

Caregiver Supervision and Child-Injury Risk: I. Issues in Defining and Measuring Supervision; II. Findings and Directions for Future Research

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Objective To discuss the role of caregiver supervision in child-injury risk, with attention given to definitional and methodological issues and outlining important questions to be addressed in future research. **Methods** Analysis, synthesis, and critique of existing literature. **Results** Comparisons across studies are difficult because of insufficient specificity regarding what constitutes *supervision*. Hence, a multi-dimensional definition of supervision is developed based on the literature. Numerous issues arise when attempting to measure supervision and these are extensively discussed, along with reporting on the recent development of two questionnaire measures of supervision (Beliefs About Supervision Questionnaire and Parent Supervision Attributes Profile Questionnaire) that have shown good validity and hold promise for addressing the problem of measuring caregiver supervision in reliable and valid ways. A review of the findings on relations between supervision and child-injury risk reveals that many substantive questions remain unanswered. A number of recommendations for future research are given and a conceptual model is presented that focuses attention on the need for research that examines how factors interact to influence child-injury risk. This model has relevance not only for research but also for prevention and serves to emphasize the complementary nature of environment-oriented and person-oriented approaches to child-injury prevention. **Conclusion** Direct evidence linking supervision to child-injury risk is scarce and many important questions remain unanswered. Based on the conceptual model presented, in future research it is important to examine how supervision interacts with other key factors to influence children's risk of injury.

Key words childhood injuries; supervision; protective and risk patterns.

Unintentional injuries are a leading cause of death and disability during childhood (Baker, O'Neill, & Ginsburg, 1992; Canadian Institute of Health Research, CICH, 1994). Most injuries to young children are preventable (e.g., Rimsza, Schackner, Bowen, & Marshall, 2002) and happen when a caregiver is supposedly supervising to ensure the child's well-being. Lapses in caregiver attention have been implicated in research on a variety of types of child injuries, including pedestrian injuries (Maleck, Guyer, & Lescohier, 1990; Rivara, Bergman, & Drake, 1989; Wills et al., 1997a, 1997b), drowning (Feldman,

Monastersky, & Feldman, 1993; Landen, Bauer, & Kohn, 2003), poisoning (Beautrais, Ferguson, & Shannon, 1981; Brayden, MacLean, Bonfilgio, & Altemeier, 1993; Ozanne-Smith, Day, Parsons, Tibballs, & Dobbin, 2001), choking on small toys (Pollack-Nelson & Drago, 2002), dog bites (Brogan, Bratton, Dowd, & Hegenbarth, 1995), playground injuries (Buck, 1988), injuries that can result from handling of hazardous substances in grocery stores (Harrell & Reid, 1990), injuries that can result from exposure to household safety hazards (Glik, Greaves, Kronenfeld, & Jackson, 1993), injuries on escalators

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(Platt, Fine, & Foltin, 1997), and fall-related injuries (Board of Trustees, 1991; Harrell, 2003).

Moreover, epidemiological data indicate that a child's risk of injury increases substantially when the child lives with a single caregiver (Rivara & Mueller, 1987), in a home with multiple siblings (Nathens, Neff, Goss, Maier, & Rivara, 2000; Scholer, Mitchel, & Ray, 1997), or with a substance-abusing caregiver (Westfelt, 1982), which are all characteristics that can be associated with a caregiver's decreased capacity to attend closely to a child's activities. Some pediatricians have suggested that inadequate supervision that leads to child injury should be reported as child abuse if the child is younger than 2 years of age (Nelson, 1979), and leading researchers in this field, including Peterson and her colleagues, have argued persuasively that caregivers contribute substantially to injury risk (Saldana & Peterson, 1998).

This confluence of indirect evidence and professional opinion has led many to assume that caregiver supervision *must* affect child-injury risk or, more specifically, that inadequate supervision must be associated with increased risk of injury to children and increased supervision must serve a protective function and be associated with the prevention of childhood injuries (Garbarino, 1988; Peterson, Farmer, & Mori, 1987; Peterson & Stern, 1997; Stratton, 1985). But what exactly are the facts regarding caregiver supervision and child-injury risk? Moreover, what do we mean when we use the term *supervision* and is our measurement approach sufficient and appropriate to capture the complexity of relations that might exist between caregiver supervision and child-injury risk? The aim of this article is to discuss definitional and methodological issues relevant to research on supervision and child-injury risk, to review research findings examining relations between caregiver supervision and child-injury risk, and to suggest directions for future research on this important topic, including presentation of a conceptual model that is relevant to both research and prevention.

I. Issues in Defining and Measuring Supervision

Issues in Defining Supervision

Supervision is a ubiquitous term. Many researchers in the child-injury area use it, but virtually no one has provided a definition of what it means. Dictionary-based definitions of supervision usually mention *seeing*, *overseeing*, *directing*, or *managing* a supervisee, and caregivers themselves provide a confusing array of definitions, including mention of "being there", "watching", and "overseeing" (Pollack-

Nelson & Drago, 2002). The problem with these definitions is that they blur distinctions between behaviors or the act of supervising (e.g., actually seeing) and knowledge (e.g., overseeing by knowing how someone usually behaves in a given situation). These distinctions have critical implications for measuring supervision.

An operational definition is also difficult to develop because caregiver behaviors, which can be observed, may not align with caregiver knowledge, which must be inferred or self-reported, and both may be considered relevant to a caregiver's capacity to supervise. Hence, if a caregiver knows what their child is doing without actually being in the act of watching the child, does this constitute supervision? Or, should we limit our focus to caregiver behaviors that give rise to their knowledge of the child's activities, such as actively watching and/or listening? Similarly, if we consider that our interest in supervision derives from a desire to know how this phenomenon relates to child injury, then should we also attend to the caregiver's capacity to supervise in service of intervention? This would mean that we also consider caregiver-to-child proximity or time-to-reach child as relevant in defining supervision. Finally, knowing something about a caregiver's supervision of a child at one moment in time may provide limited insight into this phenomenon as it relates to child-injury risk. Hence, should our definition of supervision also reflect the issue of degree-of-continuity of supervision over time?

