



THE IMPORTANCE OF PROTECTIVE CLOTHING IN WINTER SPORTS GAMES

Pulatova Laziza Bakhodirovna Doctoral student of the
Tashkent Textile and Light Industry Institute
Kasimova Aziza Bakhodirovna t.f.f.d PhD of the
Department of “Dress design” at Tashkent Textile and Light
Industry Institute

Annotation: *This article extensively describes the importance and necessity of protective clothing in winter sports games. In particular, protective fabrics were studied and the types of protective elements applied to the most vulnerable parts of the body were compared.*

Key words: *protective fabrics, protective elements, winter sports, knee pads*

Аннотация: *В данной статье подробно описывается важность и необходимость защитной одежды в зимних спортивных играх. В частности, были изучены защитные ткани и сопоставлены типы защитных элементов, применяемых к наиболее уязвимым частям тела.*

Ключевые слова: *ткани защитные, защитные элементы, спортивные зимние, подкладки коленные*

Winter sports offer exhilarating experiences – the rush of skiing down a slope, the glide of ice skating, the challenge of snowboarding in fresh powder. Yet, the breathtaking landscapes and adrenaline highs come hand-in-hand with significant environmental hazards: biting cold, harsh winds, moisture, unpredictable terrain, falls, and collisions. In this demanding environment, protective clothing is far more than mere comfort; it is fundamental safety gear, acting as your primary shield against injury and the elements.

1. Defense Against Hypothermia and Frostbite (Thermoregulation):

-The Core Threat: Prolonged exposure to freezing temperatures overwhelms the body's ability to maintain its core temperature (around 37°C/98.6°F). This leads to **hypothermia** (a dangerous drop in core temperature) and **frostbite** (freezing of

skin and underlying tissues, particularly on extremities like fingers, toes, nose, and ears).

-Protective Clothing's Role: Modern winter sports apparel uses a sophisticated **layering system**:

-Base Layer (Moisture Management): Synthetic (polyester) or wool fabrics wick sweat away from the skin. *Crucial: Wet skin loses heat 25x faster than dry skin.*

-Mid Layer (Insulation): Materials like fleece, down (excellent warmth-to-weight, but loses effectiveness when wet), or synthetic insulation (performs better when damp) trap body heat.

-Outer Layer (Weather Protection): A waterproof, windproof, and breathable shell (e.g., using Gore-Tex or similar membranes) blocks snow, rain, and wind while allowing sweat vapor to escape, preventing internal moisture buildup.

2. Impact and Abrasion Protection: Minimizing Injury Severity:

-The Core Threat: Falls are common in winter sports, whether on hard ice, compacted snow, or hidden obstacles. Collisions with objects, equipment, or other people also pose serious risks. Abrasions from sliding can cause severe "snow burns."

-Protective Clothing's Role: Beyond standard layers, specialized gear provides critical impact absorption and abrasion resistance:

-Helmet: *Non-negotiable.* Protects against traumatic head injuries, the leading cause of death and severe disability in winter sports. Modern helmets offer impact absorption, ventilation, and often integrated goggles.

-Body Armor: Worn under jackets, this includes spine protectors, shoulder pads, hip protectors, and tailbone pads (crash pants). Made from advanced foams (like D3O) that harden on impact, they dissipate force and shield bones and joints.

-Reinforced Outerwear: Pants and jackets often feature durable, abrasion-resistant materials (like Cordura) on high-wear areas (seat, knees, shoulders).

3. Enhanced Visibility and Awareness:

-The Core Threat: Whiteout conditions, flat light, fog, and twilight hours drastically reduce visibility. This makes it hard for participants to see terrain and obstacles, and crucially, for others (skiers, snowboarders, snowmobilers, lift operators) to see *you*.

-Protective Clothing's Role: Bright, contrasting colors (neon greens, oranges, pinks, blues) make you stand out against the snow. Reflective elements significantly increase visibility in low-light conditions. Properly fitted gear also ensures unrestricted movement and peripheral vision, enhancing spatial awareness.

4. Protection from the Elements: Wind, Sun & Moisture:

-The Core Threats:

Wind Chill: Wind dramatically accelerates heat loss, increasing frostbite risk even at "moderate" temperatures.

Solar Radiation: Sun reflects intensely off snow (snow reflects up to 80% of UV rays). High altitude intensifies UV exposure, leading to severe sunburn and snow blindness.

Moisture: Wetness from snow, sleet, or sweat drastically reduces insulation and accelerates heat loss.

-Protective Clothing's Role:

Windproof Shell: Essential outer layer blocks chilling winds.

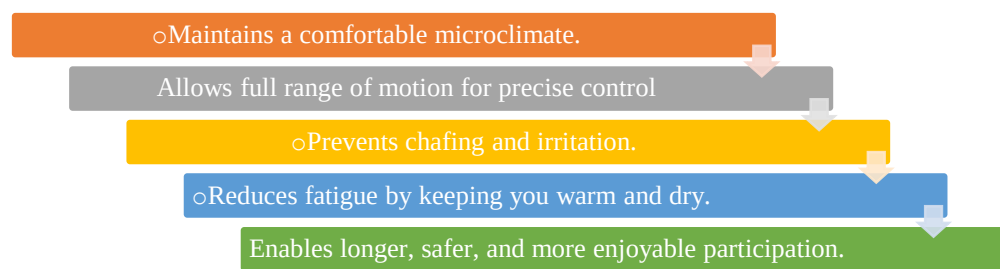
UV Protection: Many outer layers offer UPF ratings. Goggles with 100% UV protection are mandatory. High-SPF sunscreen on exposed skin is vital.

