

Our Kids, Backpacks, and the Back Epidemic

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INTRODUCTION

In my 34 years of teaching back health and rehabilitation I have observed that lifelong habits of poor posture are a main contributing factor to back pain and disability. That is why I am committed to address these habits as early in life as possible. Poor posture includes such things as forward head, forward trunk lean, and associated short stride length which we see as tendencies in aging. There are numerous references in the literature linking backpack use not only to back pain and injury but to these posture and gait problems.¹⁹ What alarms me now is how many children I see with posture and gait that we associate with 80 year olds and certainly with the majority of patients with back pain.

Since my son introduced me to the world of children 13 years ago, I have spent a good deal of time volunteering in schools. I have seen so many factors in the life of our school children which contribute to back disability that as a physical therapist I am appalled. I will share with you the problems I see and what I feel needs to be done to correct them.

FROM THE CENTER OUT

In my clinical approach I have always started at the center and worked out, while evaluating the individual as a whole. I am applying this same approach to our kids, backpacks, and the back pain epidemic.

School Chairs

Our children spend nearly 6 hours of their school day, sitting in bucket seats that have been designed for ease of stacking rather than for the humans sitting in them (Figure 1). In order to sit relaxed in seats like these, one must assume a posterior pelvic tilt and spinal kyphosis with forward head. If children plan to read or write at their desks, they must exaggerate these postural distortions even further (Figure 2). Teachers usually require students to sit back in their chairs for reasons of orderliness and safety—understandable priorities in our crowded classrooms—but in the typical school chairs the only way to sit with proper spinal position is to sit on the front edge of the chair so that your pelvis is free to rotate anteriorly on the femur to assume a neutral position. Most children instinctively try to reach this position (if there molding process is not too advanced already).

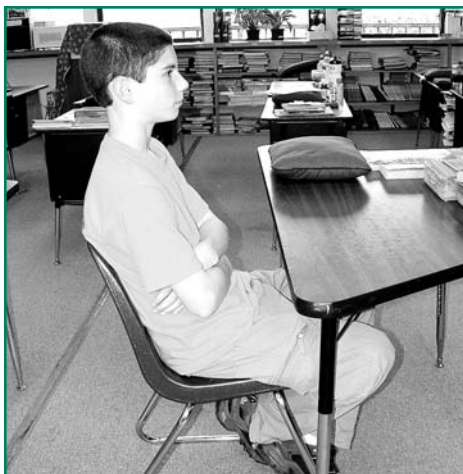


Figure 1.

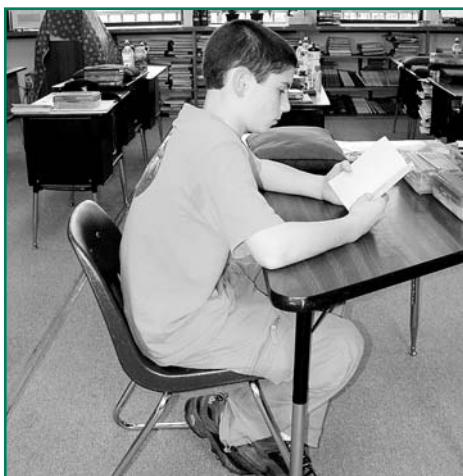


Figure 2.

Aside from the postural distortion created by these child-molding chairs, the hamstrings are put in a shortened position while seated at a desk, as are the hip flexors. The length of these two major muscle groups is crucial to proper spinal/pelvic posture and mechanics. When the children are allowed to elongate in stance, it is only for enough time to hurriedly don their backpack and rush to the next class or have a quick trip to the locker if they are lucky enough to have one. There is certainly no time for a thorough stretch of these shortened muscle groups. And, there is certainly no time and attention spent on getting one's head back on top of the spine in a vertical orientation!

Forward Heads

Heads are forward from hours in the chair, leaning over desks, hovering over computers (Figure 3) (while seated in



Figure 3.

other bucket seats or chairs that require a backward lean, as recommended by “ergonomists”), lounging in soft sofas at home watching TV, playing with Legos on the floor, etc. Children, and our entire society in general, spend so much time with a forward head that our brains adopt this as a new “normal” position. How many times have we heard from our patients when we correct their head position that “it feels unnatural, like I’m leaning backward.”