The complexity of delimiting and defining supervision is not unique to the child-injury field. Indeed, the issue of how supervision relates to child outcomes and how best to define supervision has received attention in a variety of research areas. In the literature on adolescence, for example, investigators use the term *monitoring* instead of supervision (e.g., Crouter & Head, 2002), although the reason for this is not clearly indicated; interestingly, low levels of parental monitoring are also associated with negative child outcomes (e.g., drug use). Parental monitoring is defined as "a set of correlated parenting behaviors involving attention to and tracking of the child's whereabouts, activities, and adaptations" (Dishion & McMahon, 1998). This definition implies measurement of parent behaviors per se (i.e., attending and tracking behaviors). Yet, most of the actual measures of parent monitoring focus on parents' knowledge of their child's whereabouts and activities, *not* on parent behaviors (Crouter & Head, 2002; Kerns, Aspelmeir, Gentzler, & Grabill, 2001; Kerr & Stattin, 2000). Hence, there is relatively poor alignment between definitions and measurement of supervision in the literature on adolescence, and investigators often measure outcome (what

parents know) instead of process (how they learned this) information, with little concern for specifying how they actually define supervision and/or monitoring.

In the area of child neglect there also has been considerable interest in defining supervision. However, the primary focus here has been on differentiating *adequate* supervision from *supervisory neglect* (Budd, 2001; Coohey, 2003; Feldman et al., 1993; Gaudin, Polansky, Kilpatrick, & Shilton, 1996; McGee, Wolfe, Yeun, Wilson, & Carnochan, 1995). One problem that often occurs in research in this area is that adequate supervision is often differentiated from supervisory neglect based on outcome. Hence, if a young child is injured the assumption is that there must have been inadequate supervision and the behaviors of the caregiver may constitute supervisory neglect. Alternatively, children who are uninjured are assumed to be adequately supervised. Such circuitous thinking makes it very difficult to achieve consensus on how to define and measure supervision and develop formal guidelines about supervision (i.e., What constitutes adequate supervision?).

Azar and Benjet (1994) have noted that there is a lack of universal standard regarding minimal competence in many parenting areas, including supervision. The findings from research comparing judgments of adequate supervision by parents, medical personnel, and Child Protection Service workers suggest that one may be able to develop such universal guidelines for children at young ages and for children in high-risk environments (Peterson, Ewigman, & Kivlahan, 1993). However, the increased variability in consensus as the child's age increases and the degree of environmental hazard decreases will likely make it difficult to develop uniform standards for defining adequate supervision across ages and contexts. Thus, although one would think that legal and social service guidelines would prove useful for developing criteria to define adequate supervision, in fact, there is insufficient behavioral specificity and little consensus across these sources (Melton, Petrila, Poythress, & Slobogin, 1987).

In sum, it is apparent from this brief discussion that supervision is a complex, multi-faceted phenomenon and that other research domains provide surprisingly little useful information regarding how best to define supervision in ways that have relevance for studying child-injury risk. For purposes of intervention to prevent child injury, the focus should be on the behaviors entailed in supervising children. The act of supervising, when it is performed conscientiously, generates knowledge of a child's whereabouts, actions, and activities. Measuring such behaviors over successive time periods would seem important too, so that one can capture the degree of *continuity* of super-

vision, which is an essential attribute of supervision for child-injury risk (Gitanjali et al., 2004). Hence, one definition of supervision that may prove useful in this research is the following: Supervision refers to behaviors that index attention (watching and listening) in interaction with those that reflect state of readiness to intervene (touching/within arm's reach/beyond arm's reach), with both types of behaviors judged over time to index continuity in attention and proximity (constant/intermittent/not at all).

According to this definition behaviors indicating complete and sustained attention (constantly watching, constantly listening) coupled with the closest possible physical proximity (touching) should be associated with complete knowledge of the child's whereabouts, actions, and activities, coupled with maximum readiness to act and, therefore, should constitute maximal supervision. Being out of reach of the child under the same conditions would constitute a lower level of supervision, and greater injury risk, because capacity for intervention is reduced; under these conditions, verbal interventions to prevent injury (e.g., "stop that!") *might* suffice to prevent injury (if the child complies) but might not (if the child does not comply), particularly for young children because of their limited understanding of injury risk and rules about safety. In sum, based on this definition, it is the interaction of attentional behaviors and physical proximity extended in time that defines level of supervision.

As can be seen in subsequent sections, the results of several studies examining how patterns of supervision behaviors relate to child-injury risk provide support for the utility of this definition of supervision (Morrongiello & House, 2003; Morrongiello, Ondejko, & Littlejohn, 2004a, 2004b). Evidence presented also supports the premise that one can identify *supervisory styles*, that is, general approaches to supervision (i.e., patterns of supervision behaviors) that are common across variations in context and that relate to children's injuries (Morrongiello & Dawber, 2000; Morrongiello & Hogg, 2004). Moreover, there is emerging evidence that general indices of caregivers' beliefs, values, and attitudes regarding supervision and protectiveness relate to supervision and have relevance for understanding child-injury risk (Morrongiello & House, 2003). Hence, the current evidence suggests that one can differentially define and measure supervision and supervision styles, as well underlying caregiver attributes that relate to these phenomena and inform our understanding of child-injury risk.

Issues in Measuring Supervision

One of the greatest challenges to studying relations between supervision and child injury is deciding on

appropriate measures of supervision. Studies asking caregivers to self-report on how they might supervise under different hypothetical conditions are numerous (Garling & Garling, 1993a, 1993b; Morrongiello & Dayler, 1996; Peterson et al., 1993) and provide information on what caregivers believe to be true of their behavior. Utilizing props (e.g., story vignettes, videotapes of children risk taking) may help caregivers better imagine themselves in the actual situation (e.g., Morrongiello & Dawber, 2000; Peterson et al., 1993) and improve the validity of the data. However, fundamentally, the usefulness of this method is limited because of inadequate ecological validity. Hence, this method may yield results that provide limited insight into how caregivers actually supervise under naturally occurring conditions.

Naturalistic observations maximize ecological validity but are time consuming and extremely labor intensive. Moreover, unobtrusively observing in some situations can be extremely difficult (e.g., home). One innovative approach that blends these two approaches is a *contrived-hazards* method that involves creating in the laboratory a naturally appearing situation that comprises potential injury-risk hazards (i.e., hazards that appear real but have been modified to eliminate injury risk), and then monitoring how caregivers and their children behave in this seemingly “natural” injury-risk environment.

Initial implementation of this method had mothers fully aware that their behavior was being monitored and that the hazards posed no real threat (Cataldo et al., 1992), which may have resulted in distortions in data due to social desirability biases affecting how mothers behaved. More recently, however, this method has been used with mothers unaware that they were being observed and believing that the hazards were real (Morrongiello & Dawber, 1998), which presumably provides a more accurate indication of how mothers supervise when in injury-risk environments outside the home.

