

Determinants and Consequences of Children's Coping in the Medical Setting: Conceptualization, Review, and Critique

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The recent burgeoning of theory and research on how children cope with painful medical stressors warrants close scrutiny. The authors examine the prominent typologies of coping and the research on child adjustment and outcomes stimulated by those typologies. They focus on what researchers know and need to know about moderators (characteristics of the child and the environment that influence coping and outcome) and mediators (mechanisms linking stress, coping, and adjustment). It is argued that important advances can be achieved through efforts to (a) conceptualize and study pain and coping within a multidisciplinary framework; (b) clearly distinguish among coping responses, goals, and outcomes; and (c) replace simplistic conceptualizations with transactional and goodness-of-fit models.

The investigation of children's reactions to painful medical procedures has broadened from a narrow focus on inducing compliance to an expanded focus on studying how children cope (e.g., see reviews by Peterson, 1989; Siegel & Smith, 1989). This trend reflects increased recognition of the psychological distress associated with both traumatic (Jay, Elliott, Katz, & Siegel, 1987) and more routine (Nocella & Kaplan, 1982) medical or dental procedures and the risk of transient and long-term disturbances in children as a result of hospitalization and surgery (Melamed & Siegel, 1975; Peterson & Ridley-Johnson, 1980). Additionally, preliminary findings from animal and human research have suggested that exposure to painful stressors may compromise immune system functioning and interfere with normal neural development in children (Barr, Boyce, & Zeltzer, 1994; Fitzgerald & Anand, 1993; Liebeskind, 1991).

Because the field has flourished in recent years, it seems important to consolidate our knowledge and to advance toward more sophisticated approaches to the study of pediatric pain. Toward this end, the overarching objectives of this article are (a) to provide a general conceptualization of coping that delineates what we believe to be the key dimensions of the coping process; (b) to use this conceptualization to organize existing work on children's adaptation in the context of medical stressors; (c) to demonstrate the need for a multidisciplinary perspective on pediatric pain and for a greater integration and standardization of coping research across domains; and (d) to point out some distinctive complexities of coping research and thus highlight challenges for future investigators. Our review includes studies

of stressors related to severe and chronic illness, but we concentrate on pain derived from acute medical stressors and variables proximal to the painful situation, rather than general implications of illness.

Conceptualization of Pain and Coping

Working Definition of Pain

To provide a context for studying how children cope with pain, it is necessary to consider how pain is conceptualized.

Research-Based Conceptualization of Pain

Understanding pain as a stressor requires that pain is recognized as a multifaceted phenomenon, which includes physiological, sensory, affective, behavioral, and cognitive components. Fordyce (1988) distinguished between four basic elements of a pain episode: nociception, pain, suffering, and pain behavior. *Nociception* is the initial physiological signal that alerts the central nervous system to the introduction of an aversive stimulus. *Pain* involves the sensory perception of this signal. *Suffering* is the affective reaction to the painful event, such as feelings of fear or distress. *Pain behavior* includes all actions performed by the individual in response to pain.

Because sensory perception, emotional responses, and behavior all may be influenced by cortico-limbic processes, cognitive interpretations of the stimulus, such as beliefs about threat or danger, may be an integral part of a pain episode. Psychological research efforts thus far have been focused on reactions to pain, including suffering and pain behavior. An important area for future exploration is the interface between physiological input systems (i.e., nociception and pain), affective and behavioral responses (i.e., suffering and pain behavior), and cognitions.

Children's Conceptualization of Pain

The unique aspects of children's understanding of pain must also be considered. Researchers (e.g., Elliott & Jay, 1987; Ross

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& Ross, 1984) pointed out that, until recently, studies on pediatric pain were restricted by the mistaken notion that children have lower sensitivity to pain than do adults. Children's failure to describe their painful experiences was interpreted as a lack of pain perception resulting from immature neural development or as high levels of resilience. These assumptions often led to undermedication and limited treatment of pediatric pain (Gaffney & Dunne, 1986; K. L. Thompson & Varni, 1986). However, direct empirical investigations have shown these myths to be false. A great deal of objective and subjective distress is associated with pain in children (Katz, Kellerman, & Siegel, 1980; Ross & Ross, 1984; Savedra, Tesler, Ward, Wegner, & Gibbons, 1981), and evidence now suggests that children as young as 5 years can provide detailed information about their experience of pain. Children use a variety of pain descriptors and discriminate among the sensory (e.g., quality, duration, and aversiveness), affective (e.g., tension and fear), and evaluative (overall pain intensity) components of pain (McGrath, 1993; Ross & Ross, 1984; Savedra et al., 1981). General surveys of pain knowledge also have suggested that children can accurately recall painful experiences, understand the logical nature of pain causality, and associate pain with particular feelings, such as anger, fear, anxiety, and embarrassment (Ross & Ross, 1984; Savedra et al., 1981).

