Injury Risk-Taking Behaviors in Children

Marizen Ramirez, Elizabeth O'Neal

LAST REVIEWED: 05 MAY 2017
LAST MODIFIED: 30 SEPTEMBER 2013
DOI: 10.1093/OBO/9780199756797-0134

Introduction

Unintentional injury is among the leading causes of morbidity and mortality across the world, and for children ages one to eighteen is their number-one killer. To inform the development of effective prevention strategies for children, public health research uses two frameworks for identifying causal pathways to injury. One approach, the epidemiologic triangle, involves identification of host, environmental, and agent (in the case of traumatic injury, the agent is energy; in the case of drowning, the agent is lack of oxygen; in the case of poisoning, the agent is a toxic substance) characteristics that increase risk of childhood injury. The second approach, the Haddon Matrix, builds on the epidemiologic triangle and identifies specific host, environmental, and agent factors that operate during pre-injury (prior to an injury occurring), injury (at the moment of injury), and post-injury phases. Both the epidemiologic triangle and the Haddon Matrix emphasize the complex interplay that occurs between host, environment, and agent, and demonstrate that these factors are not easily separable. Decades of research from epidemiology, behavioral health, and psychology have established that human/host behavior, specifically injury risk behaviors, contributes significantly to injury causation. Injury risk behaviors are defined broadly as classes or groups of actions taken on by the host (in this case, children) that increase the probability of injury, either directly or in synergistic interaction with the environment. This section highlights primarily empirical research on unintentional injury risk behaviors in children (generally within the age range of one to eighteen), methods used to measure and study injury risk behaviors, factors that influence behavior, and discrete behaviors (e.g., risky driving) associated with specific injury outcomes (e.g., traffic crashes). Selected works that deal with children older than eighteen are also presented to provide broader concepts with strong applicability to pediatric injury.

General Overviews

For an overview of the broad topic of unintentional injuries in *Oxford Bibliographies*, see Unintentional Injury Prevention by David Sleet. Four pertinent reviews have been published on the topic of injury risk behaviors, and these present the foundational studies establishing empirical associations between childhood behaviors and injuries. Three of these reviews focus on children (Irwin, et al. 1992; Wazana 1997; Schwebel and Gaines 2007). Irwin, et al. 1992 provides the motivations behind studying pediatric injury risk behaviors, summarizes key research studies, and highlights theory and methods used in the field. Wazana 1997 is a systematic review of the literature to identify epidemiologic studies from Australia, Canada, New Zealand, the United Kingdom, and the United States on general child injury and child pedestrian injury (ages one to sixteen). Schwebel and Gaines 2007 summarizes conceptual approaches and key findings from research highlighting behavioral risk factors for injury, including studies describing demographic characteristics; child-based factors such as temperament, personality, and cognitive development; parent-based behaviors; and peer behaviors. Because of the limited rigorous literature on the topic, readers are also referred to a broad systematic review in Turner, et al. 2004 of case-control and cohort studies on behaviors associated with injury not limited to children.

Irwin, C. E., M. F. Cataldo, A. P. Matheny Jr., and L. Peterson. 1992. Health consequences of behaviors: Injury as a model. *Pediatrics* 90.5: 798–807.

Describes the public health problem of pediatric injury, from research conducted thus far. Emphasizes the need for interventions that focus on reduction of injury risk behaviors, describing the motivations for behavioral research informed by developmental-psychosocial theory.

Key studies of injury risk behaviors in children up to age twenty-four and methodological approaches are summarized. Available online for purchase or by subscription.

Schwebel, D. C., and J. Gaines. 2007. Pediatric unintentional injury: Behavioral risk factors and implications for prevention. *Journal of Developmental & Behavioral Pediatrics* 28.3: 245–254.

A systematic review of the available literature on contributions to injury risk, specifically in children. This comprehensive introduction to behavioral risk factors of unintentional injury considers four main areas of injury risk: demographic, child-specific, parent and caregiver influence, and peer influence. Also briefly considers intervention. Available online for purchase or by subscription.

Turner, C., R. McClure, and S. Pirozzo. 2004. Injury and risk-taking behavior—a systematic review. *Accident Analysis & Prevention* 36.1: 93–101.

Reviews seven epidemiological studies (case-control, cohort, or intervention) on risk-taking behaviors, where researchers objectively measure injury and risk taking, thus highlighting a critical methodological consideration of measurement. One study reviewed was on young drivers from the United States between sixteen and nineteen years of age. Available online for purchase or by subscription.

Wazana, A. 1997. Are there injury-prone children? A critical review of the literature. *Canadian Journal of Psychiatry* 42.6: 602–610.

A literature review of eleven studies of general pediatric injury and six childhood pedestrian injury that specifically examine behavioral risk factors in children ages one to sixteen. Review includes works from Australia, Canada, New Zealand, the United Kingdom, and the United States. Describes some history of research on injury-prone children. Also included are studies of emotional factors associated with injury.