Unquestionably, the contrived-hazards methodology is a good one for studying how caregivers supervise and manage injury risks for their child. Nonetheless, broad application of the method is not possible because not all types of injury-risks can be reproduced in a laboratory setting and not all hazards can be made to appear real but not pose a risk of injury. Moreover, given the goal is to relate supervision to childhood injuries, one would need to extend this methodology and track caregiver-child dyads over time to assess for stability in caregiver behaviors and to determine whether one actually can discern distinct patterns of supervision that differentially relate to children’s injuries; of course, one problem with the latter approach is that once a caregiver participates

in a contrived-hazards setting and they are informed of the study and become familiar with the technique then the method is no longer applicable to them again, thereby precluding longitudinal studies based on this method. In sum, although the contrived-hazards method is an excellent one, it has not yet been used to derive the type of information needed to relate supervision to child-injury risk per se and it has limited potential for doing so. What is needed is an empirically derived taxonomy of supervision behavior in which one specifies different patterns of supervision that differentially relate to children’s risk of injury.

Using alternative methods, several studies have yielded such taxonomies. Wills et al. (1997a, 1997b) examined supervision at the time of pedestrian injury (36% of children were being supervised at the time of injury) for 5 to 12 year olds. After identifying cases of interest (i.e., children who experienced a pedestrian injury), they then gathered information about supervision from reviews of medical records, police reports, and parent and child interviews. Drawing on these data, they developed a taxonomy of supervision based on coding the age (i.e., adult, teen) and proximity of the supervisor (i.e., near, far), and the presence of the injured child’s companions (i.e., none, one or more). All cases could be coded along these dimensions though the authors did not provide a hierarchical taxonomy that integrated all these risk factors into one coherent rubric and identified patterns of supervision behaviors that differentially related to children’s pedestrian injuries.

Drawing on the success of the participant-event monitoring methodology (cf. Morrongiello, 1997; Peterson, DiLillo, Lewis, & Sher, 2002; Peterson & Tremblay, 1999), Morrongiello and her colleagues (2004a, 2004b) recently completed a prospective study in which mothers completed injury-recording diaries and telephone interviews over the course of 12 weeks, providing self-reports about children’s home-injuries and caregiver supervision. These data were then used to identify determinants of in-home injuries experienced by toddlers and to develop a taxonomy of supervision that differentially related to injury risk among 2- to 3-year-old children (see next section). The resulting taxonomy included: (1) not supervising (i.e., child is out of view and listening range of the caregiver and has not been checked on in more than 5 minutes), (2) listening intermittently (at least once every 5 minutes) from an out of view location, (3) going to check on the child intermittently (at least once every 5 minutes) from an out of view location, (4) listening constantly from an out of view location, and (5) watching and listening constantly.

These few studies suggest that one can develop a taxonomy of supervision behaviors that relates to child-injury risk. However, any taxonomy developed is likely to vary considerably with developmental status and environmental-risk context. For example, constant supervision may be necessary to ensure safety of a toddler in the tub but listening-in may suffice to ensure the toddler's safety in their bedroom or the safety of a preschooler in the tub. Indeed, in a study of children's minor injuries, Peterson and her colleagues provide evidence confirming that level of supervision varies with child location as a function of level of environmental risk (Peterson, Cook, Little, & Schick, 1991). The implication of this is that it will likely be impossible to develop a *single* taxonomy of supervision that informs our understanding of children's risk of injury at different ages and in varied contexts, or even at a single age in different contexts. Developing taxonomies for different ages and all the possible contexts in which children and caregivers spend time together is probably an insurmountable task. Thus, what is needed is an alternative approach to the measurement of supervision. Ideally, one seeks an approach that is efficient (e.g., does not involve lengthy observations) but still captures important variations in caregiver supervision (e.g., as a function of children's developmental status or situational contexts) and yields an index of supervision that is relevant for understanding child-injury risk. The Beliefs About Supervision Questionnaire (BAS) was developed with these needs in mind (Morrongiello & Hogg, 2004).

In the BAS, caregivers are presented with a number of common situations in which a young child might be playing, for example, in their bedroom, bathtub, kitchen, dining room, living room. For each, they are asked to indicate the youngest age at which they believe the child can be allowed to be in that situation without constant supervision for at least 5 minutes, and to indicate the frequency (in minutes) with which they would then check on the child in that situation (Morrongiello, in preparation). Initial use of this questionnaire revealed two distinct patterns or *styles of supervision* (Morrongiello & Hogg, 2004) and these distinct styles of supervision differentially related to the children's injury histories (see next section).

These findings suggest that measuring a caregiver's approach to supervising young children across a broad-array of contexts is possible and can reveal a more general *style of supervising* that is relevant to child-injury risk. Interestingly, in the parenting domain many investigators have noted that specific parenting practices are *less* important in predicting the child's well-being than is

the general pattern of parenting or parenting style (Baumrind, 1991; Maccoby & Martin, 1983). Similarly, in the field of neglect there is also an acknowledgment of the need to distinguish discrete episodes of inadequate supervision from general patterns or styles of neglectful supervision that are more predictive of risk status (Feldman et al., 1993). The same conclusion is likely to prove true in studies linking supervision and child-injury risk. It seems likely too that one may be able to extend the measurement to an even more general level, focusing on underlying caregiver attributes that relate to supervision and also inform our understanding of child-injury risk.

Grisso (1986) argues persuasively for evaluating "functional parenting competencies" (p. 201), that is, not only what the caregiver does at any one moment but what the caregiver believes, knows, and values. This type of conceptual approach redirects the measurement focus from situation-specific behaviors or even general patterns of behaviors reflected in supervisory style to those underlying attributes that give rise to such behaviors and styles of reacting, namely attitudes, beliefs, values, and personality traits (Kochanska, Clark, & Goldman, 1993; Mize, Pettit, & Brown, 1995; Polansky, Guadin, Ammons, & Davis, 1985). Presumably, these attitudes, beliefs, values, and personality traits act to direct and constrain supervision behaviors and styles, thereby contributing to cross-situational and temporal stability in styles of supervision. Again, there are numerous demonstrations of successful application of this measurement approach in diverse areas of psychology including personality (Caspi & Moffit, 1993; Caspi & Roberts, 2001), coping (Avero, Corace, Endler, & Calvo, 2003) and parenting (Darling, & Steinberg, 1993; Sigel & McGillicuddy-De Lisi, 2002). In essence then the task becomes to identify underlying traits and attributes of caregivers that are stable over time and across situations, that relate to supervision styles, and that inform our understanding of child-injury risk. The premise, put simply, is that these various sources of influence are instantiated in parenting and supervision practices, thereby impacting child-injury risk via several paths of influence, including supervisory and non-supervisory processes.

