

BRIEF REPORT

Sudden Unexpected Death on Challenge Courses

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Introduction

For decades, the “obstacle course” has been a staple of military physical training. The goal of these courses has been the development and assessment of physical fitness in a population of generally young and healthy subjects.¹ More recently, a variation of the obstacle course has become popular in some civilian contexts. The “challenge” or “ropes” course uses some elements derived from military courses and a number of unique initiatives, along with equipment and procedures developed for rock climbing (Figure). Although these programs involve physical exertion, the emphasis is more on developing teamwork, self-confidence, and communication skills than on physical training or assessment. Such courses in the United States were initially popularized by Outward Bound. In the early 1970s, Project Adventure began to introduce them in the public schools of Massachusetts. They are now found in summer camps, rehabilitation settings, colleges, corporate headquarters, and a variety of other sites.² The total number of programs operating in the United States today, based on data collected by Project Adventure, is estimated as 7750.

Although there are reports of injuries and there have been anecdotal reports of fatalities, no real effort has been made to analyze data about deaths on challenge courses. Despite this, many providers of such programs have proposed medical screening procedures to assess risk to participants. None of these has been subject to careful scrutiny, and the industry has not developed a uniform standard.

The purpose of this study was to perform the first systematic analysis of fatalities on challenge courses and to provide evidence-based recommendations on their prevention.

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Methods

DATA COLLECTION

Project Adventure, in Beverly, MA, is a provider of challenge course material, construction, and training. In addition, for over 20 years, Project Adventure has maintained a registry of accidents, injuries, and fatalities on courses. The data are collected by one of the authors (R.R.) from report forms completed by course operators. This registry has formed the database for a variety of reports on challenge course injury statistics.^{3,4}

In light of concerns about the occurrence of sudden unexpected death on such courses, the authors used this database to ascertain well-documented episodes.

Additionally, a trade organization of challenge course operators, The Association for Challenge Course Technologies, regularly brings together representatives of the industry. The authors have presented workshops at these meetings seeking additional cases that may not have been already reported.

DATA ANALYSIS

Available details of reported deaths were reviewed by the authors. Additionally, one of the authors (R.R.) made telephone or personal contact with individuals directly involved with the incidents, including witnesses and program administrative staff. Any available press reports or public statements in reference to the deaths were obtained and reviewed. The fact that some cases were currently or potentially the subject of litigation limited the ease with which such information could be gathered.

On the basis of the available information, it was first determined if the death actually occurred during or immediately after participation in a course. For purposes of the study, 30 minutes after the conclusion of the course was chosen as the outer range for symptom onset. This figure has been used in previous studies of sudden death during exercise.⁵ Deaths were classified as traumatic or nontraumatic, based on available information. Circumstances leading to the traumatic deaths were an-



Two participants being belayed on a high challenge course element.

alyzed from the standpoint of accepted industry safety guidelines.⁶ Demographic information (age, sex, etc) was obtained for nontraumatic deaths, as were the reported final diagnoses. No attempt was made to contact families or treating physicians, however, as this would have violated the confidentiality requirements of the registry.

Finally, in order to place the observations into context, conservative estimates of exposure hours were derived from registry data on the program times and numbers of courses in the United States.

Results

A total of 17 deaths between 1986 and 2000 were reported to the registry. This figure was thought to be accurate since no unreported cases were identified in the course of discussions during Association for Challenge Course Technology workshops. Two of these deaths occurred in relation to a challenge course but did not meet the temporal definition (1 was before the program commenced, while the second occurred in a parking lot over

1 hour after the course concluded). Thus, 15 deaths met the study criteria and were subjected to further analysis.

Five deaths (33%) were associated with trauma, all from falls from a height (Table). In each of these 5 circumstances, it appeared that a standard installation or operating procedure was not being followed correctly. Interestingly, only 1 of these deaths involved a participant. The others were staff members involved in course set-up or operation. Four of these 5 deaths occurred on a single element, The Zip Line. This is a pulley device secured to a cable on which participants ride from a high platform.