Data Sources

Data sources used for characterizing the burden of injury also provide information about injury risk behaviors in children. The US Centers for Disease Control and Prevention (CDC) has maintained the Youth Risk Behavior Surveillance System since 1990 to monitor health risk behaviors among children in grades 9–12. WISQARS is maintained by the US Centers for Disease Control and Prevention as a query-and-reporting system of injury statistics for fatal and nonfatal injury. Injuries captured by WISQARS are classified according to external cause, following the International Classification of Diseases E-codes. External causes are mechanisms of injury, which provide the context in which injury risk behaviors operate (e.g., motor vehicle traffic accident involving collision with pedestrian). WISQARS data on childhood injuries may be queried by age. Both the Centers for Disease Control and Prevention and the World Health Organization also provide fact sheets and statistics on injuries, of which some are focused on children and on prevention strategies targeting injury risk behaviors.

Centers for Disease Control and Prevention.

The CDC is an excellent central resource for information on injury. New content is regularly updated, with articles on a wide range of causes of injury and on prevention suggestions, and with links to relevant publications.

WISQARS.

The Web-Based Injury Statistics Query and Reporting System provides injury statistics both for fatal and nonfatal injury. Reports can be tailored to provide injury data by manner of injury. In addition, the WISQARS system provides estimated cost analysis of injury.

World Health Organization: Injuries.

The World Health Organization (WHO) is another source of information on the many aspects of safety. However, the WHO website looks at injury on an international scale. Users can easily link to their region of interest. This site links to useful publications and reports.

Youth Risk Behavior Surveillance System.

Surveys are conducted every two years with a representative sample of ninth- through twelfth-grade high-school students in public and private schools throughout the United States. YRBSS monitors six categories of priority health-risk behaviors among youth and young adults, including behaviors that contribute to unintentional injuries (e.g., helmet use, seat belt use, riding with an intoxicated driver of a car or other vehicle, and driving while drinking alcohol).

Journals

There are no journals focused solely on injury risk behaviors. Therefore, listed here are journals in which some of the most significant works on injury risk behaviors in children may be found, and in which future works in this area are likely to be published. Two journals focus on injury (Accident Analysis & Prevention, Injury Prevention), and another two focus on pediatric psychology, development, or health (Child Development and Journal of Pediatric Psychology).

Accident Analysis & Prevention.

Accident Analysis & Prevention covers general areas relating to accidental injury. Published papers do include behavioral aspects of transportation accidents, as well as with accidents at other sites.

Child Development.

Child Development covers research with application to researchers and theoreticians, but also to practitioners in child psychiatry and psychology, social work, and education. This journal is broad when considering development in children; however, injury-related research will often appear here as well. It is an influential journal, in that understanding development and injury risk behavior is a large component in reducing injuries.

Injury Prevention.

Injury Prevention is an international journal that covers research, policy, and practice in the area of injury prevention and control. It is not focused on children, but papers on injury risk behavior may be found here.

Journal of Pediatric Psychology.

A scientific publication of Division 54 of the American Psychological Association, whose mission is to promote health and psychological well-being of children, youth, and families through science and evidence-based approaches to practice, education, training, advocacy, and consultation. Articles are related to theory, research, and professional practice in pediatric psychology.

History

There are no historical works that summarize empirical evidence of child risk behaviors associated with injuries. Rather, the body of work comes from studies, reviews, and commentaries published by researchers from public health, psychology, and medicine. From the 1930s to the 1950s, research (primarily from pediatric psychology) focused on characterizing the personalities and demographic characteristics of *accident-prone or injury-prone children*, or children medically treated for repeated “accidents” (Farmer and Chambers 1926). The terms

“accident prone” and “injury prone” stirred controversy in the field of injury, because both terms suggested that the proclivity for injury is innate. This led to a misconception that injuries are not preventable through behavior change. (Today, the field does not promote the use of such terms in describing children with histories of repeated injury.) Hence, starting in the 1950s, a paradigm shift steered research away from only “identifying personality or individual traits” to more fully understanding specific groups or classes of behaviors that increase the risk of injury. The seminal Manheimer and Mellinger 1967 and Matheny, et al. 1971 report that specific childhood behavioral characteristics —that is, aggressiveness, roughhousing, and extraversion—were associated with injury. Bijur, et al. 1986 likewise reports that aggressive behavior led to injury, even after controlling for sex and age of the child. Early studies establishing that boys are more likely than girls to suffer injuries have led to subsequent bodies of work in psychology that are focused on specific attributes among boys that explain their increased risk: differences in risk appraisals, attributions to bad luck, and beliefs about the likelihood of injury (Morrongiello and Rennie 1998). Since the turn of the 21st century, the field continues to examine classes of behaviors but now focuses on discrete risky behaviors linked to specific injury outcomes (e.g., risky driving and motor vehicle crashes, children’s road-crossing behaviors and pedestrian injuries, risk taking in sports).