Questionnaire measures have generally proven reliable and valid (e.g., Kochanska, Kuczynski, & Radke-Yarrow, 1989) for measuring a variety of parenting styles (Block, 1965; Robinson, Madleco, Olsen, & Hart, 1995; Schaefer & Bell, 1958; Slater & Power, 1987). However, there have been no attempts to develop a questionnaire measure of parent attributes that inform

our understanding of supervision and child-injury risk. Recently, this gap in measurement was addressed by development of the Parent Supervision Attributes Profile Questionnaire (PSAPQ; Morrongiello & House, 2003).

In developing the PSAPQ a broad conceptual approach to supervision was adopted, focusing not only on supervisory styles but also on parent beliefs and attitudes that were likely to relate to supervisory behaviors and styles. Literature was surveyed on the topic of supervision, including the child neglect, child injury, child development, and parenting literatures (e.g., Coohy, 2003; Gitanjali et al., 2004; Iltus, 1994; Mize et al., 1995). Next, supervisory behaviors (e.g., visual and auditory monitoring, physical proximity), as well as parenting attributes relevant to child safety (e.g., protectiveness, worry about safety, vigilance about safety, confidence in ability to parent to keep child safe) were identified and then questionnaire items were developed to tap these attributes. In the current version of the questionnaire there are 4 sub-scales that show adequate internal consistency, including: protectiveness ($\alpha = .70$; e.g., *I make my child keep away from anything that could be dangerous*), worry about safety ($\alpha = .65$; e.g., *I spend much of my time worrying that he/she will get hurt*), vigilance in supervision ($\alpha = .68$; e.g., *I keep an eye on my child's face to see if he/she needs my help*), and confidence in the parent's ability to keep his/her son/daughter safe ($\alpha = .65$; e.g., *I feel confident I know what my child can do*).

Initial testing of the PSAPQ (Morrongiello & House, 2003) revealed that observational measures of supervision behaviors per se (watching, listening, proximity, engagement with child, parent distraction) were highly intercorrelated. Hence, caregivers who engaged in one behavior also engaged in other behaviors, suggesting that caregivers were either closely supervising (doing all behaviors) or not supervising much (not doing much of any supervisory behavior). Interestingly, physical proximity was the only supervision behavior that directly related to injury risk: increased proximity was associated with decreased risk taking by children. Hence, the importance of including physical proximity in the definition of supervision is supported by this finding. In addition, several subtest scores on the PSAPQ related to a composite measure of observed supervision behaviors [vigilance ($r = .41, p < .01$), confidence ($r = .33, p < .01$)] and, most importantly, every subtest score uniquely related to children's injury histories. Hence, these initial results indicate good criterion-related validity and suggest that the PSAPQ is a promising tool for studying relations between caregiver supervision and child-injury risk.

In summary, the foregoing review indicates a variety of approaches that are relevant to measuring supervision for the purpose of relating this to child-injury risk. Focusing on supervision behaviors (e.g., watching, listening, proximity) has yielded taxonomies of supervision that have been shown to relate to injury risk in select situations. This approach is of limited utility, however, because the variation in supervision that occurs as a function of environmental-risk context will likely preclude developing a single taxonomy that relates well to child-injury risk. Questionnaire measures (e.g., BAS) that tap supervisory style (i.e., a caregiver's general pattern of supervising despite normal variations in specific supervisory behaviors across contexts) have shown that one can indeed discern different styles of supervision and that these pose differential risk of injury for children. Furthermore, examining underlying caregiver attributes that give rise to supervision (e.g., PSAPQ) has proven useful for illuminating influences on supervision. From an intervention perspective, this is important work because an understanding of the underlying basis for supervision decisions is an essential first step for formulating interventions to change supervision. Hence, although much of this work is still preliminary, the findings to date indicate there is merit in pursuing development of questionnaire measures of supervisory style and its determinants.

II. Findings and Directions for Future Research

Findings from Studies of Caregiver Supervision and Child-Injury Risk

Studies Using Observational Methods

Recently, Harrell (2003) unobtrusively observed children (infancy – 5 years) and their caregivers in supermarkets, recording children's risk behaviors (e.g., standing in cart or climbing from cart) and adults' supervision behaviors. Two measures of supervision were taken: (1) whether the child was left unattended (i.e., out of the supervising adult's line of sight for 10 seconds or more) and (2) whether or not the distance between the child and the adult exceeded 10 feet. Results revealed that risk-taking behaviors by children could be predicted by level of supervision shown by caregivers. Decreased supervision (e.g., child unattended, distance between adult and child greater than 10 feet) was associated with increases in a number of risk behaviors (e.g., climbing out of cart, standing on sides of cart) but actual measures of injuries and history of injuries were not taken.

In an observational lab study using a 'contrived-hazards' situation, the behaviors of injured and uninjured children (24 to 42 months of age) and their parents were examined, with parents fully informed about the nature of the study and that what appeared to be hazards posed no real threat of injury to children (Cataldo et al., 1992). Injured children showed more disruptive and overactive behaviors and more contact with hazards than uninjured children. However, parents did not differ in hazard warnings issued to the injured and uninjured groups, possibly because they were aware that the hazards posed no real risks to children. More recently, the contrived hazards method has been used with mothers unaware that they were being observed and believing that the injury hazards were real (Morrongiello & Dawber, 1998). As in Cataldo et al. (1992), mothers were predominantly reactive in managing injury risk (i.e., intervened once child approached hazard instead of in anticipation of the child's approaching the hazard). Boys behaved in ways that elevated injury risk, whereas girls did not (see also Coppens & Gentry, 1991; Ginsburg & Miller, 1982; Rosen & Peterson, 1990). Boys approached more hazards than girls and they were more likely than girls to interact immediately with hazardous items they approached. Interestingly, interacting with hazards positively correlated with scores on a standardized measure of risk taking, as well as with injury history scores, suggesting that the behaviors observed by children in this contrived situation typifies their behavior in the natural environment (i.e., risk takers remain so across contexts and they experience more frequent injuries). Not surprisingly, parents' reactions to children's behaviors varied for boys and girls. Boys not only required more frequent intervention than girls by parents, but also different types of supervision strategies. Specifically, parents used more verbal redirection strategies for daughters than sons. However, these strategies were ineffective for sons, resulting in the need for parents to use more physical redirection strategies for sons than daughters. These findings suggest that boys required both more frequent and more effortful supervision strategies by parents than girls to ensure their safety in injury-risk situations (see next section also). Thus, child gender interacts with parent supervision to influence injury risk.

