while hiking downhill on a section of loose rocks or on a wet and icy surface, or possibly portaging with your visibility hindered by that canoe over your head. All these factors contribute to the next accident.

Do research to become familiar with the area. Information can be found in guide books and maps. Contact park authorities or talk to people who have been to the area. Check web sites for the latest postings of trail or area conditions.

Before leaving have good knowledge of:

- Nature and difficulty of the terrain.
- Condition of trails and portage routes.
- Escape routes from the backcountry in case of emergencies.
- Camping sites and facilities.
- Access to potable water.
- Vehicle access to trailhead and trail–end.
- Park regulations, permits, registration procedures etc

Some examples of common terrain hazards are:

Terrain Hazards	Specific Objective Hazard	Participant Responsibility
Steep, rough trails	Twisted knee/ankle	Slow down, be careful of foot placement.
	Falls causing abrasions and scrapes	Slow down, use poles for balance.
Wind and waves	Hypothermia	Stay close to shore. Use leeward passages.
	Drowning	Stay close to shore or wait on shore until conditions subside.

Subjective Hazard – Personal

Many accidents can be prevented (or kept from turning into major problems) by taking good care of yourselves and by making good decisions.

Personal Hazards	Specific Subjective Hazard	Participant Responsibility
Pre–trip	Inappropriate clothing/equipment	Review info and give yourself enough time to collect items and double check. Inform leader if you do not have appropriate clothing or equipment.

Protection from Lightning Strikes

- Get off the highest locations – summits, ridges.
- Stay away from taller trees.
- Move into a low–lying area.
- If you are on water, get to shore.
- Stay out of depressions or gullies where water flows.
- Find a position down a slope that is dry or well–drained.
- Avoid caves and overhangs.
- Stay low by crouching on an insulated surface (e.g. pack, foam pad) with your hands covering your ears.
- Spread out but remain in visual contact.
- The electrical current from a lightning strike can stop the heart and cause other injuries Be prepared to start first aid procedures.

Know Your Equipment

Ensure that you have all the necessary equipment and you know how to use it before setting out. This includes running a quick check on all group gear and food that may be dispersed among the other members. "I thought that you were bringing the dinner" is not what you want to hear after a long day on the trail.

Know Your Group

Getting to know the capacity of each member of your group is essential to proper planning and preparation. Be sure that the leader and other members are aware of any special considerations such as medical problems or conditions that may be made worse by the demands of the trip and allergies to foods, drugs etc.

Be Physically Fit

A certain degree of physical fitness is necessary to properly participate in any outdoor activity. This includes ensuring you have had adequate sleep and nutrition the nights and days prior to the trip.

	Health	Be physically fit: understand the physical demands of the activity and prepare before hand by exercising. Eat well before the trip: carbo load the days before and have a good breakfast the morning of departure. Be rested: plan your week and don't party the night before the trip. Illness: inform the leader if you have been sick prior to the trip.
Trip	Personal maintenance	Maintain blood sugar levels by eating and snacking. Stay hydrated by drinking regularly and often. Inform the leader if you become sick on the trip.
	Hygiene	Avoid illness by washing hands after defecating, before preparing food & before eating. Do not share water bottles, cups or utensils.
	Attitude	The way you approach your own wellbeing is fundamental to how you will interact with your group. Staying on top of eating, drinking and being comfortable affects your ability to contribute, make decisions and use good judgment.

Subjective Hazard – Group

Groups undergo complex interpersonal interactions and are often at the root of accidents and hazardous situations.

Group Hazards	Specific Subjective Hazard	Participant Responsibility
Group Dynamics	Poor decision making	Being aware of the limits of what you know and the experience you have. Being honest with your group members. Being aware of peer pressure and not "going along " with something you are not comfortable with.

The most common accidents on outdoor trips are overuse injuries or sprains, blisters, slips or falls in all conditions, minor burns from stoves or fires, and injuries from falling objects. These injuries generally result from not following instructions and over estimating your abilities. NOLS (a leading US outdoor adventure organization) estimates 80% of accidents occur due to subjective or human hazards. Listed below are some additional hazards to keep in mind as you continually evaluate your situation.

Objective Hazards	Subjective Hazards	
Water – cold, moving, deep	Making assumptions	Falling on rock, ice, etc.
– strainers in rivers	Over confidence, risk attitude	Cooking – spills, burns
– flash floods	Carelessness, hazard disrespect	Not following directions
– currents, tide, surf	Lack of respect for hazard	Exceeding ability
Terrain – uneven underfoot	Complacency, denial	Poor navigation – lost, late
– wet or slippery	Distraction, erratic behaviour	Poor hygiene
Weather – wind, rain, snow	Health – fatigue, illness	Poor technique
– temperature	Peer pressure	Unsafe speed – fast or slow
– visibility	Poor decisions & communication	Rushing to meet schedule
Falling – rocks, trees, limbs	Poor conflict resolution skills	Campsite games
Snow – deep snowpack	Lack of experience	Errors in planning
– tree wells (holes)	Lack of knowledge & skill	
– avalanche	Summit fever, tunnel vision	
Vehicles – transport	Poor planning & time allowance	

Keeping an Eye Out for Our Self and Others

Situational awareness or "being in the game" is an important part of preventing incidents and accidents. Constantly evaluating the changing environment, observing the actions of the group and monitoring your own status are critical to trouble free adventure. Some of the situations that can develop and impact on the trip if you are not in the game include: heat/cold injuries, strains/sprains, hot spots/blisters, scrapes/cuts and burns. Your objective is to prevent these situations from happening by recognizing the initial signs of a potential problem, managing as best you can and reporting to someone trained to help.