Bijur, P. E., S. Stewart-Brown, and N. Butler. 1986. Child behavior and accidental injury in 11,966 preschool children. *Pediatrics* 140.5: 487–492.

This large cohort study of British children between birth and five years old found a causal relationship between aggressive behavior and subsequent injury hospitalization. Overactivity was found to be related to nonhospitalized injuries. Available online for purchase or by subscription.

Farmer, E., and E. G. Chambers. 1926. *A psychological study of individual differences in accident rates*. Medical Research Council, Industrial Fatigue Research Board Report 38. London: H. M. Stationery Office.

Farmer and Chambers were the first researchers who coined the term “accident prone,” which led to decades of research to identify predisposing characteristics of injury-prone children. Today, the term “accident prone” is not recommended because the term suggests an inability to prevent injuries through intervention.

Manheimer, D. I., and G. D. Mellinger. 1967. Personality characteristics of the child accident repeater. *Child Development* 38.2: 491–513.

One of the classic papers that found a relationship among behaviors (specifically, indexes of extraversion), daring and roughhousing, and medically attended injuries among four- to eighteen-year-olds from the United States. This early study used the term “accident prone.” Available online for purchase or by subscription.

Matheny, A. P., Jr., A. M. Brown, and R. S. Wilson. 1971. Behavioral antecedents of accidental injuries in early childhood: A study of twins. *Journal of Pediatrics* 79.1: 122–124.

Study of one- to six-year-old twins in the United States that evaluated, longitudinally, the effect of behaviors on subsequent injury. Twins who were more active, more temperamental, and less attentive were more likely to be injured one year later. Available online for purchase or by subscription.

Morrongiello, B. A., and H. Rennie. 1998. Why do boys engage in more risk taking than girls? The role of attributions, beliefs, and risk appraisals. *Journal of Pediatric Psychology* 23.1: 33–43.

Six-, eight-, and ten-year-old Canadian children were shown black-and-white depictions of injury risk behavioral situations and were interviewed about their likelihood of being injured, their experience with being injured, and attributions to bad luck. Differences were found between boys and girls. Available online for purchase or by subscription.

Theory and Research Methods

Research on injury risk behaviors should be based on sound theory and should utilize appropriate research designs and measures of behavior. In this section, theories on child development as they relate to injury risk are discussed. In addition, research methods used in this area are described, as are instruments to measure injury risk behaviors.

Child Development, Environment, Behavior, and Injury

Theories on child development indicate that behaviors of children align with their cognitive and physical developmental abilities (see Irwin, et al. 1992, cited under General Overviews; Rivara 1995). While progressing through developmental milestones, children increasingly engage in behaviors that involve exploration of the physical environment, and thus they must manage the increased risks associated with injury (see Wazana 1997, cited under General Overviews; Safe Kids USA). Hazards in the social and physical environment serve as the context in which child development occurs, and in turn also heavily influence the kinds of behaviors taken on by children and youth. Thus, environment should be considered in evaluating the role of behavior in childhood injury risk (Gielen and Sleet 2003). Let us consider how the physical environment and social environment influence host behavior in the risk of motor vehicle crashes, and how, vice versa, host behavior can lead to a modified environment. The host (human) can take on pre-injury actions (e.g., to use or not to use a seat belt, or to follow/exceed a speed limit). These actions lead to physical changes to the automobile that modify the amount of energy dissipated during a motor vehicle crash and decrease or increase the risk or severity of injury.

Gielen, A. C., and D. A. Sleet. 2003. Application of behavior-change theories and methods to injury prevention. *Epidemiologic Reviews* 25.1: 65–76.

This paper also summarizes theories in behavioral science. Emphasizes the need for addressing human interaction when developing injury countermeasures that involve structural or engineering changes. This, too, provides a necessary foundation for understanding and conducting behavioral-science research in the field of pediatric injury.

Rivara, F. P. 1995. Developmental and behavioral issues in childhood injury prevention. *Journal of Developmental & Behavioral Pediatrics* 16.5: 362–370.

Provides a review of seminal studies that establish the link between behavioral characteristics of children and injury. Available online for purchase or by subscription.

Safe Kids USA.

A nationwide network of organizations committed to preventing unintentional childhood injury; provides a free online teaching guide on child development stages, behaviors, and injury risk.