Detailed assessments of pain comprehension also have revealed some conceptual deficiencies in children's understanding. Ross and Ross (1984) found that the majority of 5- to 12-year-olds offer unidimensional definitions of pain, which emphasize either general discomfort—"pain is when it hurts" (81%)—or specific painful events—"pain is a terrible stomach ache" (12%), whereas few children (2%) mention the process—"it's a signal sent by a nerve"—or function—"it tells you something is wrong someplace"—of pain (p. 183). Likewise, Savedra et al. (1981) observed that 64% of their 9- to 12-year-old sample was unable to identify beneficial aspects of pain, such as its signaling or diagnostic function. Both of these studies suggested that some children are aware, and often take advantage, of secondary gain—the use of pain to derive some form of personal benefit, such as the avoidance of responsibilities (e.g., missing school) or attraction of attention. Using a Piagetian framework to study developmental changes, researchers have found that definitions of pain shift with age from concrete, perceptually bound descriptions to increasingly abstract, generalized descriptions (Gaffney & Dunne, 1986). Youngsters at the formal operational stage showed more advanced understanding of the physiological-biological and psychosocial components of pain relative to their less mature peers (Gaffney, 1993).

A child's views on the value, function, and consequences of pain may have implications for the coping process. For instance, a child who focuses on potential secondary gain may view a painful situation as an opportunity to gain sympathy or a reward, which may undermine attempts to cope in more effective ways and ultimately may lead to a maladaptive outcome; a child who views a medical procedure as an unnecessary discomfort or punishment may catastrophize, whereas a child who understands the diagnostic function of a procedure may try to feel better by focusing on its benefits.

Working Definition of Coping

In reviewing the literature, we found a marked inconsistency in researchers' definitions and means of operationalizing various components of the coping process. This situation can be attributed, in part, to the intricacies of the coping-outcome relationship. Conceptually, coping is viewed as a mediator between a stressor and the outcome of exposure to that stressor (e.g., Folkman & Lazarus, 1988; Peterson, 1989). Empirically, however, coping attempts and outcomes are often interchanged. For example, researchers have noted that unsuccessful coping efforts are sometimes interpreted as failures to cope (Siegel & Smith, 1989), and variables treated as coping attempts in one study may serve as indexes of outcome in another (Peterson, 1989). In fact, isolating coping attempts from their outcomes is indeed a challenging task.

To illustrate the complexity of this issue, imagine two children receiving an injection. When the syringe appears, the first child cries and the second child runs out of the doctor's office. What do these behaviors represent? Crying may be viewed as a coping response designed to relieve the child of tension or to elicit emotional support, or it may be viewed as emotional distress resulting from a lack of, or inefficient, coping. Active avoidance may represent a coping response—albeit an unsuccessful one—designed to reduce the likelihood of receiving an injection, or it may represent a maladaptive behavioral outcome.

Researchers have attempted to address this ambiguity by distinguishing between coping strategies and goals (Weisz & Dennig, 1993; Weisz, McCabe, & Dennig, 1994). We propose a modified working definition of a complete "coping episode" as including the following elements: a coping response, a goal underlying that response, and an outcome. Coping episodes must be discriminated from the sequence of events that may follow exposure to stress in those cases where the individual is not engaged in coping (see Figure 1).

Following Lazarus and Folkman (1984), a *coping response* is defined as an intentional physical or mental action, initiated in response to a perceived stressor, which is directed toward external circumstances or an internal state. Any response that reflects a spontaneous emotional or behavioral reaction to stress, rather than a deliberate attempt to cope, is referred to as a *stress response*. A *coping goal* is defined as the objective or intent of a coping response, which generally entails some form of stress reduction or reduction in some aversive aspect of a stressor.

Conceptualizing the outcome of exposure to stress is complex and may require a distinction between two separate constructs: stress outcomes and coping outcomes. *Stress* outcomes are the immediate consequences resulting from the stress responses that do not involve coping. This direct pathway between stress and outcome is depicted on the left side of Figure 1. For example, a child may automatically begin to kick and scream at the onset of a painful medical procedure (stress response), which may in turn lengthen the duration of the procedure (maladaptive stress outcome).

Coping outcomes are the specific consequences of coping responses; coping outcomes are therefore mediated by volitional, deliberate efforts to cope with stress. The indirect pathway between stress and outcome, as mediated by the coping process, is depicted on the right side of Figure 1. This complete sequence is what we

