

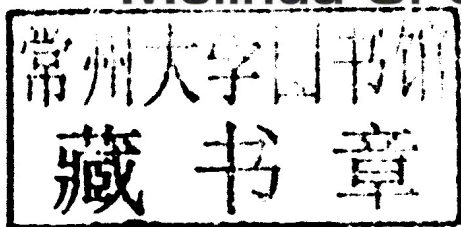
Safe and Effective Exercise for Overweight Youth



Melinda S. Sothern

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Safe and Effective Exercise for Overweight Youth

DEDICATION

This book is dedicated to Dr. Charles Brown my “partner in crime,” or so he calls me. Charlie, as he likes to be called, was instrumental in the integration of nutrition and exercise science into medical school education. His efforts were vital to raising the awareness of physicians nationwide to the importance of healthy nutrition and regular exercise to the prevention and management of chronic diseases, such as obesity and related comorbidities, especially in youth.

Charlie first began integrating his concepts for nutrition and exercise into professional sports as the New Orleans Saints team physician internist, where he served from 1967 to 2000. In 1988, he helped write the newly formed “Drugs of Abuse and Alcohol Policy” for the National Football League. Charlie then served as a member of this committee until his resignation in 2009. He was also a hero in the fight against smoking in public places. Charlie served as the chairman of the Steering Committee of the Louisiana Cancer Research Center Tobacco Free Living Initiative. Under his guidance, the state of Louisiana passed the Clean Indoor Air Act, which prohibits smoking in public buildings and restaurants.

Charlie joined the Louisiana State University Health Sciences Center (LSUHSC) as a faculty member in 1998 while I was conducting research in the Department of Pediatrics. I already knew Charlie because he was the oncologist for one of my family members who survived melanoma under his care. It was during this time that he and I discussed our similar philosophies and passion for nutrition and exercise science, and collaborated on my very first research abstract.

After Charlie joined the LSUHSC faculty, he and I worked together for more than a decade to bring the dream of a research and educational wellness center to the university. I am pleased to share that we now have a premier exercise and wellness facility at the LSUHSC, which serves the medical students, faculty, staff, and their families. More important, the center serves as a health promotion education resource to all while also providing state-of-the-art exercise instruction to members and research study participants. Trained and experienced staff members are available to help with the implementation of research studies examining the benefits of nutrition and exercise to the prevention of obesity and related comorbidities. Charlie also led the efforts to establish the Jim Finks Endowed Chair in Health Promotion, which provides research funding for students and graduate assistants, and helps to support the development of new projects for junior faculty. The availability of these resources has made it possible for us to conduct innovative translational research in the social, behavioral, environmental, biological, and molecular factors related to metabolic and inflammatory disease and to study the impact of exercise and nutrition on this process in children and adolescents.

The expansive reach of Charlie's efforts over the years cannot be measured. His dedication and passion for disease prevention through health promotion nationally and, especially in the state of Louisiana, resulted in major initiatives to improve public health through policy, research, and education. I am so grateful to be his colleague and partner, but more important to call Charlie my friend.

PREFACE

This textbook, *Safe and Effective Exercise for Overweight Youth*, encompasses decades of scientific research and clinical experience. The recommendations contained within are based on current scientific evidence and my personal clinical experience working with thousands of overweight and obese children and adolescents for 24 years. The contents provide accurate, scientifically sound, and practical guidance that clinical health care providers, educators, public health, and fitness professionals may utilize to promote physical activity in overweight and obese children of all ages, including those with significant obesity and chronic health conditions, such as hypertension, asthma, and type 2 diabetes. The text also provides a current best practices model for implementing clinical- and recreational-based physical activity interventions for preventing and managing pediatric obesity based on decades of research experience by leaders in the field. In addition, this text complements the *Handbook of Pediatric Obesity: Clinical Management*, which I coedited along with psychologist T. Kristian von Almen, PhD, and pediatrician Stewart Gordon, MD, and was published in 2006.

