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AUTHOR Buchanan, Edsel
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ABSTRACT

The paper presents information pertaining to both equipment and human factors associated with playground safety for the handicapped. Research is reviewed on injuries related to public playground equipment, the equipment/user interface, and accommodation of equipment for all children. Noted among findings are that 72% of all reported injuries were associated with falls, that the ability of children to use playground equipment safely depends on their capacity to make accurate perceptual discriminations, and that handicapped children select play activities similar to those of nonhandicapped children when provided accessible and safe play equipment. Causal factors for injury and potential remedial strategies are listed for climbing apparatus, slides, and swings. It is concluded that many accidents can be prevented by safety standards governing mechanical hazards, and through design criteria, modification of user behavior, and adaptations for appropriate sensorimotor, perceptual motor, psychomotor, and cognitive abilities. (SBH)

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Playground Safety For The Handicapped

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Dr. Edsel Buchanan
Coordinator, Recreation/Leisure Studies

University of Nebraska at Omaha

Introduction

The overall environment for playground safety for all children involves much more than just equipment. There are many human factors associated with playground injuries and this factor is, perhaps, more significant for the handicapped than it is for the non-handicapped. There is no question that playground safety is related to both equipment and human factors. This paper will address both factors and will attempt to present pertinent information and data regarding playground safety for the handicapped.

Understanding the nature of play will help one understand the nature of the problem of playground safety. Beckwith (1) indicates that play may be defined as a spontaneous behavior that is motivated by biological and social needs. Bowers (3) suggests that play may be universally characterized by spontaneity, freedom, creativity, discovery and joy. He additionally suggests that play and developmental experiences of children form an integrated process through which self is explored in relationship to the world. Brown (5) compounds the problem of understanding play in correctly reporting that playground equipment available today is as complex and diverse as are the children who use it. The situation becomes additionally complex when the using children are handicapped. It may be emphasized, however, that the diverse use of playground equipment is rather predictable and there are measures which may be used in designing playgrounds which will accommodate children's reasonable foreseeable use of the equipment. The thesis of this paper is that adequate data regarding playground safety is available and if incorporated into an overall program of playground design, operation and maintenance, it will have a significant beneficial effect

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on playground safety for all children.

Purpose

As stated previously, there are multiple factors associated with the safe use of playgrounds. Most current research has focused primarily on public playgrounds and public playground equipment. (14) Although most research has been associated with "normal" children, the basic data is also pertinent to playground areas and equipment designed for use by special populations. The author believes that the knowledge and insight gained from the comprehension of research associated with public playground equipment is essential to any adaptation and usage of either areas or equipment by the handicapped. It is, therefore, the purpose of this paper to provide the reader with significant research findings which are appropriate to playground safety.

Hazard Analysis

1978 data reveals that some 93,000 injuries were associated with public playground equipment. (14) Patterns of injuries and accidents associated with different types of equipment and surfaces revealed the following:

Seventy-two percent of all reported injuries were associated with falls. Most were falls that were directly to the underlying surface.

All types of equipment are involved in accidents. No one type stands out as particularly more hazardous than any other.

Approximately 4 percent of the reported injuries involve equipment failure or broken equipment.

Factors such as equipment spacing and playground layout and design account for approximately 9 percent of reported injuries.

Analysis of the types of surfaces involved in injuries indicates that paved surfaces account for more frequent and severe injuries. (5)

The surfacing that is used on playgrounds and beneath play equipment is a significant factor associated with patterns of injury. Paved surfaces are involved in injuries more frequently and with more severe results than are such

surfaces as sand, tire crumbs, pea gravel and other surfaces all which require continuous care due to their loose fill characteristics.

Human factors account for over 90 percent of all reported injuries on public playground equipment. Product failure, design defect or maintenance deficiency are factors in only 4 percent of all reported public playground equipment injuries. (5) Apparently, as the data suggests, the most significant aspects of safety are attributable to how the equipment is used, one or more design characteristics of the equipment, or the physical, developmental, cognitive or other limitations of the users. General recommendations which are unrelated to equipment and surfaces typically include an emphasis on quality supervision, playground layout, equipment capacity and age group separation. Design safety and function safety are especially important for all playgrounds and playground equipment.