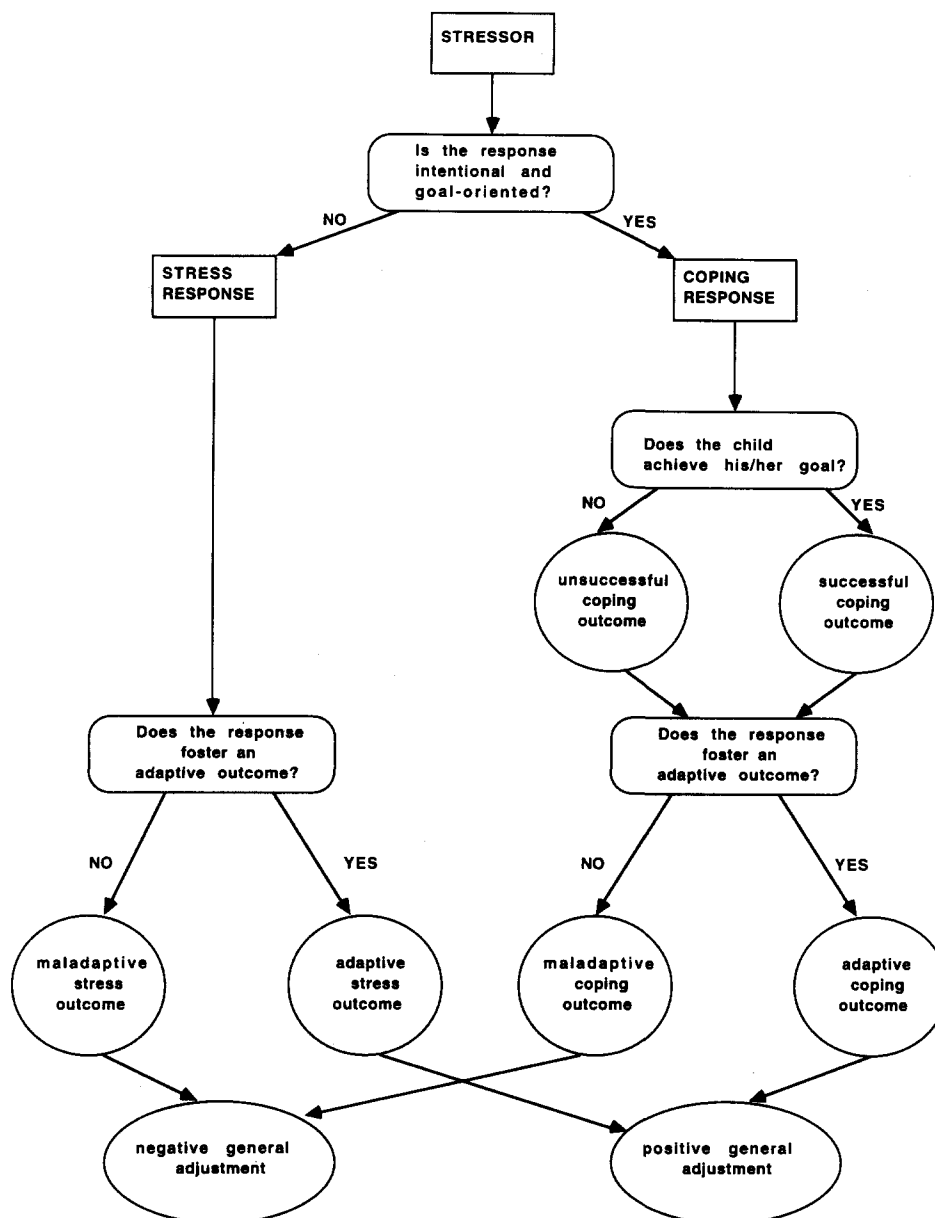


Figure 1. Schematic diagram of the steps between the onset of a stressor and outcomes/adjustment. The left side of the diagram depicts the direct pathway between stress responses and outcomes. The right side of the diagram depicts a "coping episode," including coping responses, coping goals, and coping outcomes. The pathways converge at the level of general adjustment.

refer to as a *coping episode*. For instance, a child may attempt to relax (coping goal) by using deep breathing exercises (coping response). This coping response may allow the child to lie still and facilitate the implementation of the procedure (adaptive coping outcome).

Coping outcomes are linked to a child's coping responses and goals. Thus, the success or failure of a coping outcome is defined in terms of whether an intended goal was attained (see Figure 1). In this respect, the success of coping outcomes is determined from the child's viewpoint. However, the adaptiveness of both stress out-

comes and coping outcomes inevitably must be construed from a multidimensional perspective, which also takes into account the viewpoints of other participants (e.g., parents and medical staff) and objective information (e.g., behavioral observations and physiological measures). For instance, parents may focus on minimizing observed distress in their child, whereas health care providers may focus on maximizing the child's compliance. These perspectives may lead to different assessments of adaptiveness; thus, multiple sources of information must be used when gauging the adaptiveness of outcomes.

A final distinction must be made between stress and coping outcomes that occur in the context of stressful situations (e.g., duration of procedures and degree of anxiety experienced by children during procedures) and children's more general and long-term adjustment, including psychological functioning (e.g., acting-out behavior and depression) and physiological development (e.g., immunological and central nervous system processes; see sections on *Secondary Appraisal* and *Remaining Issues*). Although Figure 1 links maladaptive stress and coping outcomes with negative general adjustment and adaptive stress and coping outcomes with positive general adjustment, data are not yet available to determine whether adaptive short-term outcomes do in fact predict more favorable long-term, general adjustment. It will therefore be important for future researchers to measure both of these constructs and to investigate relations between them.

This conceptualization may clarify somewhat ambiguous theoretical constructs, yet it poses an additional challenge to researchers who wish to apply it to the development of empirical methodologies. Most important, these distinctions are dependent on our ability to assess the presence and nature of coping goals. Although studies that include an assessment of coping goals could help to address this issue, confounds may still arise. In particular, because children often are unable to describe their intent or perhaps are unaware of their underlying goals, intentional coping efforts may be misconstrued as spontaneous responses to stress. This confound must be kept in mind when constructing assessment methods and when interpreting results.