Backpacks on Top of it All

Upon these flexed spines, children don the backpack, which has for some reason become a standard school supply item. The horizontal forces of weight behind and straps in front over shoulders, dictate a forward lean and facilitate rounded shoulders and forward head (Figure 4). Now that we have our developing loved-one sufficiently slumped for a sufficient period of time throughout each day, we add a 20-pound load to the whole gravity challenge. This is imposed upon a rapidly developing skeleton that

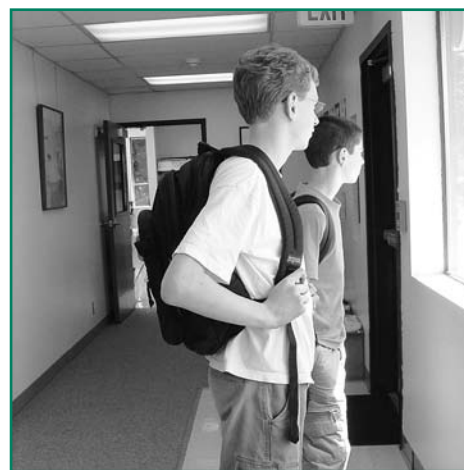


Figure 4.

will be shaped for a lifetime within these few years. All our children are victims of this disabling requirement. What are we as a society and a profession doing, tolerating this pattern?

WHY ARE OUR CHILDREN SO ATTACHED TO BACKPACKS?

If we really want to solve this backpack problem we must first analyze its cause, just as we do with our patients. I would like to first acknowledge the fine study of two Pacific University doctoral students of physical therapy, Jessica Johnson and Cathleen King, who analyzed many factors involved in backpack use in adolescence and especially the importance of studying specific age groups in order to best analyze and solve this problem.¹⁰

General observations I have made with my own child and his classmates as to why they use and misuse the backpack to the detriment of their bodies, despite all the advice from knowledgeable teachers and parents, has suggested the following reasons:

Convenience

- They don't want to be caught without something important to have along so they keep much more than they need in the backpack. Therefore the weight of the pack increases beyond healthy limits.
- It is awkward and time consuming to take it on and off so why not just keep it on therefore increasing the length of time carrying the load.
- “Out of sight out of mind.” Hand and arms are free for other activities and the backpack becomes in effect unconsciously grafted to the body, forcing our neuromusculoskeletal systems to make the necessary mechanical and physiological adaptations in order to continue to function with gravity.

Fashion

- Coolness. Gotta wear the sag bag!
- No student in their right mind would be caught without a backpack in school!
- The kindergarteners want to be big and look like a real student.
- Media and marketing make it cooler by the minute and by the dollar. Marketing sophistication is way beyond the influence of parents and certainly beyond their pocketbooks.

Required Equipment

- Many schools include backpacks in their school supply list.

SO WHAT CAN WE DO ABOUT IT?

“Form Follows Function”

We all know that the human body is designed to stand vertically. Physical therapists know what good spinal position is (though amazingly controversial these days!), and that its most efficient loading is as close to vertical, or spinal elongation, as possible. We need no elaborate research efforts to convince us that the best way to carry a load is close to the spine, the best way to use our legs properly in gait is with vertical posture, the best way to reinforce and train a movement is to give it resistance and repetition in the direction as similar to the desired movement and function as possible. As we train people to reach their highest functional levels we guide them to experience this relationship of their body with gravity. Our children all have this relationship in its purest form when they begin walking, balancing their heavy heads. I have included a diagram illustrating the horizontal and vertical components of forces associated with backpack carrying (Figure 5). The sketch illustrates why the forward pull of the shoulders is necessary to balance the downward pull of the backpack load.