The Equipment/User Interface

It has been noted by both Beckwith (1) and Brown (5) that only so much "safety" can be incorporated into equipment and surfaces. The greatest safety benefits will accrue as a result of an appropriate equipment/user interface and this requires safety-oriented behaviors and/or skills by children, parents and those who supervise play environments.

On play behavior, Brown (5) notes that children engaged in play will display three identifiable play modes; namely solitary play, parallel play and cooperative play. It is noted that playgrounds, by virtue of their design, foster cooperative or group play. The group play activity contributes significantly to the cause of accidents. Brown additionally reports that the ability of children to use playground equipment safely depends on their capacity to make accurate perceptual discriminations. Accurate perception requires the use of vision, audition and touch. Sensory input will come from the environment, from other

children, supervising personnel, the equipment and the user's own body. Successful perception is dependent on developmental changes which are generally continual throughout childhood and are routinely accompanied by motor and behavior alterations. Both learning and experience also affect behavior and motor ability.

It is well known that the cognitive process is a significant factor regarding subjective risk for a child during playground activity. Risk-taking is considered to be a necessary and integral part of a child's total development. (8) Much sensory feedback and situational information will influence a child's decision regarding risk-taking. The need for attention, competition and peer pressure are significantly interwoven and affect risk-taking judgments and psychomotor behavior.

Accomodation For All Children

Research by Bowers (4) strongly supports the thesis that if playgrounds are to serve the needs of play for children, then playgrounds must accomodate all children. All children will include those with motor dysfunction, those with physical and/or mental impairments and the able-bodied. It is reported (4) that there are over seven million school-aged children alone in the United States who because of an impairment or lack of development of the skeletal, muscular or nervous systems are classified as physically, intellectually or emotionally handicapped. Bowers (3) additionally reports that although the rate of development of basic movement abilities in handicapped children is usually slower than that for the non-handicapped, the sequence and pattern of motor development is basically the same for both groups. Research (4) indicates that when provided accessible and safe play equipment, handicapped children select play activities similar to those of a group of non-handicapped children matched for age and sex as they engage in play within the same environment.

The research literature on playground safety is replete with data supporting the fact that whenever the natural exploratory play behavior of children is in conflict with the single-standard design of most play equipment, the behavior is deemed inappropriate and frequently results in an accident. (1) (3) (5) (11) (14) Since we cannot redesign the child, we must redesign the playground.

A recent report by Bowers (3) offers the following regarding principles of playground design:

Playgrounds/Play Spaces Should -

- Be accessible to all children
- Provide safe distance between levels
- Incorporate a variety of inclines for children to move at their own level of ability
- Provide partially closed spaces through which children can safely move
- Be complex and stimulating
- Use interconnected play areas to produce higher levels of continuous play.

Bowers believes that the best test of play equipment is the amount and quality of continuous play, freely engaged in, by the children for whom it is designed.

Beckwith (1) offers a number of practical suggestions for making playgrounds more safe for children. He urges those who are planning for the provision of play areas to - -

- Provide a fall-absorbing ground cover
- Provide one and one-half play events per child
- Avoid tall equipment
- Remove/Not have heavy moving equipment
- Provide for group play
- Provide for choice
- Provide for experimental use
- Provide flexibility
- Select age-appropriate equipment
- Teach challenging ways to use the playground equipment.

Beckwith additionally notes that we cannot stop children (nor should we) from playing. Also, that we should not arbitrarily remove play equipment for "safety reasons" since this only forces children to play in and/or on areas/

equipment that is inappropriate and unsafe.

Brown (5) offers significant research data that is concerned with safety factors associated specifically with equipment typically found within public playgrounds (Climbing Apparatus, Slides and Swings). Causal factors and potential remedial strategies for these three categories will be presented in juxtaposition as follows:

Climbing Apparatus (Falls)

Causal Factors

Child misjudges the distance of the next support member for both the hand/foot placement.

An inappropriate or partial grip on a support member.

Presence of moisture on the equipment, hand or shoe.

Distance the child must reach may be too far for their leg or arm length (reach envelope).