In the following section, we outline various classification schemes proposed by coping researchers. Several of these schemes move toward a conceptualization of coping similar to what was previously presented, in that they concentrate on such dimensions as the focus, function, and locus of operation (e.g., internally vs. externally directed) of coping responses. However, existing coping models do not always clearly discriminate among various components of the coping process—coping versus stress responses, coping goals, and coping versus stress outcomes. Definitions and examples of coping-related terms from this article are presented in Table 1.

Typologies of Coping

Descriptive accounts of children's self-reported, spontaneous coping within the context of either imagined painful medical stressors or recall of pain-related events have provided inconsistent data concerning the frequency of coping efforts. Some investigators have suggested that only a small proportion of children use self-initiated coping strategies when confronted with pain (Ross & Ross, 1984) and that up to 63% may predominantly resort to catastrophization, defined as exaggerating the perceived negative qualities of the painful situation (Brown, O'Keeffe, Sanders, & Baker, 1986). In contrast, others have found that many children are able to identify techniques for coping with pain (Band & Weisz, 1988; Curry & Russ, 1985; Tesler, Wegner, Savedra, Gibbons, & Ward, 1981). Beyond the question of how frequently children cope with pain, researchers have begun to investigate how children cope. This task has been

accomplished by applying different models of stress and coping to the area of pain management.

Behavioral Versus Cognitive Coping

Investigators categorizing coping attempts in terms of their locus of operation have emphasized coping responses rather than goals. These studies involve the integration of observational measures, which focus on external modes of coping (i.e., overt, observable actions) and self-report measures, which focus on internal modes of coping (i.e., subjective thoughts, self-talk, and imagery). In 8- to 10-year-olds undergoing routine dental treatment, Curry and Russ (1985) used observations and interviews to distinguish between behavioral strategies (e.g., information seeking, support seeking, and direct efforts to maintain control) and cognitive strategies (e.g., positive cognitive restructuring or attention to positive features of the treatment, and diversionary thinking or attempts to divert one's thoughts away from the stressor). In a study of child and adolescent oncology patients, Worchel, Copeland, and Barker (1987) used factor analysis to demonstrate a reliable distinction between behavioral strategies (e.g., holding parent's hand or deep breathing) and cognitive strategies (e.g., thinking or talking about one's illness and treatment) used to cope with illness-related stressors, including painful procedures. Siegel (1983) also used a multidimensional assessment approach to discriminate between behavioral and cognitive coping in 8- to 14-year-olds undergoing medical procedures during hospitalization for surgery.

Problem-Focused Versus Emotion-Focused Coping

Through their ways-of-coping model, Folkman and Lazarus (1988) distinguished between problem-focused coping, which is directed at eliminating or altering a distressing situation (e.g., confrontive and planful problem solving) and emotion-focused coping, which is directed at regulating the emotional consequences of an event (e.g., distancing, seeking social support, and positive reappraisal). In terms of painful medical stressors, a function of problem-focused coping would be to decrease or eliminate such external demands as the painful stimulus itself or to change the environment in which the stimulus is embedded. A function of emotion-focused coping would be to deal with internal demands, including the perception of pain and the feelings generated by the painful situation (Siegel & Smith, 1989).

Primary Versus Secondary Coping

Drawing on research in the field of perceived control, Rothbaum, Weisz, and colleagues (e.g., Rothbaum, Weisz, & Snyder, 1982; Weisz, Rothbaum, & Blackburn, 1984a, 1984b) have proposed a primary-secondary model of control, which was later applied to the study of coping (Band & Weisz, 1988, 1990; Weisz et al., 1994). The model distinguishes between *primary* control, defined as coping designed to influence objective events or conditions; *secondary* control, defined as coping aimed at maximizing one's fit to current conditions; and *relinquished* control, defined as the absence of any coping at-

