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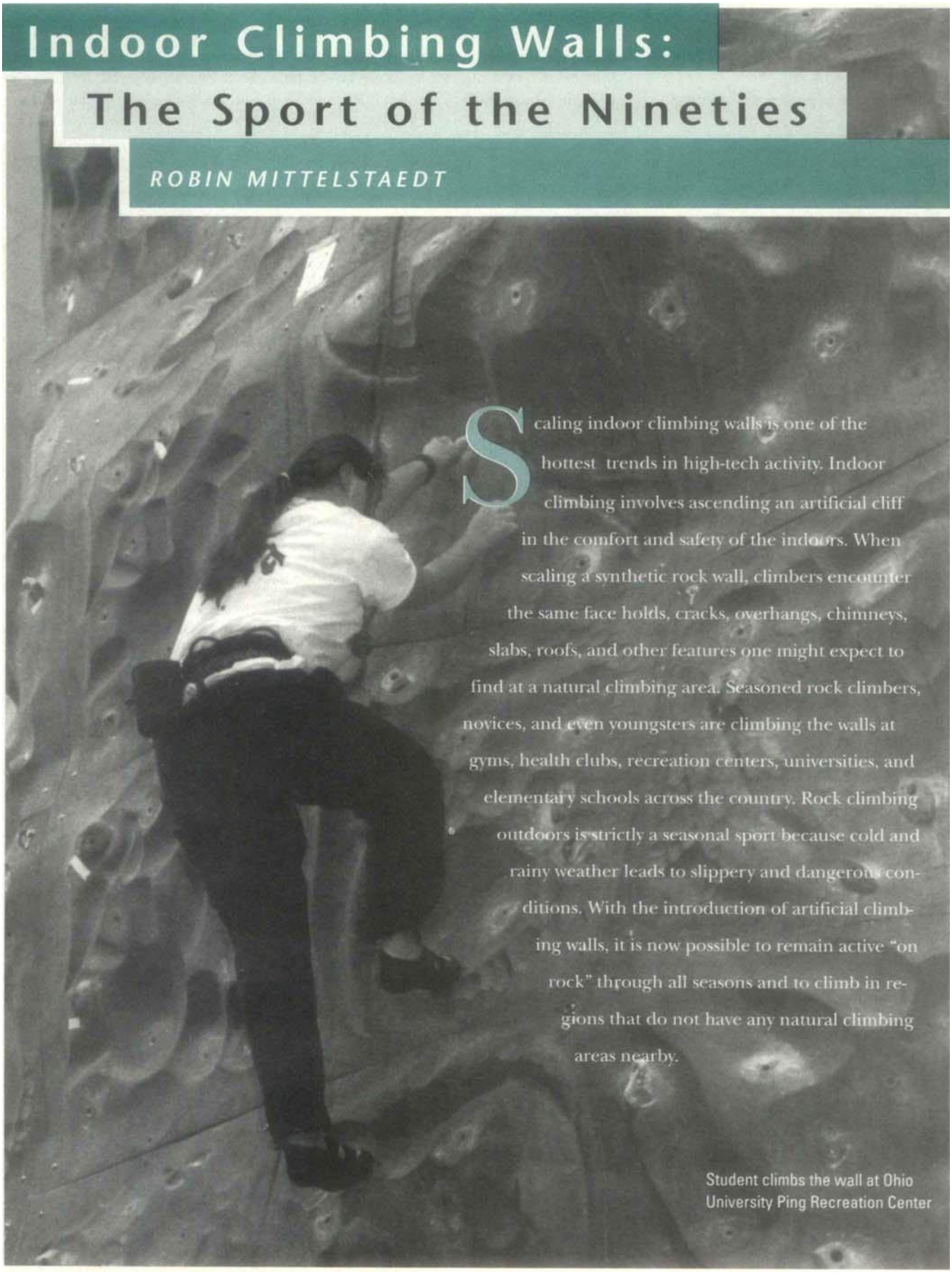

Scaling indoor climbing walls is one of the hottest trends in high-tech activity. Indoor climbing involves ascending an artificial cliff in the comfort and safety of the indoors. When scaling a synthetic rock wall, climbers encounter the same face holds, cracks, overhangs, chimneys, slabs, roofs, and other features one might expect to find at a natural climbing area. Seasoned rock climbers, novices, and even youngsters are climbing the walls at gyms, health clubs, recreation centers, universities, and elementary schools across the country. Rock climbing outdoors is strictly a seasonal sport because cold and rainy weather leads to slippery and dangerous conditions. With the introduction of artificial climbing walls, it is now possible to remain active "on rock" through all seasons and to climb in regions that do not have any natural climbing areas nearby.