Research Methods

Various research methods have been used to study risky behaviors associated with pediatric injury. These include qualitative techniques (e.g., interviews, focus groups, and observations) as well as quantitative techniques (e.g., self-report and observations surveys) (Thompson 2006). A specialized field of research in pediatric psychology uses a technique called “process analysis,” which evaluates behaviors during stages of an injury event (antecedents, injury response, and consequences) (Peterson, et al. 1987). Simulation methods have also been used to measure risky behavior during simulated or artificially created injury risk situations (Schwebel, et al. 2008). Finally, naturalistic studies now used through video technology have allowed for capture of real-time risky behaviors in actual situations, such as driving with abrupt stops, rapid accelerations, or swerving (Lee, et al. 2011).

Lee, S. E., B. G. Simons-Morton, S. E. Klauer, M. C. Ouimet, and T. A. Dingus. 2011. Naturalistic assessment of novice teenage crash experience. *Accident Analysis & Prevention* 43.4: 1472–1479.

In-vehicle instrumentation composed of video cameras, sensors, and computers was installed into the cars of teen and parent participants to measure risky driving in a naturalistic setting. Available online for purchase or by subscription.

Peterson, L., J. Farmer, and L. Mori. 1987. Process analysis of injury situations: A complement to epidemiological methods. *Journal of Social Issues* 43.2: 33–44.

Describes “process analysis,” a technique used in psychology to evaluate fine-grained behaviors during both injury and near-injury situations. Specific stages of an injury event are evaluated: antecedents, stages of response, and consequences. Available online for purchase or by subscription.

Schwebel, D. C., J. Gaines, and J. Severson. 2008. Validation of virtual reality as a tool to understand and prevent child pedestrian injury. *Accident Analysis & Prevention* 40.4: 1394–1400.

Using simulation as a tool for the measurement of risky behavior allows researchers to isolate variables of interest that are not possible in the real-world environment. This is useful only if the simulated environment elicits realistic, natural behaviors. Available online for purchase or by subscription.

Thompson, N. J. 2006. Study methods for understanding injury behavior. In *Injury and violence prevention: Behavioral science theories, methods, and applications*. Edited by A. C. Gielen, D. A. Sleet, and R. J. DiClemente, 161–187. San Francisco: Jossey-Bass.

This chapter summarizes qualitative and quantitative techniques used in public health research to evaluate injury behaviors.

Measures of Injury Risk Behaviors

There are few validated scales that measure childhood injury risk behaviors. One that is used frequently is the Injury Behavior Checklist (Speltz, et al. 1990), out of the United States. BACKIE is a standardized questionnaire used to measure Behaviors (B), Attitudes (A), Cognitions (C), Knowledge (K), and Injury Experiences (IE) of young children (Morrongiello, et al. 2010). The Child Behavior Questionnaire (Rothbart, et al. 2001), also developed in the United States, is used to assess individual temperament, a known contributor to injury risk behavior.

Morrongiello, B. A., M. Cusimano, B. K. Barton, et al. 2010. Development of the BACKIE questionnaire: A measure of children’s behaviors, attitudes, cognitions, knowledge, and injury experiences. *Accident Analysis & Prevention* 42.1: 75–83.

BACKIE is a questionnaire that measures behaviors, attitudes, cognitions, and injury experiences of elementary-aged children, related to falls, motor vehicle crashes, burns, drowning, choking/submersion, poisoning, and bicycle/pedestrian injuries. BACKIE has acceptable psychometric properties. Available online for purchase or by subscription.

Rothbart, M. K., S. A. Ahadi, K. L. Hershey, and P. Fisher. 2001. Investigations of temperament at three to seven years: The Children’s Behavior Questionnaire. *Child Development* 72.5: 1394–1408.

One of several questionnaires designed by Rothbart to capture the various aspects of temperament, a known contributor to injury risk (see Schwebel, et al. 2012, cited under Pedestrians and Cycling). The Children’s Behavior Questionnaire, designed for children aged three to eight, is a validated, parent-report measure. Some aspects of temperament related to injury include effortful control, inhibitory control, and impulsivity. Available online for purchase or by subscription.

Speltz, M. L., N. Gonzales, S. Sulzbacher, and L. Quan. 1990. Assessment of injury risk in young children: A preliminary study of the Injury Behavior Checklist. *Journal of Pediatric Psychology* 15.3: 373–383.

The Injury Behavior Checklist (IBC) is a validated, parent-report questionnaire used to assess injury risk in children. Primarily used for children aged two to five. It should be noted that this instrument has been used to evaluate injury risk in older children as well. Available online for purchase or by subscription.

Factors That Influence Injury Risk Behaviors

A number of factors may contribute to injury risk behaviors, including sleep patterns of children (Owens, et al. 2005), perceptions about safety and risk (Christensen and Morrongiello 1997), cognitions and emotions (Morrongiello and Matheis 2007), and the role of parents and peers (Morrongiello, et al. 2006). A majority of work in this area comes from the United States and Canada.