A recent study by Schwebel and Bounds (2003) indicates that child temperament also interacts with parent supervision to influence child-injury risk. Specifically, temperamentally impulsive and undercontrolled children showed more accurate judgments about their physical abilities and greater cautiousness when parents were standing next to them than when parents were out of

view. Thus, patterns of supervision behaviors that link to injury risk can vary depending on child attributes.

Studies Using Self-Report Methods

Three types of self-report methods have been used: asking caregivers to report how they think they would supervise in hypothetical situations, asking caregivers to report on actual supervision behaviors in specific situations, and having caregivers complete questionnaire indices of supervision.

Supervision in Hypothetical Situations

A number of studies have presented caregivers hypothetical situations and asked them to indicate how they would supervise under these conditions, or presented caregivers with information about different levels of supervision and had them rate perceived injury risk for children at different ages. Garling and Garling (1993a), for example, had mothers rate the degree of risk and anticipated injuries for their 1- to 3-year-olds under four levels of supervision: (1) child plays alone while mother is in another room, (2) child plays alone while mother attends to her activities in the same room, (3) child helps mother with her activities in the same room, and (4) child and mother play together in the same room. Results indicated that mothers generally reported lower levels of perceived risk of injury for older than younger children, for some rooms more than others (bedroom versus bathroom), and for situations that allowed for supervision. Similarly, Peterson et al. (1993) asked parents, as well as other child health professionals, about the length of time a child at a given age could be left unsupervised in a given environment. Results indicated that adults judged that supervision needs would vary with developmental level and extent of environmental risk, being greatest for young children and high-risk environments (see also Fagot, Kronsberg, & MacGregor, 1985a, 1985b; Glik, Kronenfeld, & Jackson, 1991).

Pollack-Nelson and Drago (2002) asked parents of children 2 through 6 years of age to report on level of supervision usually provided in the home under a variety of circumstances, including frequency of checking on a child left unattended (e.g., in another room). Consistent with Garling and Garling (1993a) and Peterson et al. (1993), parents reported decreased direct supervision with increasing child age. However, they also reported that children at all ages were routinely left unattended for periods of time while parents performed chores elsewhere in the house. For children 2 and 3 years of age, parents reported they would check on them every 5 to 15 minutes, and they would check even if there were no

sounds indicating a need for checking. For 4- and 5-year-olds, parents indicated they would check on them every 15 to 30 minutes, with checking dependent on what they heard happening. For children older than 5 years, parents reported they would only check on them every 30 to 60 minutes, depending on what they heard happening. Obviously, parents in this study believed that even by the age of 2 children could be left unattended in another room, particularly if the parent could hear what is going on. It was not until the age of 5 or 6, however, that parents reported they would leave a child alone in a room if they could not at all hear what was going on. Interestingly, a number of parents were unable to cite a specific age at which these types of supervision would be appropriate, mentioning that it would depend on the characteristics of the individual child, not just their age. One factor that was mentioned to increase the rate of checking on a child was the social context. Parents would do more frequent checking if peers or siblings were present, however, this effect was found only for younger children 2 and 3 years of age.

The results from these various studies indicate that caregivers believe that supervision serves a protective function to reduce injury risk and that the level of supervision they provide should vary depending on perceived environmental risk, social context, and child attributes, including but not limited to developmental level. Thus, supervision is not dispensed in some uniform fashion. Rather, caregivers report that the nature and extent of supervision interacts with other factors. Of course, whether caregivers' actual supervisory behavior aligns with these reported beliefs remains to be determined. Several studies, for example, have found that caregivers do not, in fact, show increased supervision of boys compared to girls (Fagot et al., 1985b; Garling & Garling, 1993a) even though boys engage in greater risk taking than girls (Morrongiello & Dawber, 1998), experience more frequent and severe injuries than girls (Baker et al., 1992; CICH, 1994; Morrongiello, 1997; Rivara, Bergman, LoGerfo, & Weiss, 1982), and caregivers report that they believe them to be at greater risk of injury than girls (Morrongiello & Dayler, 1996; Rosen & Peterson, 1987). Indeed, there is even evidence that in reaction to video-presented risk situations parents supervise boys less closely than girls even when the children are both performing the *same* injury-risk behaviors (Morrongiello & Dawber, 2000). Parents stopped the videotape to intervene in response to risk-behaviors performed by girls more frequently than they did when boys performed those very same behaviors. Moreover, they were more tolerant of risk taking by boys and

allowed the risk-behavior sequence to progress to a far more risky level before intervening for boys than girls. Interestingly, injury-history scores were negatively related to speed-to-intervene scores, indicating that parents who were slow to intervene when supervising in this task, had children who had a history of more frequent injuries.

What are we to conclude about what parents report about how they might supervise in hypothetical situations? As outlined in the previous section on measurement of supervision, we must be cautious in our conclusions about how supervision relates to child-injury risk when these conclusions derive from studies asking caregivers to respond to hypothetical situations about supervision. Nonetheless, based on these findings, it would appear that parents do not uniformly supervise in one way. Rather, their supervision varies depending on a variety of environmental and child-based characteristics. Parents presumably supervise more closely in high-risk environments and for children at younger ages, although there is little reported agreement about what an adequate level of supervision would actually be under these conditions. Finally, parents appear to supervise girls more closely than boys, intervening more quickly and frequently for girls than boys, even when boys and girls are performing the exact same risk behaviors.

Self Reports About Actual Supervision Behaviors

In an effort to advance our understanding of young children's risk of injuries in the home, Morrongiello and her colleagues had mothers complete injury-recording diaries and telephone interviews that provided detailed reports about injuries, including supervision at the time of injury (Morrongiello et al., 2004a, 2004b). These data were then used to identify determinants of in-home injuries experienced by toddlers and to develop a taxonomy of supervision that differentially related to injury risk among 2- to 3-year-old children (see *Questionnaire Measures of Supervision*). Results revealed distinct patterns of supervision, and these were differentially associated with injuries for boys and girls. Boys essentially required constant supervision to manage injury risk, whereas intermittently going and checking on the child was sufficient to manage injury risk for girls. These findings are consistent with those obtained using a contrived-hazards methodology which revealed that boys required more frequent and more effortful supervision strategies than girls to manage their risk of injury when hazards were present. Hence, several lines of evidence suggest that different supervision strategies are needed to curtail injury-risk for boys as compared to girls, with boys generally

requiring closer supervision than girls. The findings of Morrongiello et al. (2004a, 2004b) also confirm that different patterns of supervisory behaviors can be discerned and that these are associated with different levels of risk of home injury for young children.