Table 1
Definitions and Examples of Key Coping and Coping-Related Constructs

Term	Definition	Example
Behavioral vs. cognitive coping	Behavioral = external modes of coping (e.g., observable actions)	Information seeking; support seeking
Problem- vs. emotion-focused coping	Cognitive = internal modes of coping (e.g., subjective thoughts)	Positive cognitive restructuring
Primary vs. secondary control coping	Problem focused = efforts to eliminate or alter a distressing situation	Confrontive and planful problem solving
Approach vs. avoidance	Emotion focused = efforts to regulate emotional consequences of stress	Distancing; seeking social support
Information seeking vs. information avoiding	Primary control = efforts to influence objective events or conditions	Problem solving; active support seeking
Attention vs. distraction coping	Secondary control = efforts to maximize one's fit to current conditions	Cognitive distraction; self-talk
Active vs. passive coping	Approach = active efforts to confront a stressful event	Information seeking; active involvement
Sensitization vs. repression	Avoidance = attempts to avoid a stressful event	Escape behaviors; turning away
High monitoring vs. low monitoring	Information seeking = efforts to acquire information about stressor	Asking questions; observing procedure
High blunting vs. low blunting	Information avoiding = efforts to avoid information about stressor	Absence of information-seeking behaviors
Primary appraisal	Attention = focusing attention on aspects of the stressful stimulus	Seeking information; examining equipment
	Distraction = diverting attention away from stressful stimulus	Cognitive distraction; distracting activities
	Active = willingness to encounter information	Asking questions; observing preparation
	Passive = tendency to avoid or deny stress	Looking away during preparation
	Sensitization = approaching threatening stimuli; not repressing affect	Approaching preparatory information
	Repression = avoiding threatening stimuli; repressing negative affect	Avoiding preparatory information
	High monitoring = scanning for threat-relevant information	Seeking information about a stressful event
	Low monitoring = ignoring threat-relevant information	Avoiding information about a stressful event
	High blunting = efforts to cognitively distract from threat-relevant cues	Engaging in distracting activities
	Low blunting = lack of efforts to cognitively distract from threat-relevant cues	Not engaging in distracting activities
	Evaluation of the potential meaning or implications of a stressor (e.g., harm/loss, threat, and challenge)	Harm/loss = perception of injury or damage
		Threat = concern about future harm/loss
Secondary appraisal	Judgment about the extent to which one can influence the outcome of a stressful event (e.g., self-efficacy and perceived control)	Challenge = opportunity for growth, mastery
		Self-efficacy = generalized beliefs about one's ability to achieve desired outcomes
		Perceived control = possibilities for control within a specific stressful encounter
		Perceived contingency = perceptions of the degree to which particular outcomes are dependent on people's behavior
		Perceived competence = perception of one's own ability to manifest necessary behaviors

tempt (Rothbaum et al., 1982; Weisz, 1990). Because of its joint emphasis on the actual coping response and the target or intent of the response (i.e., changing objective conditions vs. changing one's internal state), the primary-secondary model has the clearest association with our conceptualization of coping, which incorporates both coping responses and goals. Empirically, this is the only model that has been used to assess coping responses and goals as distinct constructs. For example, a child undergoing a medical procedure may describe a primary control coping response ("try not to kick and move") and a primary control goal ("so they can get it done faster"), a secondary control coping response ("try not to think about it or just forget it") and a secondary control goal ("so you can keep the worries away"), a primary control coping response ("hold my mother's hand") and a secondary control goal ("so I know that she's with me"), or a secondary control coping response ("think about getting a toy") and a primary control goal ("so that I don't feel the needle going in").

Approach Versus Avoidance

One of the most popular conceptual paradigms organizes coping styles along a dimension that has alternatively been referred to as approach versus avoidance (Hubert, Jay, Saltoun, & Hayes, 1988; Roth & Cohen, 1986), information seeking versus information avoiding (Peterson & Toler, 1986), rumination or attention versus distraction (Compas & Grant, 1993; Fanurik, Zeltzer, Roberts, & Blount, 1993), and active versus passive (Peterson, 1989). These constructs resemble distinctions made in the adult literature between repression and sensitization (Byrne, 1964), high and low monitoring (Miller, Brody, & Summerton, 1988), and high and low blunting (Miller, 1987).

Various forms of assessment have been used to operationalize this dimension. Adopting a behavioral approach, Hubert et al. (1988) developed the Behavior Approach-Avoidance and Distress Scale to examine overt manifestations of approach and avoidance during preparation for a bone marrow aspiration (BMA) and hospitalization of child leukemia patients. High approach behavior included looking, touching, questioning, or initiating involvement, whereas high avoidance included turning away or trying to escape or change the situation. Burstein and Meichenbaum (1979) used a less-direct behavioral approach with 5- to 9-year-old patients 1 week prior to hospitalization for surgery. Children were classified as *low* defensive if they played actively with medically related toys and *high* defensive if they avoided playing with medically related toys.

Other investigators have construed the approach-avoidance dimension as traitlike. For instance, Peterson and Toler (1986) distinguished between information-seeking and -avoiding dispositions using the Coping Strategies Interview and the Coping Behaviors Scale. For the Coping Strategies Interview, a generalized information-seeking disposition was reflected by child reports of such tendencies as asking questions and observing medical procedures, having a prearranged plan for dealing with medical stressors, and expressing appropriate concerns. For the Coping Behaviors Scale, an information-seeking disposition was represented by parent reports of children's tendencies to

engage in verbal discussion and questioning about medical procedures (for both measures, an information-avoiding disposition was reflected in an absence of the described behaviors).

Finally, Melamed and colleagues have used physiological indexes of approach-avoidance. Measuring children's palmar sweat and cardiac deceleration prior and during preparation for surgery (Melamed, 1982) and for dental treatment (Melamed, Yurcheson, Fleece, Hutcherson, & Hawes, 1978), the authors posited that physiological arousal can be viewed as an indicator of children's active reception of preparatory information, thus a reflection of an approaching coping style.