The other 10 incidents (67%) were all classified as sudden cardiac death (SCD). All 10 occurred in men. The reported age range of these individuals was 33 to 60 years.

Based on the known numbers of challenge courses in the United States and the mean participant hours as estimated from registry data, it was conservatively estimated that the period of this review comprised 194 800 000 participant hours. This would yield a rate of SCD of 1 per 19 480 000 participant hours.

Discussion

Fatality analyses such as these are only of use in the event that they provide a background for evidence-based policy recommendations. We believe that this study has a few salient points in this regard.

First of all, the overall fatality risk from participating on these courses is quite low. This experience is consistent with the registry’s data on injuries.^{3,4} Defining serious injuries as those resulting in 1 or more days lost from school or work, the injury rate on reporting courses was established as 4.33 per 1 million participant hours. This rate was orders of magnitude below that of competitive basketball (2650 per 1 million hours⁴) and that

Traumatic deaths on challenge courses, 1986–2000

<i>Case no.</i>	<i>Individual</i>	<i>Element</i>	<i>Description</i>
1988-1	Instructor	Zip Line	Fell from a “homemade” structure that was not professionally constructed or inspected
1991-1	Instructor	Zip Line	Fell from platform while running element; was not secured to element
1992-1	Participant	Zip Line	Pulled off platform by retrieval system; not secured to element
1997-1	Instructor	Zip Line	Fell from platform while shutting down operation at night; not secured to element
2001-1	Instructor	Not certain	System attaching belay rope to cable incorrectly attached; fell from element

of another outdoor adventure activity—backpacking (192 per 1 million hours⁷).

Although the fatality rate was low, details about the incidents are revealing. One third of the deaths were traumatic, occurring as the result of a fall from a height. Each of these was clearly associated with failure to observe published installation or operational standards. Thus, none of these deaths appears to be the sort of random, unpreventable event that characterizes some outdoor sports. Four of the 5 victims were actually staff members, not participants. While programs may have stringent safety requirements for participants, these may not extend to the individuals running the courses. This should obviously be an area of concern for program administrators.

The final issue is that of SCD. In terms of participant hours, the 10 cases noted herein represent about 1 per 19 480 000. Establishing denominators for such incidence rates is difficult, but this number appears to be about 100-fold below that reported for marathon running (1 per 215 000 hours),⁸ a sport for which fairly accurate statistics are available.

Although some challenge course programs have instituted varying degrees of medical screening for cardiac risk, it is difficult to justify such procedures from these data. With an incidence rate so low, it would be impossible to validate any screening process. Certainly, sports with a well-recognized risk of SCD that far exceeds that of challenge course participation (eg, racquet sports, jogging, and golf)^{9–11} do not employ formal screening. The medical literature is quite consistent in questioning the usefulness of such screening.^{11,12}

Perhaps more easy to support would be preparation for responding to a cardiac event on a course. Most programs have some requirement for staff training in basic life support and mechanisms in place for activating the advanced life support system. Currently, the additional inclusion of automated external defibrillators on courses has not been adopted by the industry, although some operators have queried the authors about this. The best data on the utility of automated external defibrillators have come from venues in which SCD occurs frequently (airports¹³ and casinos¹⁴). These are sites in which thousands of at-risk individuals congregate. On challenge courses, SCD is uncommon, and there are rarely more than a few dozen individuals on a course at one time. Thus, they would not appear to be the types of locations at which automated external defibrillators would likely be important.

Sudden death on challenge courses is uncommon. About one third of such deaths are traumatic and yet potentially preventable with rigid adherence to industry safety standards, especially among staff. The balance

consists of SCD. Although staff training in basic life support is probably prudent, there are insufficient data to support the use of any formal cardiac risk assessment procedure.

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