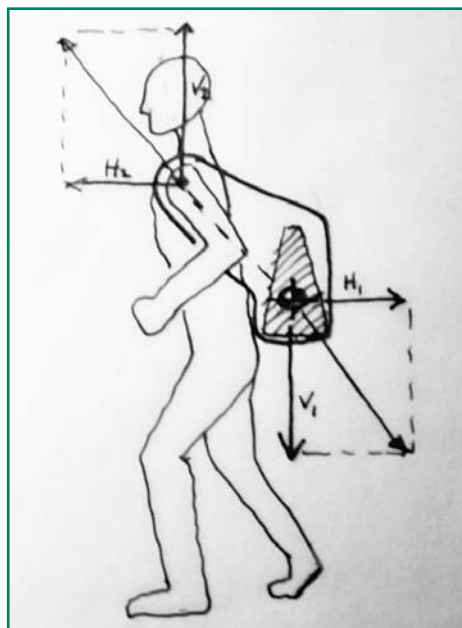


Figure 5.

Load Axially

The human body is its own load, ie, mass and gravity. How is it made to work with its weight? It is made to work vertically in partnership with gravity. So shouldn't we complement this already perfect design by keeping the load vertical and not messing it up! We should look at our toddlers and our wise native brothers and sisters and use our heads to

balance our axial loads, as they have done for centuries.

Are we victims of fashion too? Our first reaction when someone in our culture places something on their head — laughter! We think they are being silly. Well it's time to get serious. And don't underestimate our children's wisdom. When given the facts about themselves, their bodies, and peoples of this earth, kids will want to make the right choices, especially if they are part of the creative solution process—and know that they are helping their own loved ones by their example and their ideas.

Horizontal versus vertical

Look at our classrooms, our daily lives, our chairs, our loads. Do they complement this vertical effort or do they change the direction of our human movement and posture toward the horizontal activities of our lives—driving, computer work, watching TV? In my experience the only effective way to train good posture is to do proprioceptive neuromuscular facilitation for axial extension. This can be done with any head carrying exercise or device that is of minimal but sufficient weight to proprioceptively facilitate, once the individual assumes full axial extension and optimal spinal posture, which can be measured by CV angle measurements.¹¹ This often requires extensive retraining to overcome decades of poor postural habits.

People of the World

Why don't we join the rest of the world and carry loads as they have been doing for centuries, from the head and/or with balanced axial loading over the shoulders? They must use their bodies properly for survival. They cannot rely on technology to do the body's work, and they have no worker's compensation for back disability.

In plains regions such as in Africa, many natives apply a twisted rag in a donut shape as a base for carrying objects directly on the head. In mountainous regions requiring constant travel on inclines, people use a tumpline (head strap) system with a basket on the back (see Figure 6). In 1983 when visiting Nepal with our beloved colleague, the late Sarah Semens, I personally experienced the Nepalese carrying system for 2 weeks by employing it myself. I also met with an orthopaedic surgeon in Kathmandu who expressed amazement that the Nepalese people who carry very heavy loads in this manner for days at a time, do not have the back problems so common in our society. Needless to say,



Figure 6.

they begin postural training by necessity at a very early age.

When speaking in classrooms, I bring slides of people around the world to demonstrate how we are all part of the human family and how we have much to learn from those less “privileged” than we. This has been an enormous breaker of the fashion and vanity consciousness that especially influences adolescents. It gets them excited and expands their awareness of design possibilities.

ACTIONS I HAVE TAKEN

My crusade began when my son was in the fourth grade. The class was studying comparative skeletal anatomy, and when they got to the human, the teacher asked if I would cover that area. I took the opportunity to teach about why we were designed as we are and how to respect and care for that design, posture first. I provided small travel cushions for the children’s chairs so they could experience correct and incorrect sitting posture. They used them for the rest of the year and experienced how much better their backs felt. I notified our local newspaper about the project. The editor did a very informative and fun article using photographs of the children. She was happy to have me do most of the writing so the information would be correct. These cushions by the way are a simple remedy for the bucket seats, short of replacing them. I have arranged for all the classrooms I have been involved in to purchase these cushions at a discounted rate.

I discovered several years later that the fourth-grade was an ideal time to start the posture and back health awareness education. Fourth-graders are open to ideas and less affected by the many physiological and social concerns of adolescence that limit attitudes about their bodies.