Coping Efficacy

Researchers know only a modest amount about the efficacy of children's attempts to cope with painful medical procedures and even less about the relative efficacy of particular coping approaches. We summarize the current state of the field, but the reader should keep several issues in mind when interpreting the findings and trying to generalize across studies. First, as described, results are often confounded by inconsistencies in the distinction between coping responses and outcomes. Second, outcomes have been defined in diverse ways, ranging from immediate, specific responses during ongoing medical stressors to long-term, global indexes of functioning. Third, conceptualizations and methods of assessing outcome have varied considerably, including subjective reports of pain and distress, objective indexes of behavior, informant ratings of adjustment, and even measures of cooperation or compliance with medical staff.

Table 2 displays results from studies of child outcomes/adjustment as a function of modes of coping. The table summarizes the types of stressors studied (column 2), the model of coping and source of information about coping (column 3), and the method of assessing outcome and source of information about outcome (column 4). The final column notes the association between particular coping modes and outcomes/adjustment. We refer to these studies throughout the next section.

Variety of Coping Responses as a Predictor of Outcome

Siegel (1983) observed that successful copers, as measured by behavioral observations of increased cooperativeness, decreased anxiety, and higher thresholds for physical discomfort during medical procedures, reported using a greater variety of strategies than did unsuccessful copers. In contrast, Worchel et al. (1987) found that the presence of fewer, well used strategies may be more effective (as judged by nurse ratings and self-reports of adjustment) than a large array of different strategies.

Few other studies have included analyses of children's coping repertoires or their access to a variety of responses. Because these two studies involved different populations and different means of assessing outcome, the competing findings may reflect methodological disparity. However, more complex explanations also are important to consider. On the one hand, the availability and use of multiple coping responses may reflect increased flexibility in reaction to failure ("if this strategy does not work, then I will try that one") or the ability to match coping responses to

Table 2
Coping Modes as Predictors of Outcomes in the Medical Setting

Study	Type of stressor	Model of coping/source	Dependent variable/source (measure)	Age (N)	Results: Coping mode → outcome
Band & Weisz (1990)	Illness related (including injections)	Primary-secondary/self	Social and behavioral adaptation/parent (SBAS)	11.7 (64)	• Primary control coping → better adjustment
Brown et al. (1986)	Hypothetical (including dental)	Cognitive-behavioral/self	Trait anxiety/self (STAI-C)	8-18 (487)	• Cognitive coping → less trait anxiety
Burstein & Meichenbaum (1979)	Surgery	High-low defensive/observer	Anxiety/self (Gilmore Anxiety Scale)	4-8 (20)	• Medical play → less anxiety
Hubert et al. (1988)	BMA's	Approach-avoidance/observer	Distress/observer (OSBD) Distress/nurse (1-5 scale) Fear and pain/self (1-5 scale) Physiological activation/heart rate	3-11 (43)	• Posthospitalization • Approach coping → less distress • Approach coping → less distress • NS • NS
Katz et al. (1980)	BMA's	Question asking/observer	Distress/observer (PBRs)	1-17 (115)	• Question asking → less distress
Melamed (1982)	Surgery	Physiological activation/ Palmar sweat	Anxiety/nurse (1-5 scale) Medical fears/self	6-15 (15)	• Question asking → less anxiety • Physiological activation → fewer medical fears
Peterson & Toler (1986)	Surgery	Information seeking/self	Distress/observer (PBRs) Distress/parent (CBRS) Post-op distress/parent (DDDS)	5-10 (59)	• NS • Information seeking → less distress • Information seeking → less distress
Siegel (1983)	Surgery	Successful-unsuccessful/self	Anxiety and cooperation/medical staff	8-14 (80)	• Information seeking → less distress • Asked more questions about hospital and more accurate information → less anxiety and more cooperation
Weisz et al. (1994)	Cancer related	Primary-secondary/self	Distress/observer (OSBD) Distress/self (SRD) Adjustment/parent (CBCL)	5-12 (33)	• Secondary coping → less distress • Secondary coping → less distress • Secondary coping → better adjustment
Worchel et al. (1987)	Cancer related	Control strategies/self	Adjustment/nurse (CBCL) Depression/self (CDI) Adjustment/parent (CBCL)	6-17 (52)	• Behavioral control → poorer adjustment and more depression • Cognitive control → higher passivity and noncompliance • Decisional control → better adjustment

Note. BMA = bone marrow aspiration; SBAS = Sociobehavioral Scale (Band & Weisz, 1990); STAI-C = State-Trait Anxiety Scale for Children (Spielberger et al., 1973); PBRs = Procedure Behavior Rating Scale (Katz et al., 1980); DDS = Degree of Distress Scale (Peterson & Toler, 1986); CBRS = Child Behavior Rating Scale (Peterson & Shigetomi, 1981); CBCL = Child Behavior Checklist (Achenbach & Edelbrock, 1983); CDI = Children's Depression Inventory (Kovacs, 1983); OSBD = Observation Scale of Behavioral Distress (Jay & Elliott, 1984); SRD = Self-Reported Distress (Weisz et al., 1994); NS = nonsignificant.

the demands of the situation ("if this strategy is not appropriate in this situation, then I will try that one"). On the other hand, Worchel et al. (1987) suggested that the use of a

number of different, sometimes contradictory, actions . . . may indicate that individuals are unsuccessfully searching to find a workable solution. Therefore, engaging in many different behaviors does not seem to connote flexibility in adapting to a situation; rather, it appears to suggest ineffectiveness in coping. (pp. 35-36)

Teasing apart these alternatives requires additional studies that consider the quality of the different coping responses available, the process by which decisions are made regarding when to use which responses, and the *temporal ordering* (Folkman & Lazarus, 1988, p. 315) of coping efforts (e.g., the use of particular responses during particular stages of the stressor). We discuss these issues in more detail later in the sections on interactional or goodness-of-fit approaches and on ways to expand conceptual models of coping.