Christensen, S., and B. A. Morrongiello. 1997. The influences of peers on children's judgments about engaging in behaviors that threaten their safety. *Journal of Applied Developmental Psychology* 18.4: 547–562.

A case-control study that evaluated the influence of peers on injury risk in eight- and nine-year-old children. Peers were found to be persuasive in participants' decision making when choosing routes with varying degrees of danger. Available online for purchase or by subscription.

Morrongiello, B. A., M. Corbett, M. McCourt, and N. Johnston. 2006. Understanding unintentional injury risk in young children II: The contribution of caregiver supervision, child attributes, and parent attributes. *Journal of Pediatric Psychology* 31.6: 540–551.

Identifies contributing factors of caregiver supervision found both in parents and in their two- to five-year-old children to assess how they affect injury risk behavior. Aspects in children studies include temperament, sensation seeking, and current risk behavior engagement. Parental attributes include personality measures, beliefs about supervision, and dimensions of parenting and health locus of control.

Morrongiello, B. A., and S. Matheis. 2007. Understanding children's injury-risk behaviors: The independent contributions of cognitions and emotions. *Journal of Pediatric Psychology* 32.8: 926–937.

Explores the effects of emotions (e.g., fear and excitement) and cognition (e.g., danger assessment, perceived injury vulnerability, and injury designation) on injury risk in children ages seven to twelve.

Owens, J. A., S. Fernando, and M. McGuinn. 2005. Sleep disturbance and injury risk in young children. *Behavioral Sleep Medicine* 3.1: 18–31.

Reports an association between increased injury and lack of sleep. Measures included parent report of sleep disturbance, injury behaviors, and medically treated injuries. A good introduction to sleep deprivation and unintentional injury in children. Available online for purchase or by subscription.

Temperament and Personality

Individual differences in children's personality and temperament have also been linked with injury risk behaviors. Measures of impulsivity and inhibitory control are of significant importance (Schwebel and Plumert 1999; Schwebel 2004). A better understanding of the role of temperament (Rothbart and Bates 2006) as it pertains to childhood development is useful to understanding the nuances that contribute to injury risk behavior. Articles in this section come primarily from US researchers.

Rothbart, M. K., and J. E. Bates. 2006. Temperament. In *Handbook of child psychology*. Vol. 3, *Social, emotional, and personality development*. 6th ed. Edited by N. Eisenberg, W. Damon, and R. M. Lerner, 99–166. Hoboken, NJ: Wiley.

An excellent overview of temperament and all its facets, written by two very influential researchers in the field. Of particular interest to injury risk behavior will be those sections that concern effortful and inhibitory control and impulsivity in infants, children, and adolescents. A child's individual temperament is a major contributor to injury risk behaviors.

Schwebel, D. C. 2004. Temperamental risk factors for children's unintentional injury: The role of impulsivity and inhibitory control. *Personality and Individual Differences* 37.3: 567–578.

Utilizes parent-report, child (self)-report, and behavioral measures to describe the connection among specific temperamental contributions to injury in six-year-old children. Available online for purchase or by subscription.

Schwebel, D. C., and J. M. Plumert. 1999. Longitudinal and concurrent relations among temperament, ability estimation, and injury proneness. *Child Development* 70.3: 700–712.

Understanding physical capabilities for achieving a goal has injury risk implications. Researchers found that three-year-old children with temperament measures that were high on extraversion and low on inhibitory control overestimated their abilities. These children also had a higher injury rate at age six. Available online for purchase or by subscription.

Psychopathology

Understanding injury risk behaviors requires the contributions of many of the subdisciplines of psychology and public health. Psychopathology is one area that provides valuable insight into the role of individual differences associated with injury risk behavior. A wide range of developmental (Lee, et al. 2008) and intellectual (Sherrard, et al. 2002) disabilities contribute to an increase in childhood unintentional injury. In addition, disorders experienced in childhood are likely to influence injury risk throughout the lifetime (Jokela, et al. 2009). While there are a variety of conditions that have been identified as influencing children's injury behavior risk, none are as pronounced as oppositional defiant disorder (ODD) and attention deficit hyperactivity disorder (ADHD), as reported in Rowe, et al. 2004. The contributions of psychopathology to injury risk further underscore the importance of intervention and treatment in this area. The following literature is representative of research conducted in the United States, Australia, Finland, and the United Kingdom.

Jokela, M., C. Power, and M. Kivimäki. 2009. Childhood problem behaviors and injury risk over the life course. *Journal of Child Psychology and Psychiatry* 50.12: 1541–1549.

This empirical article looks at the influence of childhood behavior on injury risk throughout the lifetime. With data taken from a longitudinal study, the researchers concluded that children who scored high on externalizing behavior were at an increased risk for injury later in childhood, adolescence, and adulthood.