In preparation for writing this book, I spent 2 years gathering information in an effort to update the tailored exercise prescriptions contained within, which were designed specifically to age, level of obesity, and medical condition. I discovered in this process that the original exercise guidelines that I developed in collaboration with Dr. Mark Loftin, and which were based on physiologic and metabolic testing in his laboratory at the University of New Orleans, are still applicable today. In this regard, the scientific evidence actually followed our initial exercise testing findings and resulting intervention design, as our early observational studies were repeated and conducted in more rigorous scientific designs by other researchers. The results of these subsequent studies continually supported our initial hypothesis: *Children with increasing levels of obesity are physiologically and metabolically impaired during exercise, especially weight-bearing modalities*. This is especially relevant in younger children with comorbidities such as asthma, insulin resistance, and type 2 diabetes, and even more pertinent in those with musculoskeletal problems or disorders. As such, the results of our exploratory research became the conduit for future more rigorous scientific studies that now support current U.S. guidelines for physical activity in overweight and obese youth.

In the initial exercise curriculum, which was designed based on the results of our research, we established two major goals for managing overweight conditions in children: (1) increasing overall energy expenditure by raising daily activity levels and improving body movement awareness through fitness counseling, including motivational techniques based on social cognitive theory (Bandura, 1986); and (2) improving cardiopulmonary endurance, muscular strength, and flexibility by engaging in a structured and tailored moderate-intensity, progressive exercise program. The first goal was accomplished by motivating the child to replace sedentary behavior with short bursts of light to moderate activities, such as twisting while watching television, dancing to a favorite song, shooting hoops outside, riding a bike to a friend's house, or stretching on the floor throughout the day while educating him or her on how the body responds to movement. Children thus gained the physiologic and kinesthetic awareness necessary to adopt physical activity patterns that promote long-term health. This goal was intended to be promoted in parallel with the second goal. The second goal was accomplished by establishing weekly short-term goals for intensity, duration, and frequency based on information from our laboratory findings, which provided upper level limits of ability for each obesity category, that is, level 1 (red) severely obese (more than 20 percent of the 95th percentile BMI or an absolute BMI greater than 35 kg/m² [Kelly et al., 2013; U.S. Centers for Disease Control and Prevention, 2012]), level 2 (yellow) obese (more than

95th–99th percentile BMI), level 3 (green) overweight (more than 85th–95th percentile BMI), and level 4 (blue) healthy weight or maintenance (less than 85th percentile BMI). Children were encouraged to select activities that they enjoyed from a list of options with an intensity and modality (weight-bearing or non-weight-bearing activities) appropriate for their individual overweight level. Goals for how long and often they should exercise became more challenging as they progressed through the program. These recommendations eventually were utilized to develop an individualized exercise program, which was translated for home use in the book, *Trim Kids: The Proven 12-Week Plan That Has Helped Thousands of Children Achieve a Healthier Weight* (2001) with coauthors T. Kristian von Almen, PhD, and Heidi Schumacher, RD.

Our original recommendations remain appropriate for healthy weight, overweight, obese, and severely obese youth with and without comorbidities. Current research, however, indicates that light activity, in particular, including activities that require the body weight to be supported (weight-bearing activities) are advantageous for improving metabolic health in overweight and obese children. In a recent review of decades of research (see Chapter 10), it was concluded that exercise prescriptions in overweight and obese youth should consider a multistep strategy. In this case, sedentary activities initially are replaced with light activities that are enjoyable and unstructured, such as table tennis, billiards, darts, archery, fishing, or playing in a pool. Then intensity gradually is increased over time by selecting moderate and then vigorous activities in such a way that U.S. guideline goals to include 60 minutes of moderate- to vigorous-intensity activity eventually are met. Thus, the original goal of increasing overall energy expenditure by raising daily activity levels is now more specific as the recommendations in this text also include options for light-intensity activities, which are specific to age, obesity level, and medical condition, during the first few weeks of the program. Light to moderate exercise is supported by a multitude of researchers as overweight and obese children can exercise at this intensity for long periods without fatigue, thus enabling youth to burn calories and fat (see Chapters 1 and 10). This, in turn, improves metabolic health, promotes the attainment of a healthy body weight, and reduces the risk of developing obesity comorbidities.

HOW TO USE THIS BOOK

Chapters 1–5 provide an overview of the existing scientific literature in support of individualized, tailored exercise prescriptions for overweight and obese children with and without comorbidities. This information provides the basis of support for the specific recommendations contained in Chapters 6–9. Chapters 2–5 also contain exercise instructions, illustrations, and sample lesson plans to improve cardiopulmonary endurance, muscular strength, power and endurance, and muscular flexibility.