I continued working with each of my son’s classes, now approaching the eighth-grade. Our local newspapers and television stations have been interested in each class project. This has been a real validator with the kids and the community, as well as just exciting and fun. It has also been useful as carry over information for the students from year to year.

In one fifth-grade class, I involved the students in evaluating several chair samples to advise the principal in what chairs he should order when chairs were to be replaced. I also photographed the children in sitting posture at their desks, before and after training. This posture awareness project with all 60 fifth-graders of the Nestucca Valley School District was shown on big-time Portland network news, a huge thrill for the students of our small rural community on the Oregon Coast.

At the end of the project, I gave them copies of the photos so that they and their families could visualize the subject and practice at home. Photos are especially valuable as teaching tools because there is so little time and attention available in the classroom for outside people such as us.

I also involved the students in book bag design brainstorming. Here they could apply to a real-life situation what they learned about the basics of how the body works, with respect for the spine as the center of healthy movement and posture. They came up with “right on” suggestions. One of these is also my recommendation: bilateral shoulder bags joined like a vest with an optional head strap.

Currently I am working on an attachment to the present backpacks that will decrease the horizontal vector and include the head for some of the load, which facilitates axial extension and optimal posture. If any of you are interested in my backpack attachment you can contact me. Maybe some researchers among you would like to use it in a study.

I have included “Guidelines for Backpack Use” in Appendix 1; a handout I put together for students, parents, local doctors’ offices, etc. I made it available to parents, students and teachers in local schools during the registration and orientation periods and throughout the year.

When Sharon Kitzhaber, a physical therapist, was First Lady of Oregon, I wrote to her for her input regarding my concerns about the spinal health of our school children related to poor postural habits. She recommended I speak with the Physical Education Specialist of the

Oregon State Board of Education, Margaret Bates. After an afternoon of interesting exchange of ideas and information, she suggested I write an article for the professional journal of Oregon physical educators. See Appendix 2.

FURTHER ACTIONS WE CAN ALL TAKE IN OUR COMMUNITIES

- Collaborate with your local Pediatric Orthopedist to expose these problems to your community from a broad medical perspective.
- Go into the classrooms, volunteer to help. While you are there, notice all the other factors in addition to backpacks that contribute to the back pain epidemic.
- Offer to do a posture class in the classroom or instruct teachers in the basics to share with their class and incorporate into daily classroom good habits.
- Meet with physical education and classroom teachers. At first I had thought that PE was the class in which to teach posture and body mechanics, but then I realized that the instructors only have a very short time with each student, and maybe only two classes a week. Since it is really daily habits that we need to address, I now think back health habits are best brought into the classroom. Present them in a way that benefits teachers as well. Everyone needs to stretch throughout the day and the students and teachers will work better, and with a more positive attitude if their bodies are not being abused at the same time.
- Find out how the chairs are ordered, what catalogues, who orders, the criteria they use, etc. and offer to educate and help with the selection of chairs.
- Contact vendors and school chair designers, schools of industrial design, etc. Educate them in the importance of fostering good posture with design.
- Coordinate PTs and OTs in your school district to demonstrate our professional commitment as a team to address issues that affect lifelong spinal health.
- Contact your legislators. Legislation is proposed in California regarding backpacks. Lead that process in your state. Los Angeles County schools employ physical therapists to oversee the ordering of furniture and to properly adjust it to the students.
- Best of all, teach children what to be aware of at school and at home. Teach

them to feel and learn healthy posture through their neuromotor system, and how to properly stretch the muscles that are shortening while just being a student. Teach them the mechanics of backpack use and have them design a better system for carrying books. They love learning and creating solutions to their own problems. Most of them will have an emotional involvement with the problem since the majority of families have someone who has suffered a lot with back pain, has been crabby, unable to work, and unable to play with them due to back pain.

- Get the media involved.
- Write the Surgeon General.
- If all else fails...use the legal system!!!!