Heat and Cold Injuries

Hypothermia

Hypothermia occurs when the body loses heat faster than the body can produce heat. Refer to the clothing chapter as a review of heat gain and loss mechanisms.

Signs: You suspect a person is hypothermic if you see the following signs: shivering, goose bumps, inability to perform complex tasks with hands, e.g. can't do up a zipper.

Nutrition

Consuming the appropriate foods at the right times in manageable quantities is key to keeping your energy up and your spirits high. (See the section on menu planning for more info.) From an accident prevention standpoint, snacking all the time is an essential element for both individual and group safety. Trail mix, candy bars, dried fruit and other goodies should always be available and need to be part of your ongoing personal maintenance.

Hydration

- You should be drinking enough fluids so that you urinate regularly and the colour of your urine remains clear and there is lots of it! This means drinking small amounts regularly. During moderately strenuous activity in cold weather you could be losing up to 1L of water per hour! That works out to a drink of 200ml every 20 minutes.
- Signs of not consuming enough water (dehydration) are headache, irritability, lethargy, weakness and dizziness combined with low urine output that is yellow to brown in colour with a foul smell. Dehydration can result in you becoming a burden on the group, a potential safety concern and untrustworthy in terms of making decisions for yourself.

The situation is more serious if the shivering is intense, if the person is confused and lacks coordination.

The key to effective management is to prevent further heat loss. For a mildly hypothermic person anything that maintains or creates heat helps.

Management:

- Remove all wet clothing and replace with dry insulating layers.
- Shelter the person from the elements, wind rain etc.
- Insulate the person from the ground.
- Give them warm sweet fluids. Tea, coffee, and alcohol are diuretics and will further dehydrate the person, so avoid them.
- Have them eat to provide glucose to the cells so they can generate heat.
- Get them to exercise if they have the energy and are not exhausted.
- Place the person in sleeping bags to insulate them and add heat with hot water bottles placed in high heat loss areas such as neck, armpits, groin hands and feet.

Tell someone where you are going

Always inform at least one responsible person of the location of your trip, number of people in your party, and the estimated trip schedule, including the approximate time of your return. Call ahead if possible to inform them if you will not be returning by the prearranged time.

Heat Exhaustion

Heat exhaustion usually occurs in hot weather when the person is dehydrated, has low blood sugar and is exhausted after extended activity.

Signs: headache, dizziness, nausea, signs of shock

Management: remove the person from the sun to a cooler place, have them rest, cover with a wet towel to promote cooling and encourage them to hydrate.

Navigation

Check your route and pace frequently as well as the condition of all members in your group. Sound navigation skills (map and compass) are essential to your safety as well as enjoyment of the trip.

Frost Bite

Frostbite can be classified into two basic categories: superficial frostbite or deep frostbite.

Superficial frostbite is the initial stage of frostbite when tissue is damaged by the cold but does not freeze solid.

Signs: Pale skin (blanched), numbness, skin may feel "waxy", soft and pliable to touch.

Management: Skin to skin warming is the best treatment and avoid further exposure to the cold. Do not pop blisters ("Blebs") that might form after warming as this could lead to infection.

Deep frostbite is severe and is characterized by actual ice crystals forming in the skin and underlying tissues.

Signs: Hard frozen tissue, loss of sensation and motion, white or bluish in colour.

Management: The person should be evacuated immediately and the affected part insulated to protect it from thawing or further freezing.

Keep the group together

Know where your group members are at all times. Stop and regroup at all junctions. Maintain a pace that the slowest members of your group are comfortable with. Allow frequent stops early on in the day. This will allow folks to "warm up" to the desired pace and will provide opportunities to adjust clothing, drink, snack etc.

Sprains and Strains

A strain is an overuse injury while a sprain results from extending a joint past its normal range of motion. Sprains involve the ligaments holding a joint together and can vary in degree from slight over-stretching of the ligaments to complete tears.

Knees and ankles are susceptible to sprains. A sprain can create severe problems in the backcountry as it affects your mobility. A sprained ankle or knee can seriously impact the objective and nature of a trip.

Signs: soreness, swelling, difficulty with range of movement or weight bearing.

Management:

The first response in treating a strain or sprain is critical. This treatment takes 20 –30 minutes and is started as soon as possible to reduce swelling and maximize results.