Chapter 6 applies the existing scientific literature to specific guidelines for prescribing exercise to overweight children along with verbal cues or “talking points,” clinical reminders, and handouts to assist health care providers with discussing the most appropriate exercise modality, intensity, frequency, and duration for each child’s individual needs. At the end of the chapter, a 40-week exercise curriculum, including lesson plans, is provided, which can be implemented in clinical, recreational, or home-based settings. This curriculum contains the complete exercise intervention from the comprehensive, multidisciplinary approach that my colleagues and I utilized successfully for more than two decades to assist children in achieving a healthier weight. Our hands-on, clinical setting provided the optimal laboratory in which to discover what is unique about obese children and to identify specific approaches and activities for promoting improved health through increased physical activity and structured exercise.

Chapter 7 discusses the importance of regular medical and self-monitoring and also provides easy tools and techniques that health care providers can use to track the child's progress, including forms, handouts, talking points, and reminders. Chapters 8 and 9 provide detailed clinical and field protocols to assist with the measurement of health and fitness outcomes. Chapter 9 also describes realistic expectations and presents the current U.S. recommendations for promoting physical activity and fitness in youth. Chapter 10 provides a summary of current studies to support future research in the area of physical activity to prevent and manage pediatric obesity.

Each chapter contains printable forms that can be used in clinical practice or community and field settings. These forms also may be downloaded from our website at <http://publichealth.lsuhsu.edu>. In addition, this website provides links to exercise instructional videos that are based on the color-coded four-level approach, and a link to an educational series from Louisiana Public Broadcasting Company as well as updates from our current studies, Trim Teens and Trim Tots.

SUMMARY

Many professionals lack the time to keep up to date on such a rapidly changing field of pediatric exercise science as it relates to the prevention and treatment of obesity and chronic disease. Medical, public health, recreational, and exercise professionals need a solid, readily available resource to consult when developing exercise plans for overweight and obese children. More important, colleges, universities, and medical schools need an authoritative manual on the subject of childhood obesity to better prepare health care and educational professionals on the appropriate care and counseling of physical activity and exercise for obese youth. *Safe and Effective Exercise for Overweight Youth* provides a state-of-the-art, scientifically supported, and clinically relevant source of information to research, medical, educational, public health, and recreational professionals, which is essential to the design of appropriate exercise interventions for obese youth. The text condenses all of the available scientific literature and recommendations into a prescriptive, comprehensive guide and hopefully will serve as a valued resource to universities, hospitals, recreational and educational facilities, clinics, and physician offices.

The success or failure of children to achieve a healthy weight is a responsibility that is shared by both the family and the health care professional. This textbook will provide the necessary information and tools for you to become proficient in matching or tailoring physical activity recommendations to the medical, physical, and emotional needs of developing children. When paired with your dedication, positive approach, time, and energy, the most appropriate care can be provided to overweight and obese children and adolescents.

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ACKNOWLEDGMENTS

Because this textbook summarizes a large part of my life's work, I would first like to acknowledge and thank the most influential person in my life, my father, James M. Sothern, professor, geologist, musician, visual artist, author, folklorist, organic farmer, and cultural, wetlands, and coastal preservationist (aka, the *Cajun Naturalist*), who at a very young age made me believe I was the best of everything—the smartest, brightest, fastest, and funniest. He also led me to believe that I could do absolutely anything I set my mind to, no matter how challenging, as long as I worked hard and knew deep inside that I could do it. My father taught me to love and cherish all things in nature, especially small things—animals, plants, children. More important, he instilled in me the belief that I was responsible for taking care of and protecting those most vulnerable, especially children. This is what led me to an initial career in youth aquatic sports and eventually in pediatric medicine—the ideal that those who are young and small are to be protected and allowed to be children and to experience all that childhood offers (e.g., play, exploration, running until out of breath). I also would like to thank my father for allowing me to explore the world with his blessing, wise words of caution, and assurance that I could always come home. And, notably, he did not promote typical female career goals, but rather he encouraged me to seek advanced education and opportunities typically held by men. He did this from the time I was born, and it is why I became a “tomboy” and eventually pursued a career in sports medicine, public health education and research, and pediatric exercise physiology.

Second, I would like to thank my mentor, Dr. Mark Loftin, who was the most instrumental person in my academic development. He took my passion for helping children seriously and was especially helpful and encouraging as I transitioned from teaching and coaching to pediatric exercise physiology research. I remember my first research paper during my graduate studies at the University of New Orleans (UNO), which was full of references to popular-press family, health, and fitness magazines. Dr. Loftin allowed me to present to the class without criticism, but, later, he pulled me aside in his always-laughing voice and steered me in the right direction (e.g., research journals housed in the library). Once I learned where to find the scientific literature, all I wanted to do was explore the research contained in those journals. And, to this day, I still thoroughly enjoy poring through the research, now conveniently online.