Lee, L.-C., R. A. Harrington, J. J. Chang, and S. L. Connors. 2008. Increased risk of injury in children with developmental disabilities. *Research in Developmental Disabilities* 29.3: 247–255.

Developmental disabilities found in children aged three to five are shown to increase the incidence of injury. Developmental disabilities that were included for analysis were autism, ADHD, learning disability, and psychopathology. Available online for purchase or by subscription.

Rowe, R., B. Maughan, and R. Goodman. 2004. Childhood psychiatric disorder and unintentional injury: Findings from a national cohort study. *Journal of Pediatric Psychology* 29.2: 119–130.

Using data from a longitudinal study that followed children from age five to fifteen, researchers linked both externalizing and internalizing behaviors with increased injury risk. Disorders such as ADHD, ODD, and depression were considered.

Sherrard, J., B. J. Tonge, and J. Ozanne-Smith. 2002. Injury risk in young people with intellectual disability. *Journal of Intellectual Disability Research* 46.1: 6–16.

This study examined problems and factors specifically associated with intellectual disability that could increase injury risk in that population. All participants had an IQ score of 70 or below and were aged four to eighteen. A wide variety of factors were linked with injury risk. Available online for purchase or by subscription.

Discrete Risky Behaviors Linked to Specific Injuries

Injury due to traffic-related incidents is the leading cause of unintentional injury and death in children. As such, the study of what specific behaviors and developmental structures increase children's traffic-related injury threat is paramount. To best inform prevention, research is now focused on specific types of traffic injuries, such as bicycling, pedestrian, and teen driving, in order to understand the myriad of types of risky behaviors linked to specific injury outcomes.

Pedestrians and Cycling

In the case of pedestrian injury, many developing systems, such as perception (Plumert, et al. 2004), decision making (Demetre, et al. 1992), and, more broadly, cognition (Schwebel, et al. 2012), are essential to determining how to reduce injury risk behaviors. In addition to studying and understanding the development of structures responsible for safe traffic behavior, an understanding of how injury behavior risk differs between children and adults is critical for identifying those behaviors that need the most improvement (Pitcairn and Edlmann 2000). The literature in this section represents research conducted in the United States and the United Kingdom, as well as school-based studies of pedestrian and cycling injury risks among children from Nepal (Poudel-Tandukar, et al. 2007) and China (Dong, et al. 2011).

Demetre, J. D., D. N. Lee, T. K. Pitcairn, R. Grieve, J. A. Thomson, and K. Ampofo-Boateng. 1992. Errors in young children's decisions about traffic gaps: Experiments with roadside simulations. *British Journal of Psychology* 83.2: 189–202.

Accurately judging oncoming traffic and making a timely decision as to when to cross the road is one of the cognitive tasks that contributes to injury risk. Available online for purchase or by subscription.

Dong, X., C. Peek-Asa, J. Yang, et al. 2011. The association of road safety knowledge and risk behaviour with paediatric road traffic injury in Guangzhou, China. *Injury Prevention* 17.1: 15–20.

Surveys with primary and secondary schoolchildren were conducted in China. Children with low levels of road safety knowledge and high levels of risky road behaviors had increased risk of suffering a bicycle or pedestrian injury. Available online for purchase or by subscription.

Pitcairn, T. K., and T. Edlmann. 2000. Individual differences in road crossing ability in young children and adults. *British Journal of Psychology* 91.3: 391–410.

A comparison of child and adult road-crossing behavior that identifies individual differences in injury risk behavior in children. Comparing adult and child behavior is important in identifying where children's deficits lie. Available online for purchase or by subscription.

Plumert, J. M., J. K. Kearney, and J. F. Cremer. 2004. Children's perception of gap affordances: Bicycling across traffic-filled intersections in an immersive virtual environment. *Child Development* 75.4: 1243–1253.

Children's developing perception, tightly coupled with action, is a major component of decision making in the environment. Judgments of gap affordances in a virtual bicycling environment revealed that children aged ten and twelve who are still developing this skill are at greater risk from injury than are adults. While both choose similar gaps, children are delayed in their entrance into the virtual roadway. Available online for purchase or by subscription.

Poudel-Tandukar, K., S. Nakahara, M. Ichikawa, K. C. Poudel, and M. Jimba. 2007. Risk perception, road behavior, and pedestrian injury among adolescent students in Kathmandu, Nepal. *Injury Prevention* 13.4: 258–263.

A survey of adolescents in grades 6–8 reports children were more likely to sustain a pedestrian injury when they did not follow green signals for crossing the road. However, no other associations were found between roadway behaviors (such as looking both ways) and pedestrian injury. An emphasis is made to consider interventions that involve both behavior modification and improving the roadway environment. Available online for purchase or by subscription.

Schwebel, D. C., A. L. Davis, and E. E. O'Neal. 2012. Child pedestrian injury: A review of behavioral risks and preventive strategies. *American Journal of Lifestyle Medicine* 6.4: 292–302.