Type of Coping Responses as a Predictor of Outcome

To examine the efficacy of certain types of coping responses, we divide the outcome studies according to the typologies of coping.

Behavioral versus cognitive coping. Evidence as to the relative effectiveness of behavioral versus cognitive coping is scarce. Worchel et al. (1987) found that behavioral coping was most consistently related to emotional and behavioral adjustment, with increased use of different behavioral control strategies predicting poorer adaptation (i.e., lower nurse ratings of overall adjustment, higher self-reported depressive symptoms, and more somatic complaints). Increased use of cognitive control strategies predicted higher nurse ratings of passivity and noncompliance. Studying 8- to 18-year-olds, Brown et al. (1986) found an inverse relation between trait anxiety and the availability of cognitive strategies—positive self-talk, attention diversion, relaxation, and thought stopping—in response to three imagined stressors, one of which was a visit to the dentist. No comparisons were reported regarding relations between specific strategies and anxiety.

Problem-focused versus emotion-focused coping. Presently, there is no efficacy data using the ways-of-coping model in children undergoing painful medical procedures. In light of the pervasiveness of this model in the coping literature, such studies would be of value.

Primary versus secondary coping. Our database on the relative efficacy of primary versus secondary control coping in the context of acute medical stressors is likewise limited. Weisz and colleagues have provided information on stressors associated with chronic illness, some of which involve acute painful procedures. Band and Weisz (1990) examined strategies used by diabetic youngsters to cope with specific illness-related stressors and broader illness-related concerns. The authors reported that greater reliance on primary control coping (e.g., "taking insulin to control my sugar") was significantly correlated with higher parent ratings of social and behavioral adaptation to diabetes (although this finding was qualified by level of cognitive maturity—see the section on moderators). Because coping scores

had represented averages across acute (e.g., insulin injections) and chronic (e.g., diet and glucose monitoring) medical stressors, conclusions could not be drawn specifically about coping with painful procedures.

Weisz et al. (1994) found a contrasting pattern in a group of child leukemia patients. Although some analyses involved averaging across responses to treatment-related concerns (e.g., nausea and hair loss) and acute medical procedures (e.g., BMAs), other analyses were conducted separately by stressor. Results showed that child reports of increased secondary coping (e.g., "trying to think on the good side") were consistently related to more favorable adjustment, as reflected in parent ratings of overall behavioral and emotional problems and self-reported distress in response to BMAs and lumbar punctures (LPs).

Thus, the Band and Weisz (1990) and Weisz et al. (1994) studies provided contradictory results as to the efficacy of primary versus secondary control coping. We explore possible reasons for this discrepancy in the sections on the impact of stressor controllability and stressor-coping match on coping efficacy.

Approach versus avoidance. Several researchers have assessed the predictive value of the approach-avoidance distinction. Although studies have been based on a broad range of empirical methods, results have been fairly consistent: Children who actively seek information about impending painful events manifest improved adjustment and diminished distress.

Hubert et al. (1988) found that children's avoidant behavior and behavioral signs of distress in reaction to information about upcoming BMAs predicted greater distress during the actual procedure and higher nurse ratings of distress during the first 2 days of hospitalization. Avoidance and behavioral distress during preparation did not, however, correlate with children's self-rated fear prior to the aspiration, pain during the procedure, or changes in heart rate. Burstein and Meichenbaum (1979) discovered that children who were characterized as low defensive on the basis of their tendency to play with medically related toys prior to hospitalization reported less anxiety following surgery. General information-seeking dispositions (Peterson & Toler, 1986), specific question asking (Katz et al., 1980; Siegel, 1983), and accuracy of information about hospitalization (Siegel, 1983) also have been found to be inversely related to behavioral distress in children undergoing stressful medical procedures (Peterson & Toler, 1986, found significant results for parent, but not observer, ratings of distress). Finally, Melamed (1982) found that enhanced physiological activation during a preparatory session, which was assumed to reflect greater reception of the information, was associated with higher retention of information and lower self-reported medical fears.

Overall, these studies suggest that the approach-avoidance distinction may be of some use in predicting outcome. However, the approach-avoidance tendency has been measured almost exclusively during preparation or as a global disposition. Only a handful of studies have provided preliminary cross-validation data. Peterson and Toler (1986) demonstrated that information-seeking versus -avoiding tendencies (see prior discussion) were significantly related to parent reports of their children's typical coping mode within medical situations and to parent

and observer reports of children's actual coping during medical procedures. Peterson, Harbeck, Chaney, Farmer, and Thomas (1990) also found that children's endorsement of information-seeking strategies was positively associated with reported coping techniques during a hypothetical blood test. Finally, Field, Alpert, Vega-Lahr, Goldstein, and Perry (1988) found that children classified by their mothers as sensitizers more often observed medical procedures and sought information about the procedures than did repressors. Such efforts to link the approach-avoidance dimension with the implementation of specific coping responses during procedures warrant further attention.