The diameter of the hand support may not optionally correlate to the hand size of the minimum user.

Fatigue, congestion, interface (i.e., being pushed or shoved) or at transitional points (from moving up to moving down).

Inattentiveness, poor perception, layout, or visual barriers may contribute to instances where children, not using the equipment, run into it.

Potential Remedial Strategies

The number of children using climbing equipment should not exceed the equipment's capacity.

Spacing of support members/bars, whether for foot or hand should be scrutinized to match the reach envelopes of the intended user.

Equipment should be evaluated as to whether it provides for the user to make transitions easily. That is, does the equipment lure the child to climb easily to the top and then not provide for the child to descent equally as easily or provide a way out option (e.g., lead to a platform or other piece of equipment for descent).

If there is ample equipment for all children to use, less negative behavior will be evidenced.

Brightness, color contrast, size and angle of the equipment can improve a child's ability to accurately perceive distances.

Use of certain materials which have a high coefficient of friction may enhance abilities to maintain grip.

Use of highly textured materials can increase the amount of sensory feedback children receive while climbing.

Wearing of shoes which do not have a slick surface.

Slides

Casual Factors

- Children do not slide down the slide in the appropriate manner.
- Children are forced into a congested space with "no way out" or "wait your turn" situation.
- Inability to reach handrails.
- Inappropriate diameter of handrails or supports.
- Inappropriate ladder incline.
- Inappropriate step width or depth.
- Inappropriate exit gradient.

Potential Remedial Strategies

- Slides with a 2½ inch minimum slide side height. This is intended to prevent falls from the slide when used in the appropriate manner.
- Establishment of criteria for the angle of ladder, step width and depth and minimum size of platform transition area. This should be based on the manner in which a child uses a ladder and the size of the intended user.
- Diameter of hand supports that correlate to the minimum user's grip size.
- Slides with a reduced exit gradient which slows down the user so that balance can easily be gained. Also, the height of the exit from the ground should be considered with the leg length of the user as a guideline.
- The space needed for exiting a slide should be considered when determining layout. Because the child is being propelled from the slide, he must have ample room in which to regain his balance. Thus, the slide exit should be located in an area where there is little or no congestion and be out of the way of other play traffic areas.

Multiple means of access to the top of the slide.

Swings

Casual Factors

- Younger children's ability to accurately estimate time, distance and speed of an approaching swing.
- Location of swing(s) or swing set is too close to other play activities.
- Too many children, not swinging, are in close proximity of the swing sets.
- Creative play, competitive play, or risk-taking behavior displayed by running under, jumping from or standing on the swing.

Potential Remedial Strategies

- Swing seats should not generate impact forces in excess of 100 g's.
- Location of swing(s) or swing sets away from other activities or equipment. Minimum use zone.
- Close supervision to control for congestion or misuse behavior.
- Utilizing colors or noise to increase sensory input or aid in perception.
- Tire swings may prove to be more advisable.
- Design support frames for swing sets which do not invite climbing.

Other factors reported by Brown (5) relative to considerations associated with the level of safety for public playground equipment were (a) supervision, (b) layout, (c) equipment capacity and (d) age group separation. Each of these considerations may interact significantly regarding safety. Quality of supervision and number of children supervised, traffic (flow, density, layout), capacity (space and number) and age group appropriateness will interact in a manner that consistently affects the safety of all children engaged in play activity.

Conclusion

Playground equipment today that is readily available to the public is as complex and diverse as are the children who use it. The equipment/user interface may well be the most significant element to consider for equipment and playground safety. (5) Safety of playground areas and equipment is closely related to design, intended functional use and the specific abilities of those who use the area and/or equipment. Many accidents can be prevented by safety standards governing mechanical hazards, but significant additional accident reduction may be achieved through design criteria, modification of user behavior, adaptations for appropriate sensorimotor, perceptualmotor, psychomotor and cognitive abilities. In previous years, product design has largely resided with the manufacturer. Current research by child developmentalists, social scientists, safety engineers, behavioralists and numerous allied professionals strongly suggests one central theme: playground design, playground equipment and playground usage must meet the needs and abilities of those who play whether "normal" or "handicapped."

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