A review of the literature on childhood pedestrian injury. Provides comprehensive information on prominent developmental factors in children aged four to twelve that lead to childhood pedestrian injury, such as cognition, distraction, temperament, and social influence. In addition, this review article discusses the effectiveness of tested prevention strategies. Available online for purchase or by subscription.

Teen Risky Driving

Risky driving is one of the most significant risky behaviors undertaken by adolescents, because of its strong relationship with vehicular crashes and subsequent fatal and nonfatal injury. Compared with all other age groups, rates of motor vehicle crash are highest for sixteen- to nineteen-year-old drivers. A number of risky driving behaviors have been identified in youth, including driving without a license, driving unbelted, speeding, nighttime driving, driving while distracted (e.g., cell phone, texting), driving with multiple passengers, and driving under the influence of alcohol or drugs. Institute of Medicine and National Research Council Committee on the Science of Adolescence 2011 provides an overview of adolescent risk behaviors, including sections that describe the biobehavioral and psychological processes observed during the adolescent years. Risky teen driving is described as one of several risky health behaviors observed among adolescents. A number of reviews are published in the literature; highlighted here are two broad overviews of the teen driving problem and associated risky behaviors (Shope and Bingham 2008, Williams 2003) and one older review of the literature, focused on alcohol-involved teen driving (Mayhew, et al. 1986). The remaining reference works are other notable studies that have been conducted, consisting of evaluating (by analyzing crash reports) multiple risky driving behaviors (McKnight and McKnight 2000; Rice, et al. 2003) or of US national surveys of teens (Everett, et al. 2001). While a growing number of international studies have begun to examine risky driving in youth, and perceptions of risky driving situations in particular, we highlight here one study from New Zealand (Blows, et al. 2005). Also note that many published works study youth up to age twenty-four, reflecting the young-driver age range, and thus are included in this article.

Blows, S., S. Ameratunga, R. Q. Ivers, S. K. Lo, and R. Norton. 2005. Risky driving habits and motor vehicle driver injury. *Accident Analysis & Prevention* 37.4: 619–624.

This cross-sectional survey of over 21,000 sixteen- to twenty-four-year-olds from New Zealand found that youth who raced or drove 20 km/h over the speed limit and those with prior citations were more likely to be in a crash that involved injury. Available online for purchase or by subscription.

Everett, S. A., R. A. Shults, L. C. Barrios, J. J. Sacks, R. Lowry, and J. E. Oeltmann. 2001. Trends and subgroup differences in transportation-related injury risk and safety behaviors among high school students, 1991–1997. *Journal of Adolescent Health* 28.3: 228–234.

Used the Youth Risk Behavior Survey to evaluate trends in drinking and driving, use of seat belts, and helmet use among a US school-based cluster sample of high-school students. Available online for purchase or by subscription.

Institute of Medicine and National Research Council Committee on the Science of Adolescence. 2011. The science of adolescent risk-taking: Workshop report. Washington, DC: National Academies Press.

This report was produced by the Board on Children, Youth, and Families (BCYF) of the Institute of Medicine and the National Research Council (NRC) to evaluate threats to adolescent health and well-being. The report includes sections on the biobehavioral processes and the psychology of adolescence, and a summary on the various types of health risks encountered by adolescents. A short section is dedicated to teen driving.

Mayhew, D. R., A. C. Donelson, D. J. Beirness, and H. M. Simpson. 1986. Youth, alcohol and relative risk of crash involvement. *Accident Analysis & Prevention* 18.4: 273–287.

Provides a review of the literature on studies, primarily surveys, that indicate a high prevalence of youth who drive while intoxicated. Also, studies that show an increased risk of crashing among intoxicated young versus intoxicated older drivers. Available online for purchase or by subscription.

McKnight, A. J., and A. S. McKnight. 2000. The behavioral contributors to highway crashes of youthful drivers. *Annual Procedures for the Advancement of Automotive Medicine* 44:321–334.

Evaluated over two thousand crash narratives of drivers under age twenty from California and Maryland. Found that driver error (e.g., poor attention, inadequate visual scans, driving too fast for conditions, inadequate hazard recognition, poor emergency maneuvers) contributed to the majority of crashes. Overt risky behaviors (e.g., speeding >70 MPH, alcohol/drug impairment) contributed to 5 percent of crashes.

Rice, T. M., C. Peek-Asa, and J. F. Kraus. 2003. Nighttime driving, passenger transport, and injury crash rates of young drivers. *Injury Prevention* 9.3: 245–250.

Evaluated crashes by sixteen- and seventeen-year-olds in California and found increased crash rates were associated with driving at night, driving with passengers, and using alcohol.