This study also provides direct evidence that parents moderate supervision depending on perceived risk of injury, just as parents report they would do in response to hypothetical situations (see *Supervision in Hypothetical Situations*). Parents' perceptions of injury risk varied as a function of room in the home. Correspondingly, the time they would leave their child alone in high-risk environments (i.e., bathroom, kitchen) also systematically varied, and these scores related directly to perceived injury risk. For both the kitchen and the bathroom, which were perceived as high-risk environments for their children, parents allowed their child less time alone ($r = -.31$ and $-.41$, respectively, $ps < .05$). Hence, the ways that parents supervised were not uniform across contexts. Rather, parents varied their supervision depending on the degree of perceived injury risk, showing closer supervision in situations they believed posed greater risk of injury to their children.

Was this strategic use of supervision to moderate injury risk successful actually to reduce injuries to children in the home? Yes. For both high-risk environments, the bathroom and the kitchen, there was a positive relation between time-left-alone scores and the frequency of children's injuries, $r = .41$ and $.35$, respectively, $ps < .05$. Hence, closer supervision by parents was associated with a reduced risk of injury for children in high-risk environments, providing further evidence of a direct link between caregiver supervision and child-injury risk.

Questionnaire Measures of Supervision

Questionnaire-based approaches to measuring supervision are cost-effective and may be especially effective to capture information about caregiver supervision across variations in development and contexts. The BAS was developed to examine this possibility by tapping general styles of supervising.

Initial use of this questionnaire with mothers of children 6 to 10 years of age revealed two distinct styles of supervision (Morrongiello & Hogg, 2004). Among *Frequent Monitors*, caregivers cite younger ages at which children can be without constant supervision and they manage injury risk by checking on them frequently. In contrast, among *Infrequent Monitors*, caregivers would not leave children alone without constant supervision until at older ages and they would then check on them infrequently on the assumption that the child is now old

enough to manage risk himself/herself. Moreover, these distinct styles of supervision differentially related to the children's injury histories. Children who had a history of having experienced more injuries had mothers who would leave children to play without constant supervision at younger ages and check on them more frequently (*Frequent Monitors*), whereas children with a history of fewer injuries had mothers who would not leave children to play alone until they were older, then checking on them less frequently (*Infrequent Monitors*). Similar results linking these two styles of supervision to children's injury histories have also been found for toddlers 2 to 2 1/2 years of age (Morrongiello et al., 2004a). Thus, the BAS questionnaire has proven useful to discern two distinct styles of supervision, and these styles differentially relate to children's injury histories.

The recently developed Parent Supervision Attributes Profile Questionnaire has also provided some unique insights into caregiver supervision and child-injury risk (Morrongiello & House, 2003). In our initial test of the PSAPQ we sought to establish its criterion validity by relating the findings from this questionnaire to actual supervision behaviors, observed and a questionnaire measure of children's risk taking (*Injury Behavior Checklist, IBC*; Speltz, Gonzales, & Quan, 1990), and to children's injury histories (non-minor, medically attended). This initial study included parents of children 2 through 5 years of age.

Included in the study were measures of parent personality attributes (*Big Five Inventory*, cf. John, Donahue, & Kentle, 1999), including conscientiousness (i.e., extent to which person is well organized, has high standards, and always strives to achieve goals) and neuroticism (i.e., adjustment vs. emotional instability). There is considerable research documenting that underlying personality attributes contribute substantially to cross-situational consistencies in how adults behave (Caspi & Moffitt, 1993; Caspi & Roberts, 2001) and a variety of studies have shown that personality characteristics of adults systematically relate to the ways in which they parent (Belsky, 2002; Collins, Maccoby, Steinberg, Hetherington, & Bornstein, 2000). In addition, we included a questionnaire measure to tap parents' beliefs about the extent of control they have over their child's health and injury status (*Fate subscale of Parent Health Locus of Control*, cf. DeVellis, DeVellis, & Blanchard, 1993). One might reason that such beliefs might influence their approach to supervision (e.g., parents who believe they can exert little control over their child's injury/health status, may supervise less closely than those who believe they can exert an influence over their

child's health). Participants were randomly selected from local parks, parent and children's behaviors were unobtrusively observed and coded (e.g., parent supervision, child risk taking) for 20 minutes, and then parents were approached and asked to complete our questionnaire measures; hence, at the time supervision behaviors were measured parents were unaware they were being observed.

Several aspects of the findings are noteworthy. First, questionnaire reported measures of supervision positively related to actual observed supervisory behaviors, confirming that one can utilize a questionnaire measure to index this complex phenomenon. Parent conscientiousness related both to children's risk taking and their injury histories but it did not relate to observed supervision. Thus, some parent attributes exert an effect on child-injury risk in ways that are not manifest in caregiver supervisory behaviors. Clearly, if we wish to understand how caregivers influence child-injury risk, we need to not limit our focus simply to the study of supervision. Rather, supervision must be understood in the context of all strategies that caregivers use to manage injury risk for their children, including modifications to the environment and teaching children about safety (see Morrongiello et al., 2004b for further discussion). Finally, a variety of parent attributes that were measured by the various subtests of the PSAPQ were associated with decreased risk of injuries, including protectiveness, worry, vigilance, and confidence in ability to keep their child safe. In summary, the preliminary test of the Parent Supervision Attributes Profile Questionnaire suggests that it holds promise as a measurement tool in studies that seek to relate caregiver supervision style to child-injury risk.

Directions for Future Research

Although there is accumulating evidence that certain patterns and styles of supervision are associated with elevated risk of injuries to young children, interpretation of these findings is limited by the fact that we have no data on exposure rates. If all caregivers leave young children unattended when in the home for some periods of time, then what are the distinguishing characteristics of those caregivers, children, and/or homes in which this pattern of supervision actually leads to injury? In the survey of parent supervision conducted by Pollack-Nelson and Drago (2002), for example, virtually all parents (98%) reported leaving their young child unsupervised for periods of time while they did things in other locations in the home. Similarly, in an observational study of parent-child pairs in grocery stores, lapses in caregiver attention

were commonplace: 80% of adults lost visual contact with their child at least once and 75% left their child unattended at least once (Harrell, 1994). Recently, we completed a study in which we gathered continuous supervision (i.e., from the child's waking until their bedtime) and child-injury data for 10-day periods (including weekday and weekend days) for approximately 70 families. These data will provide insights into the frequency with which different patterns of supervision occur routinely within homes of young children. This type of exposure data is essential for informing our interpretation of those patterns of supervision that seem to relate to children's risk of injury. Research yielding exposure data for different patterns of supervision in other situations also is needed.