Student climbs the wall at Ohio University Ping Recreation Center

Photo: Robin D. Mittelstaedt

Development of Indoor Wall Climbing

The idea for indoor sport climbing grew out of two main components of outdoor rock climbing. The first is the more tame practice of bouldering, a technique used by mountaineers to hone their skills on low-level rocks usually no higher than 4 to 5 feet. Basic hand- and footholds and traversing techniques can be practiced without the aid of a safety rope, with little or no danger. The second component is climbing well above the ground on rock faces and cliffs using a climbing partner, a rope, and safety devices to protect them from injury in the event of a fall.

During the mid-1960s, individuals in England united these two aspects of the sport by fitting cement walls with bolted handholds. The resulting "cliff" offered avid climbers a year-round training ground. The French added refinements by incorporating interchangeable handholds and by developing lightweight compounds made of fiberglass, resin, and sand to simulate real rock (Klugman, 1993).

Indoor sport climbing is becoming more popular. In Belgium, for example, there were only two climbing walls in the entire country in 1985 but by 1990, that number had risen to 50. Presently, Belgium has the largest number of climbing gyms per capita in the world (Gregory, 1993; Klugman, 1993). Now, working out at an indoor climbing gym is considered one of the most rigorous forms of exercise in France and Spain, as well as Japan, Russia, and Chile.

Indoor climbing is gaining altitude in the United States, as well. In 1990, the Campus Recreation Services Outdoor Program at Illinois State University conducted a survey and identified more than 25 universities and agencies with artificial climbing walls (Morford, 1991). In addition, virtually hundreds of sites on the World Wide Web are devoted to indoor climbing, as well as three recently published books (figure 1).

According to Fesko (1992), climbing represents an exciting new phenomenon in the fitness industry and is growing rapidly. Not surprisingly, children have really taken to climbing walls. An Ohio store that caters to recreational enthusiasts has incorporated an indoor wall for shoppers to use for free. Kids climb while parents shop and the adults can have a turn too. The wall has been popular with parents, teens, and young children. Approximately eight elementary schools in Worthington Ohio have even added a climbing wall to their gyms, successfully incorporating climbing into their physical education programs.

...in a very real sense, this new indoor sport can also lead to improved "mental fitness."

A Fun, Challenging Form of Fitness Exercise

In the past, the role of fitness has been downplayed in many climbing settings. Most physical educators or instructors of basic rock climbing courses barely touch on the subject of fitness. For safety reasons, instructors will typically spend a majority of the class time covering the technical aspects of belaying, knot-tying, climbing procedures, and commands to follow, as well as basic hand- or footholds. Liability issues must also be addressed. It is common to require climbers (or a parent or guardian) to sign a waiver of liability before participating (for more information on risk management, see Mittelstaedt, 1996).

Today, people want to climb for both fun and fitness (Jacobs, 1992; Wescott, 1992). As the popularity of indoor climbing continues to grow, instructors should incorporate fitness and training guidelines for climbing students of different skill levels. Four major fitness benefits from climbing have been identified. Components of physical fitness that are enhanced through climbing include muscular strength, muscular endurance, cardiorespiratory fitness, and flexibility (Kascenska, Dewitt, & Roberts, 1992; Mittelstaedt, 1997).

When muscular strength is developed, the climber is able to generate maximal force in a single movement and is better able to make dynamic "crux" moves, such as a "mantle" or push-up-style move onto a ledge or a pull-up style move using a large bulge or outcropping.

Muscular endurance is the ability to generate submaximal force for extended periods of time. Much of rock climbing is composed of many smaller moves that do not require one's maximum level of strength in any one move. However, muscles may become tired and fatigued and a buildup of lactic acid is common. Fitness training can greatly improve one's endurance level and the ability to sustain the multiple movements required when ascending a route. Novice wall climbers often complain of burning in the forearms, cramping in the calves, and a phenomenon called "sewing machine leg," wherein one's leg can shake uncontrollably as a result of muscle spasms brought on by fatigue. A well-conditioned climber will encounter less muscular trauma and will recover from an ascent much more quickly than a poorly conditioned climber.

Cardiorespiratory fitness means that a climber's heart, lungs, and blood vessels are able to supply oxygen to the working muscles and can also remove carbon dioxide from the system. Climbing can be an aerobic activity, especially with the new competitions that stress speed climbing.

Flexibility refers to the range of motion that occurs at the site of a joint. Student climbers should be encouraged to develop and maintain flexibility, which can greatly reduce the likelihood of injury. The majority of injuries to climbers occurs in the body's small joints, especially in the elbows, hands, and fingers

(Maitland, 1992) The knee and shoulder joints are also susceptible.