Shope, J. T., and C. R. Bingham. 2008. Teen driving: Motor-vehicle crashes and factors that contribute. In *Special Issue: Teen driving and adolescent health: New strategies for prevention*. *American Journal of Preventive Medicine* (Suppl.) 35.3: S261–S271.

Provides an excellent overview of teen driving trends, impact of policies, and risk factors. Included is an excellent discussion of risky driving behaviors. Presents a conceptual model for teen driving and risky behaviors. Available online for purchase or by subscription.

Williams, A. F. 2003. Teenage drivers: Patterns of risk. *Journal of Safety Research* 34.1: 5–15.

Review of the literature supporting high risk among teenagers. Identifies high-risk driving situations for teens, particularly driving while intoxicated and driving with other passengers.

Prevention of Childhood Injury

Understanding risky behaviors associated with injury has informed the development of interventions from many different perspectives. Some seek to change the environment (Leden, et al. 2006), others seek to change the child's behavior through increased knowledge or training (Rothengatter 1984), and some hope to change caregivers' attention and supervision (Barton and Schwebel 2007). Some have

achieved these improvements through a combination of changing children's behavior and improving caregiver supervision (Schwebel, et al. 2007). The works highlighted here are related to topics covered in this article, and they come from Sweden, the United States, and the United Kingdom. Prevention of childhood injury involves comprehensive strategies that target environmental change as well as educational and behavioral change. Sleet and Gielen 2007 is a chapter in a practical textbook (*Handbook of Injury and Violence Prevention*) with contributions from researchers in the field, describing behavioral theories used for developing strategies of injury and violence prevention that lead to reduced risky behaviors. Similar information is found in a previous paper by these authors (Gielen and Sleet 2003). *Handbook of Injury and Violence Prevention* also provides a concise chapter on the motivations for behavioral science in injury prevention, as well as applicable theories of behavioral health.

Barton, B. K., and D. C. Schwebel. 2007. The roles of age, gender, inhibitory control, and parental supervision in children's pedestrian safety. *Journal of Pediatric Psychology* 32.5: 517–526.

Supervision is known to be a protective factor in preventing childhood injury in a variety of domains. This article demonstrates the efficacy of parental supervision on children's risky road-crossing behaviors in a sample of five- to eight-year-olds. Simply by being present, parents positively affected their children's risky road-crossing behavior.

Gielen, A. C., and D. A. Sleet. 2003. Application of behavior-change theories and methods to injury prevention. *Epidemiologic Reviews* 25.1: 65–76.

This paper also summarizes theories in behavioral science. Emphasizes the need for addressing human interaction when developing injury countermeasures that involve structural or engineering changes. This, too, provides a necessary foundation for understanding and conducting behavioral-science research in the field of pediatric injury.

Leden, L., P. Gårder, and C. Johansson. 2006. Safe pedestrian crossings for children and elderly. *Accidental Analysis & Prevention* 38.2: 289–294.

This article addresses changes implemented in the environment to decrease the likelihood of pedestrian and cycling injuries in children and the elderly. Marked crosswalks, speed bumps, and increased visibility were all cited as improving safety. This article addresses both child and elderly pedestrian safety. These two age groups are often considered "trouble" populations in the pedestrian literature and, as such, are sometimes studied together. Available online for purchase or by subscription.

Rothengatter, T. 1984. A behavioural approach to improving traffic behaviour of young children. *Ergonomics* 27.2: 147–160.

Parents are in prime position to teach their children about how to behave safely. Minimal literature exists on how parents achieve this broadly. However, this article set out to determine if parents are capable of teaching their children to behave safely in a street-crossing situation. They found not only that were parents capable of improving their children's road-crossing behavior, but that these gains persisted over time. Available online for purchase or by subscription.

Schwebel, D. C., S. Lindsay, and J. Simpson. 2007. Brief report: A brief intervention to improve lifeguard surveillance at a public swimming pool. *Journal of Pediatric Psychology* 32.7: 862–868.

Highlights an intervention designed to improve lifeguards' scanning of the pool and perception of drowning vulnerability. The intervention improved lifeguards' scanning and decreased risky behavior in swimmers. This is one example of changing caregiver behavior to improve children's safety. It should be noted that the behavior of swimmers of all ages was observed. This is an issue for children's unintentional drowning, because it is a leading cause of death in this population.

Sleet, D. A., and A. C. Gielen. 2007. Behavioral interventions for injury and violence prevention. In *Handbook of injury and violence prevention*. Edited by L. S. Doll, S. E. Bonzo, J. A. Mercy, and D. A. Sleet, 397–410. Boston: Springer.

This chapter provides a summary of theory from behavioral science applied to injury and violence prevention. Understanding behavioral-science theory informs its application to the field of childhood injury risk behavior. Note that portions of this chapter were taken with permission from a previous paper written by these authors (Gielen and Sleet 2003).

back to top