But once again, let's remember to go to the CENTER first. You can't correct all of these problems fast enough anyway, so take a deep breath and start with one. If you are a parent you can do something about the health of your own child now. I sometimes spend too much time with the big problems of our society instead of addressing the problem right in my own household.

Here is what we work on at home to keep our child orthopaedically healthy:

ACTIONS ON THE HOME FRONT

- Practice good posture: when sitting, standing, sleeping, reading, playing Legos, eating at the table, etc. Use occasional posture checks such as standing against the wall to learn how it feels to be vertical or lying flat on the floor, so the head can learn proper alignment with the spine.
- Our son especially loves sports so we demonstrate how these posture principles improve all athletic performance. Build on your child's personal interests.
- Eliminate leaning onto elbows whenever possible, especially while eating.
- Encourage frequent change of positions and know what positions to get into that "undo" the position he may have been in for a long time, eg, with Legos on the floor or computer activity.
- A written Home Exercise Program!! of appropriate stretches (hamstrings, hip flexors, thoracic spinal extension), and strengthening exercises (sit-ups, pull-ups, handstands, leg strengthening, etc).
- Head-carrying activities whenever possible.
- Experiment with carrying systems other than a backpack.

- Solicit his suggestions of how we all can improve our postural habits and encourage ideas from him of other stretches and strengthening exercises to do.
- Play games like keeping a balloon off the ground or batting it back and forth, volleyball, head carrying relays, pull-up contests, etc.
- Share clinical examples of disabilities from postural disorders, and comments from patients, such as "if only someone had told me this 40 years ago."
- Learn about carrying methods of people around the world who must use their bodies correctly for survival.
- And most important of all, BE AN EXAMPLE. We imitate one another.

SUMMARY

GET RID OF BACKPACKS for school use. They were originally designed for mountain climbers, whose hands are occupied and who are bent forward to climb an incline. Somehow the market spread to children for school supplies, and now backpacks are fashion statements. (Check out fashion and posture since the 70s, the post-Backpack Era vs. pre-70s, the pre-Backpack Era, in films, cartoons, magazines, commercials, etc.)

LOAD AXIALLY. If we need school bags at all (which is certainly questionable for kindergarteners and first graders), they should allow the weight to be evenly distributed on both sides and as close to the spine as possible to facilitate axial extension. Learn from native populations around the world who depend on their bodies for survival, instead of the conveniences our prosperity provides. They are the authorities in body mechanics. They use their heads and balance their loads. Teaching habits of healthy aging, beginning with our children, is the professional challenge of our day.

LET'S BE AN EXAMPLE. We must be able to show what we know if we want to teach it. I am proud that Physical Therapy is taking a leadership role in educating the public so all people can be as healthy as they were created to be. This must continue to be our focus.

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GUIDELINES FOR BACKPACK USE FROM THE AMERICAN ACADEMY OF ORTHOPAEDIC SURGEONS

1. Don't let your backpack's weight exceed 20% of your body weight (less for a young child).***
2. Use a hip strap for heavier weights.
3. Use a backpack with wide, padded straps and a padded back.
4. Use both of the backpack's straps, firmly tightened, to hold the pack 2 inches above your waist.
5. Engage in exercises to condition your back muscles. Ask an orthopaedic surgeon or physical therapist for advice.***
6. Use the correct lifting techniques; Bend with both knees keeping a straight spine when picking up a heavy back pack.***
7. Place the heaviest items close to your back.
8. Pack your backpack neatly, and try to keep items in place.
9. Try to make frequent trips to your locker, between classes, to replace books.
10. Consider purchasing a backpack with wheels.
11. Purchase a second set of books for home.

*****EXERCISES AND FURTHER TIPS FOR HEALTHY BACKPACK CARRYING**

from Marilyn Miller von Foerster, Physical Therapist

Never add a load to a slumped spine. Keep your heart and head high, especially when you are lifting or carrying.

When loading and unloading your backpack, place it on a waist-high platform like your desk, rather than the floor, using your legs with a straight spine to lower yourself to the load.

Use a head strap to take some of the weight off shoulders and help maintain good posture.