Furthermore, the fingers, wrists, and elbows are subject to the highest levels of stress, especially if the artificial wall includes crack systems. For example, placing the fingers, or whole hand in a fissure can hold one's entire body weight because the finger joints or hand are literally "jammed" into the crack system. These holds produce high levels of rotational torque on the fingers, wrists, and elbows, and joints may be swollen and stiff as a result of repetitive climbing using finger holds or hand jams.

To reach a maximal level of climbing fitness, caution must be exercised and a variety of climbing techniques should be incorporated. Repetitive, high torque movements in rock climbing can lead to overuse injuries. A well-rounded training and fitness program that includes exercises to develop flexibility can prevent injuries. In addition, climbers should avoid overuse caused by intense training and not climb at a higher level of difficulty than they are ready for. Some researchers have suggested that many injuries could be avoided by applying basic principles of fitness. Rock climbing is a weight-bearing activity that places considerable stress on the body's muscles and joints, and injuries are not uncommon for both novice and experienced rock climbers. As with many sports, injuries are often the result of improper training or inadequate fitness level. Some colleges and universities have begun to offer courses that specifically focus on fitness for climbing (Kascenska, Dewitt, & Roberts, 1992; Shirer, 1990).

Photo: R. Susan Pine

Children at Devonshire (OH) Project Adventure Elementary School climb the walls as a regular part of the physical education program.

Through participation and practice, a climber will develop a unique combination of fitness that includes strength and power, endurance, flexibility, and mental tenacity.

Indoor Climbing and "Mental Fitness"

It could be argued that climbing can lead to a higher level of "mental fitness" by increasing one's self-discipline and self-confidence (Shirer, 1990). Climbers know that ascending a sheer cliff is as much a mental challenge as a physical one. Overcoming fear or a panic attack can require real mental tenacity. Often, the greatest difficulty lies in remaining calm and not listening to the "inner voices" that can play with the mind.

Climbers also develop problem-solving skills while trying to negotiate a difficult overhang or chimney and when deciding which type of foothold or handhold to use. According to Walker (1997, p. 2), "by following or choosing a route or path in the [climbing] gym, you will be strengthening your mind, both halves of the brain, by using logic,

spatial awareness, and problem solving skills, ingenuity and imagination, all under physical exertion." So, in a very real sense, this new indoor sport can also lead to improved "mental fitness."

The New Fitness Craze of the '90s

People associated with indoor climbing are calling it "the sport of the '90s." People of all ages are taking up the sport and thriving on the tremendous opportunity it provides for personal development in both physical fitness and mental fitness. Rock climbing is a vigorous activity. As climbers develop their skills and techniques and progress toward more difficult routes, fitness will play an increasingly important role. Many indoor climbing enthusiasts believe that reaching and maintaining an adequate level of fitness is as important as developing the more technical aspects of the sport.

Walker (1997) explains that, "To get an aerobic workout ... all you need to do is laps. Choose a wall angle and level of climbing that is easy for one climb and simply do it over and over again with speed but with precision. You can increase the intensity by climbing up and down, rather than being lowered between [climbs]. Raising your heart rate, expanding your lungs and resisting gravity in this way provides an incomparable aerobic workout."

Scaling cliffs, cracks, roofs, and chimneys is attractive to women, children, student groups, teens, churches, at-risk youth, corporate executives, vacationers, fitness enthusiasts, and noncompetitive individuals. Climbing on artificial rock faces combines both physical and mental challenges with the fun of climbing and promises to continue to take the human spirit to new heights.

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- Comprehensive Index to Rock Climbing Gyms in North America: <http://www.climbing-gyms.com/>
- Index to Indoor Climbing Gyms in the Continental United States: <http://www.wall.com/user/radwall/gyms.html>
- Information on the Indoor Climbing Wall in the New York City Parks Department Recreation Center on 59th Street <http://www.nynow.com/news/sports/wallwalk.html>
- Information on the Indoor Climbing Wall in Long Beach, CA YMCA. (Wall is operated by an independent business, but is located in YMCA building) <http://home.earthlink.net/-therock/>
- Rock Climbing Links — Magazines, Catalogs, Indoor Climbing Gyms, Equipment Sources, Home Pages, News & Events, Profes sional Associations, and More! <http://www.brainlin ... bscanlan/climb.html>
- Chat line for Discussions about Companies that Build Climbing Walls: <http://home.sportsite.com/chat/rockclimbing/4/discussion.html>
- Available World Wide Web: <http://www.fsr.com/ ... sport/ecosport.html>