I especially would like to acknowledge *Trim Kids* developers and coauthors, Heidi Schumacher, RD, and T. Kristian von Almen, PhD, for their support, collaboration, and friendship for more than 20 years. Without their dedication and commitment to overweight and obese children, my research and this textbook would not have been possible.

I would like to express my gratitude to my current mentors, Dr. Eric Ravussin, who inspired and challenged me to transition from clinical intervention work to mechanistic explorations and who became a dear friend, as well as Dr. Sarah Moody Thomas, who is probably unaware of how much her mentorship helped to shape my current career. She taught me temperance and patience as well as how to be poised and professional even when faced with difficult challenges. I am grateful to the Dean of the Louisiana State University Health Sciences Center (LSUHSC), School of Public Health (SPH), Dr. Terri Fontham, and the Clinical Director of the Pennington Biomedical Research Center (PBRC), Dr. Donna Ryan, who remain the ultimate role models for young female clinicians and scientists. I wish to thank and acknowledge the LSUHSC Director of Communications, Leslie Capo, whose expertise, unyielding determination, and hard work at the LSUHSC continue to provide me with opportunities

to translate important pediatric obesity, exercise, and physical activity scientific findings to the public.

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On a personal note, I am very grateful to my husband, Dave, who helped me to raise my children even while I traveled extensively as part of my obligation as a research scientist, educator, and clinician, and who provided encouragement every step of the way. To my mother, Jerry (deceased), and sister Becky (deceased), whom I still miss so much, and my sisters Rachael, Wilma, and Julie, my brother Jim, and childhood friend Dena, who have been my best friends throughout my life and offered support when I most needed it.

Most important, I would like to acknowledge my children, Samantha and Allyson, who sacrificed so much during their childhood so that their mother could achieve graduate degrees—thus affording me the opportunity to realize my career goals—and who, to this day, provide me with so much love and encouragement, are just a joy, and are the most valuable gifts in my life.

ABOUT THE AUTHOR

Melinda S. Sothorn, PhD, CEP, is a licensed clinical exercise physiologist and currently serves as academic program director and professor with tenure at the Louisiana State University (LSU) Health Sciences Center (HSC), School of Public Health in New Orleans, Louisiana, and the Prevention of Childhood Obesity Laboratory at the LSU Pennington Biomedical Research Center in Baton Rouge. She is a recipient of the Jim Finks Endowed Chair in Health Promotion in Behavioral and Community Health Sciences and maintains an adjunct appointment in the Department of Pediatrics, School of Medicine, LSUHSC. Dr. Sothorn's research is widely published in a multitude of peer-reviewed scientific journals and in two scientific textbooks, *The Handbook of Pediatric Obesity: Clinical Management* (Taylor & Francis, 2006) and *The Handbook of Pediatric Obesity: Etiology, Pathophysiology and Prevention* (Taylor & Francis, 2005). She also senior-authored a popular press book for parents of overweight children to use in conjunction with their pediatrician or family physician entitled *Trim Kids* (HarperCollins, 2001). The *Trim Kids* program is recognized by the National Cancer Institute as a Research-Tested Intervention Program and is acknowledged by the U.S. Surgeon General for its community dissemination in The YMCA centers in Louisiana. Dr. Sothorn was the 2009 recipient of The Obesity Society's Oded Bar-Or Award for Excellence in Pediatric Obesity Research. In 2008, she received the Cecil J. Picard Award for Excellence in Education to Prevent Childhood Obesity in Louisiana, and was selected as one of the Top Ten Female Achievers in New Orleans by *New Orleans* magazine. She recently cofounded and chaired the Louisiana Childhood Obesity Research Consortium (LA CORC).