Waterproof/Breathable Shell: Keeps external moisture out while releasing internal sweat vapor. Sealed seams prevent water ingress.

5. Comfort, Performance, and Enjoyment:

-The Core Threat: Discomfort from cold, wetness, chafing, or restricted movement distracts focus, saps energy, reduces performance, and ultimately diminishes the enjoyment and safety of the activity.

-Protective Clothing's Role: Properly fitted, high-performance gear:



Conclusion: An Investment in Safety and Experience

Viewing protective clothing as merely optional apparel is a dangerous misconception in winter sports. It is a vital **integrated safety system**. Helmets, goggles, layered technical fabrics, and specialized armor work together to:

1. **Preserve Core Body Temperature:** Preventing life-threatening hypothermia and tissue damage from frostbite.
2. **Mitigate Impact Forces:** Reducing the severity of injuries from falls and collisions.
3. **Shield from Environmental Assaults:** Blocking wind, water, and harmful UV radiation.
4. **Enhance Visibility:** Making you seen in challenging conditions.
5. **Maximize Comfort and Performance:** Allowing you to focus on skill and enjoyment.

Investing in high-quality, activity-appropriate protective clothing is an investment in your safety, well-being, and the pure enjoyment of the incredible world of winter sports. Don't just dress for the cold; armor yourself for the adventure. Your safety on the snow or ice depends on it. Winter sports participation is increasingly popular worldwide, with recent estimates of 9.8% of the U.S. population (~30 million people) participating in winter sports during the 2022-2023 season. Skiing (~15 million people) and snowboarding (~8 million people) represent the vast majority of winter sports activities.

Musculoskeletal injuries that occur in skiing or snowboarding are often related to a traumatic event due to a dangerous combination of steep terrain, high speeds,

skier/snowboarder ability, variable snow conditions and fatigue. A recent study using data from the National Electronic Injury Surveillance System (NEISS), between 2008 and 2019 demonstrated that there were over 156,000 injuries related to skiing, snowboarding and snowmobiling. Several studies have demonstrated upper extremity injuries, especially wrist injuries, to be more common in snowboarding and lower extremity injuries, especially anterior cruciate ligament tears, to be more common in skiing.

Overall, fractures are cited as the most common diagnosis related to emergency room visits, although soft tissue injuries, including sprains, contusions, ligament tears and meniscal injuries occur frequently as well. Given the high-speed nature of skiing and snowboarding, no body location is exempt from injury.

An important feature of winter sports is the high proportion of pediatric participants. Prior studies have suggested that pediatric patients may be at higher risk for injury during skiing and snowboarding, possibly due to a higher center of gravity, increased head-to-body ratio, underdeveloped neurocognitive control and poor coordination. A recent study demonstrated a similar incidence of injuries among pediatric skiers and pediatric snowboarders, with head trauma (19%) being the most common injury, followed by wrist (16%), forearm (11%) and shoulder (10%). Appropriate awareness of the different injury patterns across adult and pediatric skiers and snowboarders is essential for the physicians caring for these athletes.

Injury prevention is essential to make winter sports participation safe for all ages and ability levels. Many of these injury prevention strategies should begin before hitting the slopes. Strengthening the core, hamstrings, gluteal musculature and quadriceps is critical to improving balance, coordination and preventing falls. Additionally, regular aerobic exercise helps improve cardiovascular and pulmonary health, which is especially important when skiing and snowboarding at higher altitudes. Finally, proper nutrition, hydration and warm outerwear are all

critical to minimize the effects of ever-changing environmental conditions, as most injuries occur later in the day, likely during periods of physical and/or mental fatigue.

As mentioned previously, the use of proper equipment is an important component of injury prevention, including appropriately sized boots, bindings, skis/snowboards, and protective gear. Frequent professional servicing of this equipment is also critical, as adjustments may be needed due to changes in weight, height, terrain conditions or other factors. Appropriate helmet use has been a topic of concern for many years in winter sports injury prevention, with previous surveys demonstrating that less than 50% of skiers and snowboarders routinely wore helmets.⁶ Falls from height and at high speeds may occur during skiing and snowboarding activities and can result in significant, devastating traumatic brain injury, which has been associated with 88% of fatal skiing and snowboarding accidents. While helmet use is not currently mandated by U.S. ski resorts, recent evidence from the National Ski Areas Association (NSAA) has reported encouraging increases in helmet use over the last 20 years (Figure 1). This has also been associated with significant decreases in the rates of head, neck and face injuries.

In conclusion, Winter sports participation in skiing and snowboarding has continued to increase over the last decade. There is a risk of injury due to the high rates of speed involved in these sports. Fortunately, the overall injury rates have declined, which is likely a reflection of improvements in protective equipment and increased safety awareness. Through the continued evolution of safe skiing and snowboarding practices, we can help ensure that participants of all ages and abilities may continue to enjoy these winter sports while minimizing injury risk.

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