Another gap in the literature derives from the fact that there are no longitudinal data on supervision. Hence, we know nothing about if, and how, caregivers alter their patterns of supervision as children develop and/or in response to children's injuries. These data are essential for addressing the critical question of how supervision changes in response to children's development and accumulating injury histories (or lack thereof). In reaction to children's injuries, do parents become increasingly sensitized to injury risk and supervise more closely, or do they become increasingly desensitized and show more lax supervision? Alternatively, in response to children not experiencing injuries do caregivers become more lax in supervising? When mothers were asked to indicate how they would react to a number of children's behaviors that could be interpreted in terms of discipline or safety, they showed a greater focus on discipline for sons and safety for daughters, even though sons had experienced significantly more injuries than daughters (Morrongiello & Hogg, 2004). These findings suggest that prior injuries do *not* serve to sensitize mothers to be vigilant about the potential for injuries in the future, at least not for sons. Indeed, it may be that a history of injuries, despite parents' best efforts to curtail risk behaviors and effectively manage injury risk, results in desensitizing parents to injury-risk thereby leading to greater tolerance of risk taking (see Morrongiello & Hogg, 2004 for further discussion). A thorough test of this hypothesis, however, necessitates longitudinal research on how parent supervision changes in reaction to children's development, and how injuries impact on these supervision trajectories.

Examining supervision across caregivers also merits attention in future research. With few exceptions (e.g., Fagot et al., 1985b; McLaughlin, 1983; Morrongiello & Dawber, 1998), most of the research to date has been

conducted with mothers. It is essential to determine, however, if fathers show similar or unique patterns of supervision and how these paternal patterns of supervision relate to children's risk of injury. One observational study comparing mother-child with father-child interactions found that mothers and fathers reacted similarly to the risk behaviors of toddlers (Morrongiello & Dawber, 1998), although a study examining adults' reactions to young children in hypothetical situations found women more likely to intervene than men under certain conditions (Fagot et al., 1985b). Similarly, a study of parental beliefs about the benefits to children of experiencing minor injuries reveals that fathers endorsed stronger beliefs than mothers regarding children's learning from injury experiences and 'toughening up' from such experiences (Lewis, DiLillo, & Peterson, 2004). Findings based on school-age children's reports indicate that they believe that fathers are more tolerant of risk-taking behavior than mothers (Morrongiello & Bradley, 1997). Whether this belief derives from differential supervision of children by mothers versus fathers (e.g., children are aware that fathers supervise less closely and this leads them to assume greater tolerance of risk taking by fathers), or sex differences in other aspects of parenting (e.g., communications about safety vs. risk behaviors differs for fathers and mothers), or adults' behavior (e.g., greater modeling of risk taking by fathers than mothers) remains to be determined. Suffice it to say, addressing this question is important for determining if mothers and fathers show different patterns of supervision, if injury risk varies as a function of whether the mother versus father is providing the supervision, and what are the mechanisms responsible for any obtained differences in child-injury rates when children are in the care of their mother vs. father (e.g., Are injury rate differences due to variation in how children behave when supervised by mothers vs. fathers and/or in how mothers vs. fathers supervise their children?).

Related to this point, there is very little known about siblings as supervisors, although this is without doubt a common occurrence in North American families. Younger siblings rate their older siblings as being less able than parents to provide them with adequate supervision (Kurdick & Fine, 1995), and there is some circumstantial evidence to support this premise. For example, in a study examining the circumstances of 32 drownings of toddlers in a bathtub, Rauchswalbe, Brenner, and Smith (1997) found that almost 35% of these occurred when an older sibling was supervising. Such findings raise a number of questions, including what are the conditions under which leaving an older sibling to supervise

a younger one elevates the risk of injury to the younger child, and what are the patterns of supervision by older siblings that are associated with injuries to younger children. Recent research in our laboratory indicates that sibling supervision routinely occurs about 10% of the time that both children are at home with a parent, and that children who are more often looked after by an older sibling have a history of more frequent home injuries (Morrongiello, MacIsaac, & Johnston, in preparation). However, much more research is needed to determine how individual child attributes of both the supervisor and supervisee (e.g., age, sex, temperament) interact with sibling supervision style to influence injury risk for young children being supervised by an older sibling.

Finally, studies examining relations between supervision and child-injury risk will most likely provide the greatest insights when supervision is acknowledged to be only one of several possible means by which parents manage injury risk for young children. Prior research on home injuries among toddlers, for example, indicates that parents utilize supervision, modifications to the home environment, and teaching children rules about safety *in combination* to manage child-injury risk (Morrongiello et al., in 2004a, 2004b), and other findings suggest that the relative use of these different strategies changes as children develop (Garling & Garling, 1995). Moreover, these distinct approaches to managing injury risk show differential effectiveness depending on how they are combined within different risk contexts (see Morrongiello et al., 2004b). Hence, parents may show decreased supervision in contexts in which they have substantially modified the environment to eliminate hazards. The point is that focusing *only* on supervision and trying to relate this to child-injury history may prove unsuccessful to the extent that caregivers have adopted other strategies to decrease injury risk for their child. For these reasons, a comprehensive approach to studying how caregivers manage injury risk for children is likely to provide the greatest advancements in our knowledge regarding relations between caregiver behavior and children's risk of injury.

Along these same lines it is important to consider the interaction between caregiver, child, and environmental factors in predicting child-injury risk. Research with farm families, for example, reveals that supervision is actually associated with increased risk of injury to young children when the supervision occurs while the caregiver is engaged in farm work as opposed to in the home (Pryor, Caruth, & McCoy, 2002). This elevated risk occurs because supervising children while engaged in chores on the farm increases the children's exposure

to hazards and risks (e.g., machinery, poisons), and the child obviously responds in ways to interact with these hazards despite caregiver supervision. Hence, injuries can be *more frequent*, not less frequent, under these supervision conditions for farm contexts. Such findings highlight the importance of considering environmental risk context, as well as how a child typically behaves in this context (i.e., interaction of child and environmental factors), when interpreting data on caregiver supervision and drawing conclusions about determinants of child-injury.