Dr. Sothorn is currently serving as principal investigator on two National Institutes of Health (NIH)-sponsored studies entitled *Molecular and Social Determinants of Obesity in Developing Youth* (NIMHD) and *Obesity and Asthma: Determinants of Inflammation and Effects of Intervention* (NIMHD). She also serves as principal investigator of a Louisiana Office of Public Health Maternal and Child Health-sponsored study, *An Intervention to Promote Environmental Changes in Pre-School Centers to Prevent Childhood Obesity* (NAP SACC), and co-investigator/scientist on another NIH-sponsored grant, *Community-Academic Partnership to Address Health Disparities in New Orleans* (NIMHD). Dr. Sothorn previously served as a principal investigator on two other NIH-sponsored studies entitled *Exploring Mechanisms of the Metabolic Syndrome in African American and Caucasian Youth* (NICHD) and *Insulin Sensitivity in Children with Low Birth Weight* (NICHD) and as co-investigator on the NIH-sponsored study, *Anthropometric Assessment of Abdominal Obesity and Health Risk in Children and Adolescents* (RC1), and another NIH-sponsored, 6-year study entitled *Increasing Physical Activity Patterns in Adolescent Girls: The TAAG Study*, with seven other sites nationwide. She previously directed the physical activity intervention of the NIH-sponsored study, *Environmental Approaches for the Prevention of Weight Gain: The Wise Mind Study*, and served as co-principal investigator or mentor of three additional NIH-funded studies: (1) *Environmental Determinants of Physical Activity in Parks* (K01), (2) *Training Translational Researchers in Louisiana* (COBRA), and (3) *Measurement of Sedentary Behavior in African American Adults* (K01). Dr. Sothorn also served as consultant to several NIH-funded projects, including a school-based study entitled *LA Health* at the LSU PBR.

Dr. Sothorn coauthored a position paper and serves as faculty for the Academy of Nutrition and Dietetics pediatric weight management certificate program. She is considered a national spokesperson for overweight youth and has been featured extensively in national and international television, radio, and print media, including *Good Morning America*, *The Today*

Show, CNN International, NPR Radio, Fox News TV, *48 Hours*, Nickelodeon TV, *The Oprah Show*, Discovery Channel, Yorkshire TV British Broadcasting Co., *USA Today*, *Associated Press—World News*, *Washington Post*, *Wall Street Journal*, *National Geographic*, *LA Times*, *Parents Magazine*, *Parenting*, *Better Homes and Garden*, *Prevention Magazine*, *Psychology Today*, WebMD, and many others.

Dr. Sothorn led her field in establishing standardized guidelines for prescribing exercise for children with increasing levels of obesity and is best known for her work in promoting active play as a means of preventing and treating childhood obesity. In acknowledgment of her achievements, she received the University of New Orleans Dr. Vane Wilson Award in recognition of excellent work and service in the field of human performance and health promotion in May 2000. She has been a member of the American College of Sports Medicine (ACSM) and The Obesity Society for more than 20 years, is a fellow and former council member of The Obesity Society, and previously served as a member of the Annual Scientific Program Planning and Education committees. In 2007, Dr. Sothorn served as chairman of the Publications Committee and supervised the transition of the scientific journal entitled *Obesity* to publication in the Nature Publishing Group. She is currently an associate editor for the journal, *Obesity*, and serves on the editorial board of the journal, *Childhood Obesity*. She previously served as associate editor for the journals *Pediatric Obesity* and *Childhood Obesity* for 4 years. She cofounded the Pediatric Obesity Interest Group, which is now formally integrated into The Obesity Society as the Pediatric Obesity Section.

Dr. Sothorn was a scientific presenter for The Obesity Society Distinguished Lecture Series in 2004, the Southeast ACSM Distinguished Lecturer in the fall of 2007, and was chosen as the Delta Omega Honorary Society in Public Health Faculty inductee for outstanding public health performance in scholarship, teaching, research, and publications in October 2007. In June 2011, she provided the keynote lecture for the 2011 U.S. Public Health Service Commissioned Officer Scientific and Training Symposium and delivered an invited lecture for the 2012 American Academy of Pediatrics Annual Scientific Meeting. Dr. Sothorn also served as a member of the American Heart Association/Clinton Foundation Advisory Board and is currently a scientific advisory board member for the Windward Islands Research and Education Foundation, St. George's University, School of Medicine, Grenada. She is a member of the scientific advisory committee for the Louisiana Report Card on Physical Activity and Health for Children and Youth and for the United States Report Card on Physical Activity for Children and Youth.

During the past 24 years, Dr. Sothorn has presented more than 250 invited scientific lectures or presentations to universities, medical centers, and scientific meetings. She is a reviewer for the NIH and for numerous pediatric, obesity, behavioral science, and exercise scientific journals and she provides scientific advice to several major national and international corporations, including Gerber Foods, Kraft Foods, Nestle International, Knoll Pharmaceuticals, Health Nutrition Technology, Susan Dell Foundation, the Disney Corporation, and others.

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