Rest – Get off the injured limb immediately and prevent further movement.
Ice – Cool the affected area quickly to reduce swelling. Apply cold for twenty to thirty minutes. Ice is ideal if but, if unavailable, snow or cold water will do.
Compression – Apply a compression bandage to reduce swelling and support the joint.
Elevation – Get the foot up and provide a means of keeping it there. Prevents blood and fluid from pooling in the lower extremities.

Soft Tissue Injuries

Hot Spots and Blisters

Blisters can be debilitating and need not happen if the pre–blister hot spot is recognized and dealt with immediately.

Sign: A hot spot is a reddish spot (created by friction on the skin) that feels like it is burning.

A blister is a raised area created by fluid under the skin. If the skin is open the problem is compounded.

Management:

Hot Spot: Stop and cover the area with a material that will reduce the friction to the area. Materials that work include athletic tape, mole skin, and gel products such as compeed or second skin held in place by mole skin or tape.

Blister: The management is similar but should be handled by someone trained in the procedures to prevent further damage.

Prevention:

- Footwear must fit properly and be well broken in.
- Wear two pairs of socks, a thin liner sock and a heavier outer sock, so that most friction occurs between the socks.
- Avoid wearing cotton socks as they retain moisture and tend to crease in footwear.
- Stop and deal with hotspots immediately. Don't be embarrassed, others probably have hotspots too.
- Change socks frequently and keep your feet as cool and dry as possible.
- Keep laces tight enough to prevent feet from moving inside the boot.
- Keep the top half tighter while walking up–hill and the bottom half tighter on the way down.

Cuts, Scrapes, and Abrasions

Soft tissue injuries such as cuts, scrapes, and abrasions are a concern for long term management to prevention infection in an outdoor environment. Often they are difficult to keep clean due to the nature of the surrounding and the lack of hygienic materials.

Management of soft tissue injuries in the backcountry involves three basic elements:

1. Stop the bleeding
2. Prevent infection
3. Promote healing

Your main concern is to stop the bleeding by applying (or having the injured person apply) direct pressure to the wound with the cleanest cloth available. Preventing infection (cleaning the wound) and promoting healing should be completed by a trained person.

Minor Burns

Minor burns are a common injury in the outdoors and may be the result of inadvertently picking up a hot pan or grill, the spilling of a tasty dinner or similar accidents.

Management:

First aid for burns is initially the same regardless of the cause or severity of the injury:

- Remove victim from source of heat.
- Cool area with copious amounts of cold water.
- Remove any burned clothing and restrictive jewelry.
- Further treatment should be done by a trained person.

How to Use the Hazard Identification Worksheet

Once you have a good understanding of your route, the terrain, typical weather conditions and the people who you will be going on the trip with – take the time to complete this worksheet for your trip.

Indicate the specific hazard you have identified.

Discuss what actions you and your group can take to prevent the hazard from occurring and/or if the situation develops what could be done to minimize the consequences.

Hazard Identification Worksheet	
Identified Hazard	**Response**
Objective/Environmental Hazards	
Weather	
Terrain	
Equipment	
Other	
Subjective/Human Hazards	
Individual	
Group	
Other	

The following example of a completed Hazard Identification Worksheet is based on a hypothetical canoe trip during the first week of August in Eastern Canada. The proposed route goes through a well known park in Canadian Shield country. The proposed route is approximately 60 km of a combination of lakes, rivers and portages. The group has some experience. The itinerary is for a five day trip.

Sample Hazard Identification Worksheet	
Identified Hazard	**Response**
Objective/Environmental Hazards	
Weather	
Hot & Sunny – Sunburn	*Use suncreen, cover up, avoid exposure between 10 am - 2 pm.*
Thunderstorms/Lightning	*Contunually monitor conditions, avoid exposed areas when*
	weather threatens. Take shelter using 30/30 guideline.
Terrain	
Large Lakes - wind/storm potential	*Plan itinerary with extra time if large lakes are on route.*
	Wait out winds, travel during early morning/evening.
	Can an alternate route be chosen to avoid large lakes?
Equipment	
Loss of food pack.	*Distribute food in several packs, especially in conditions*
	where a pack could get lost (e.g. river trips)
Malfunction of cellular/sattelite phone	*Have a back up plan in the event of communication break-*
	down. Know escape routes and locations of land telephones.
Other	
Wildlife encounters	*Critter proof campsite. Hang food. Don't camp in terrain traps*
	especially in areas known for bear problems.
Subjective/Human Hazards	
Individual	
Failure to follow safety rules	*Know and follow rules. If you don't agree ask for justification.*
Inadequate preparation	*Review your pre-trip info. Ask if you're unsure of something.*
	Attend pre-trip meetings and prep sessions. Take responsibility!
Group	
Poor decision making	*Be aware of the limits of what you know and the*
	experience you have. Be honest with your group members.
	Be aware of peer pressure and do not go with
	something which you are not comfortable.