



Carrying Backpacks: Physical Effects

**Illinois State Board of Education
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It is estimated that more than 40 million U.S. youth carry school materials in backs (Wang, Pascoe, Weimar, 2001). These backpacks routinely contain books, laptop computers, personal and other items used on a daily basis. The Consumer Product Safety Commission (CPSC) estimates that 7,277 emergency visits each year result from injuries related to backpacks. The CPSC also reports backpack-related injuries are up 330 percent since 1996.

Injury can occur when a child tries to overcompensate for the extra weight by leaning forward, arching his or her back or leaning to the side. Carrying a backpack with one or two straps promoted significant forward lean of head and trunk compared athletic bags or strapless bags. This type of compensation leads to improper spine alignment causing fatigue and strain that may result in further injury. (Wilmarth, 2005) The daily physical stresses associated with carrying backpacks on one shoulder significantly alter the posture and gait of youth. (Pascoe 1997)

The American Occupational Therapy Association, American Chiropractic Association, American Physical Therapy Association and American Academy of Orthopedic Surgeons have similar recommendations to limit backpack weights to 15 percent of a child's weight as listed:

Person's Weight (pounds)	Maximum Backpack Weight (pounds)
60	5
60-75	10
100	15
125	18
150	20
200 or more	25*
*No one should carry more than 25 pounds	

In addition to weight restrictions, Wilmarth recommends the following instructions for proper use of the backpacks:

- **Wear both straps.** Use of one strap causes one side of the body to bear the weight of the backpack. This can be true even with one-strap backpacks that cross the body
- **Remove and put on backpacks carefully.** Keep the trunk of your body stable and avoid excessive twisting.
- **Wear the backpack over the strongest mid-back muscles.** Pay close attention to the way the backpack is positioned on the back. It should rest evenly in the middle of the back. Shoulder straps should be adjusted to allow the child to put on and take off the backpack without difficulty and permit free movement of the arms.
- **Lighten the load.** Keep the load at 10-15 percent or less of the student's bodyweight. Carry only those items that are required for the day. Each night remove articles that can be left at home. Organize the contents of the backpack by placing the heaviest items closest to the back to reduce kinetic forces that cause postural misalignment and overwork muscles.

When selecting a new backpack, Wilmarth recommends choosing ergonomically designed features that enhance safety and comfort:

- **A padded back** to reduce pressure on the back, shoulders and underarm regions and enhance comfort'

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- **Hip and chest belts** to transfer some of the backpack weight from the back and shoulders to the hips and torso;
- **Multiple compartments** to better distribute the weight in the backpack, keep items secure and ease access to the contents; and
- **Reflective material** to enhance visibility of the child to drivers at night.

Parents and children can avoid injury by recognizing the following warning signs that the backpack is too heavy:

- change in posture when wearing the backpack;
- struggling when putting on or taking off the backpack;
- pain when wearing the backpack;
- tingling or numbness in arms and legs, mostly arms; or
- red marks on the shoulders.

References

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