Condition your back with such activities as:

- swimming (backstroke and breaststroke);
- jumping jacks, pull-ups, archery;
- overhead presses with light weight such as 2 books; and
- holding a book on the head with tall posture and slowly sit and stand from a chair 10 times.

Have a great year and a tall and healthy spine!

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**URGENT
WE ARE TAKING ACTION NOW AND NEED YOUR HELP**

Medical research has identified extensive backpack use as a major contributor to poor postural habits, which if not corrected, will lead to a lifetime of recurrent pain and increased risk of injury and disability. More and more students are requiring physical therapy for shoulder and back pain related to both carrying the backpack and putting it on and taking it off.

The problem is especially urgent and serious for kids in middle school since the skeleton grows most rapidly and develops most permanently on people between the ages of 10 and 14.

There is no "good" backpack for carrying school books because the weight is distributed in a way that requires the student to lean forward to balance the weight, and to twist and bend with it loaded in order to take it on and off. Wheeled packs are some help, but often still requires lifting onto the back to get on and off the bus with an instrument etc.; the wheels make the pack heavier. My son went through three backpacks in our effort to find the healthiest situation. None was significantly better than the next.

WHAT WE CAN DO:

In addition to the guidelines on the opposite side of page, there are other bag systems that would help. Ideally the weight should be as close to the spine as possible, balanced, and complement good posture. As people in the third world demonstrate, head-carrying is the best way, according to the design of our skeleton. The next best is equal weight on both shoulders, as in two equal bags with wide straps evenly loaded. The third is a strap diagonally across the chest with the bag against the back. In many cases, arm-carrying may be preferable to using a bag at all.

I am currently working with students and staff in several schools to reduce the backpack problem. The students themselves are involved in the problem solving and research. Staff and students will learn how to use their bodies properly. We will also explore ways to reduce the need to take books home and develop alternatives to backpack use.

If you would like to help solve this problem or simply to discuss the issue please contact me.

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11/18/2002

POSTURE: THE FOUNDATION FOR FITNESS

Fitness requires movement. Movement is generated by muscles working together within our bony skeleton. Proper posture means our skeleton is aligned in a manner that provides for movement efficiency and grace with minimal risk of injury; the way we were designed to move, sit, and stand.

We all should be dedicated to the promotion of lifelong fitness based on movement. The most common cause of movement impairment in adults is musculoskeletal, especially postural low back pain. Rehabilitation and prevention of these injuries begins with teaching correct posture and good execution skills. Thank you Tiger Woods, Michael Johnson, and the late Florence Griffin-Joyner (to name a few) for demonstrating what excellent posture can do for performance.

Too often we take good posture for granted, especially in children, as something that is natural. But as our culture has become more sedentary, posture has become more dysfunctional, molding our bodies to the furniture we relax in. In earlier times good posture would have been natural for an active child, but in today's world of fashion slouch, computers, television, poor school chairs, and deep couches, we have to teach how to sit, stand and move properly.

The back pain epidemic is now reaching our children at an alarming rate. Our schools impose several obvious and not-so-obvious challenges to back health: (1) many schools no longer provide lockers, requiring children to transport their heavy books in backpacks much of the day; (2) School chairs are well designed for stacking but poorly designed for sitting, contributing to a slumped posture when doing desk work; (3) Physical Education (PE) is either nonexistent in schools or, when offered, seldom teaches musculoskeletal fitness, good posture and healthy movement habits.

Our public education system should prepare our children for the future. If children begin having back pain at age 11, imagine how they will fare as adults! If PE can teach movement skills and habits that will have long-term benefit, the public will want to support such valuable and essential education, and parents will also benefit by learning from their children.

During World War I, physical therapy in the United States grew out of physical education in order to meet the urgent needs of our war-injured men and women. As our needs change, our professions must continue working together to meet the changing movement needs and problems of our society.

Postural awareness and performance training are needed more than ever as basic components of the PE curriculum. Simple modifications of existing exercises and posturally oriented games can be enormously effective in teaching posture awareness. I would like to see our professions join together for the postural fitness of our country, starting with our children. Your local Physical Therapy Association has resources to help.

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