Figure 1 provides a conceptual model that may prove useful in future research on factors that contribute to child-injury risk. The model highlights the dynamic aspects of the caregiver × child × environment system, the point being that these factors interact and *jointly* influence children’s risk of injury in the natural environment. Hence, studying any one factor in isolation of the others may provide relatively limited insight into how risk factors for child injury typically arise in the real world. The model also illustrates that this risk-determining system is embedded within a sociocultural context that can shape, direct, and constrain how the system

functions to influence children’s risk of injury. These contextual-based influences may make some outcomes more likely than others (e.g., those consistent with culture-based norms about safety and/or risk behaviors). To the extent these sociocultural factors vary with economic status and/or ethnicity, the model highlights the importance of conducting research that is sufficiently sensitive to reflect the impact these broader contextual variables can have on children’s injury risk. In summary, as indicated in Figure 1, injury outcomes often follow from complex processes that involve a number of precipitating, interacting factors. The conceptual models motivating research need to be sufficiently comprehensive in order to yield meaningful advancements in our understanding of child-injury risk.

Application of this conceptual model is relevant not only to the research domain but also to the domain of prevention. Scholars who are interested in the prevention of childhood injuries have long debated the relative merits of focusing on modifying the environment versus a person’s behavior in order to reduce injury risk and achieve greater injury control (e.g., Christophersen, 1989; Finney et al., 1993; Robertson, 1997). However,

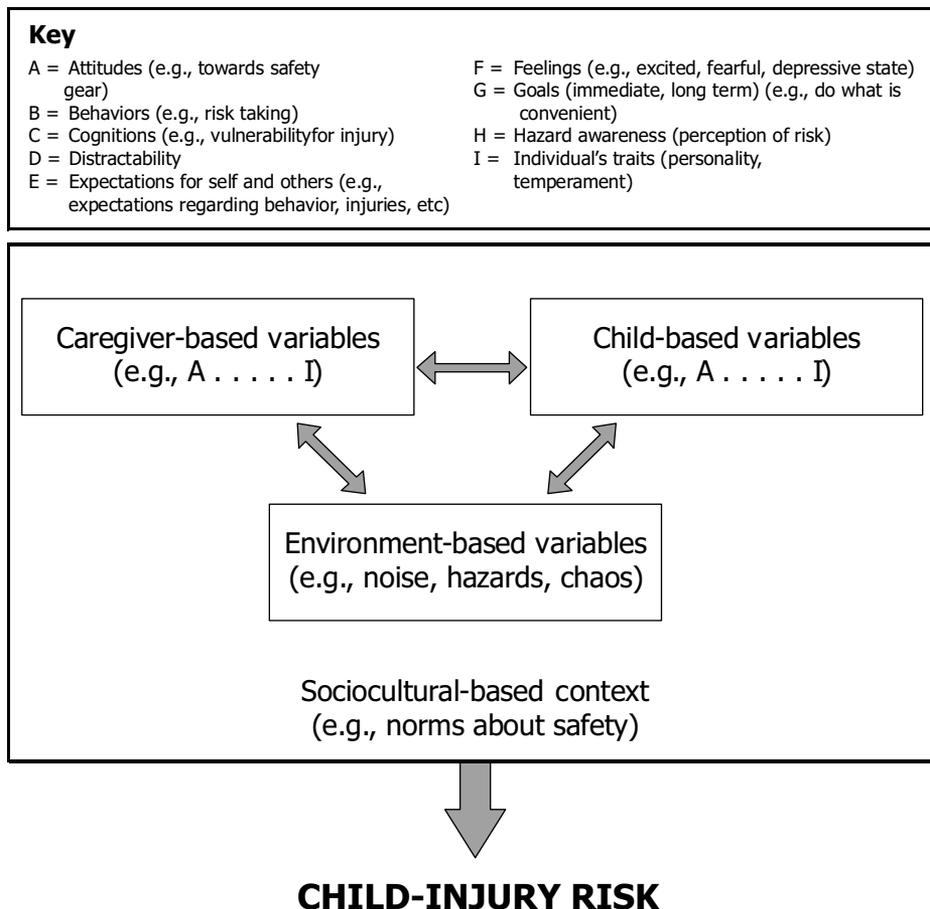


Figure 1. Conceptual model highlighting how interactions between child, caregiver, and environmental factors, which are shaped, directed, and constrained by sociocultural context, jointly influence child-injury risk.

adopting a conceptual approach that focuses on the interaction of person \times environmental determinants of injury risk highlights the relative merits and necessity of both approaches. The fact is that not all environments can be modified to reduce risk, and not all behaviors are easily amenable to modification (e.g., inherent traits may be more intractable). Hence, both approaches to injury control are needed and these should be viewed as complementary and representative of a *comprehensive* approach to prevention. For example, environmental modifications can greatly reduce the risk of serious falls on playgrounds. However, identifying ways to promote closer caregiver supervision and/or reduce fall-risk behaviors by children also can substantially contribute to reduce injury risk, particularly in jurisdictions that cannot afford the environmental modifications to playgrounds that are needed to reduce the risk of serious injury from falls. Those that favor environmental modification as the key approach to injury control must also consider findings demonstrating risk compensation (i.e., increased risk taking in response to environmental modifications that reduce risk). Although there is considerable controversy about risk compensation (Hedlund, 2000; McKenna, 1988; Simonet & Wilde, 1997; Thompson, Thompson, & Rivara, 2001), there are a sufficient number of studies demonstrating this phenomenon that one certainly cannot simply dismiss it from consideration. Moreover, if individuals do increase risk taking in response to environmental modifications intended to reduce injury risk this would not mean that one should dispense with such modifications but that environmental modifications are not sufficient. For example, parents allow children to engage in greater risk taking when wearing safety gear or when environmental modifications reduce risk (Morrongiello & Major, 2002). Thus, to achieve the maximum benefit from environmental strategies there needs to be a complementary focus communicating the importance of close supervision by caregivers even when safety gear is worn by children. Applying the conceptual model outlined in Figure 1 when planning for prevention will promote the development of a multifaceted and comprehensive approach including both environment-oriented *and* person-oriented strategies.

In sum, injuries to children are complex, multi-determined events. Caregiver supervision is one approach to managing injury risk that merits further study, but definitional and methodological issues have historically hampered progress on this important research topic. Recent research reveals distinct patterns of supervision that elevate children's risk of injury, styles of supervision that are measurable and relate to child-injury risk, and

caregiver attributes that can be measured via questionnaires and relate not only to supervisory behaviors but also to children's risk of injury. This recent research also suggests, however, that to achieve a comprehensive and accurate understanding of the dynamic processes that lead to child injury, the conceptual model on which research is based needs to incorporate caregiver, child, *and* environmental factors, with the aim being to assess specifically for interactions among these potential determinants of children's injuries. This *systems approach*, which focuses attention on the interaction of factors that lead to injury, has relevance not only for research but also for prevention. Hence, environment-oriented and person-oriented prevention strategies should be viewed as complementary, with both approaches equally important to ensure a comprehensive approach to the prevention of childhood injuries.

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