Parameters of Coping and Outcomes/Adjustment: Moderators and Mediators

Investigators have studied a multitude of intervening variables thought to be involved in the coping process. Creating sophisticated models of coping requires theorists to develop and test conceptual frameworks that incorporate and organize these diverse strands of research. Our own organizational efforts build on the moderator-mediator distinction (Baron & Kenny, 1986). Baron and Kenny defined a moderator as "a variable that affects the direction and/or strength of the relation between an independent or predictor and a dependent or criterion variable" (p. 1174). With regard to coping research, moderators may be conceptualized as preexisting variables that influence coping and outcome but that they are not themselves likely to be influenced by the nature of the stressor or the coping responses. In particular, moderators may reflect characteristics of the child (e.g., gender and developmental level), the stressor (e.g., type of stressor and controllability), or the context in which the stressor is embedded.

Baron and Kenny (1986) defined a mediator as "the generative mechanism through which the focal independent variable is able to influence the dependent variable of interest" (p. 1173). In the context of coping, mediators may be viewed as variables that underlie links among stressors, coping responses, coping goals, and outcomes (e.g., cognitive appraisal and attentional deployment). Mediators are distinct from moderators because they are activated during the coping episode and presumably can be influenced by the stressor and ensuing coping responses. Figure 2 displays the complex relations among stress, coping, moderators, mediators, and outcomes/adjustment.

Two basic approaches have been applied to studying the underpinnings of coping and its efficacy: Some investigators have focused on person-specific moderators; others have emphasized situational moderators. We focus on these two classes of moderators in separate sections. Person- and situation-specific variables may influence several aspects of the coping process, including coping goals, generation of particular coping responses, and efficacy of coping responses (see the path between circles 1 and 3 in Figure 2), as well as coping and stress outcomes (see the path between circles 1 and 5).

Moderator 1: Person-Specific Variables

Research on person-specific moderators has presupposed the presence of stable, traitlike coping styles. This research has stim-

ulated attempts to identify characteristics or experiences of the child that influence coping and adjustment. Studies examining person-specific moderators are presented in Table 3, organized around the three moderators studied thus far—age or developmental level, gender, and prior experience. The table summarizes the types of stressors studied (column 2), the type and source of the dependent variables—either outcome or coping mode (column 3)—and the relation between the moderator studied and the dependent variable (column 5). The top of each section of the table lists studies of age, gender, or prior experience as moderators of outcomes/adjustment; the bottom of each section lists studies of these variables as moderators of coping.

Demographic Characteristics of the Child

Developmental level. Evidence attests to the impact of age on adjustment to painful medical stressors. Some researchers noted that advancing age seems to be associated with less behavioral distress in reaction to medical procedures (Hubert et al., 1988; Jacobsen et al., 1990; Jay et al., 1987; Katz et al., 1980; Peterson & Toler, 1986), but others have countered these findings (LeBaron & Zeltzer, 1984; Weisz et al., 1994). These discrepant results may in part result from the different age ranges used in these studies. However, other variables must be considered when evaluating developmental differences in distress. First, reductions in overt signs of distress were not necessarily paralleled by a decreased self-report of anxiety or pain (Hilgard & LeBaron, 1982; LeBaron & Zeltzer, 1984). Second, age effects in certain studies may have resulted from biases in the operationalization of distress, in that older children manifest qualitatively different types of distress behaviors that are not always included in observational measures (LeBaron & Zeltzer, 1984). For example, younger children may be more likely to manifest anxiety through vocal protest and skeletal activity, whereas older children exhibit greater muscular rigidity and verbal expression of pain (Katz et al., 1980). Thus, when LeBaron and Zeltzer used an observational measure that was similar to other studies but included more subtle signs of distress (flinching and groaning), no significant age differences were found.

As to coping with medical stressors, findings indicate that older children are more likely to invoke some type of coping strategy and to use more cognitively based or secondary control strategies in particular (Altshuler & Ruble, 1989; Band, 1990; Band & Weisz, 1988; Brown et al., 1986; Worchel et al., 1987). Increased age has also been found to be related to higher levels of information seeking (Peterson & Toler, 1986), although Hubert et al. (1988) found no age differences in approach and avoidance behavior. One study suggested that older children may engage in higher levels of direct problem solving and lower levels of problem-focused avoidance in relatively controllable medical situations faced by children with diabetes (Band & Weisz, 1988). However, in the context of less controllable illness-related stressors, Bull and Drotar (1991) found that adolescents reported more emotion-focused coping and fewer problem-solving strategies than did school-age children. Likewise, Altshuler and Ruble (1989) reported that the tendency to engage in cognitive distraction during uncontrollable medical

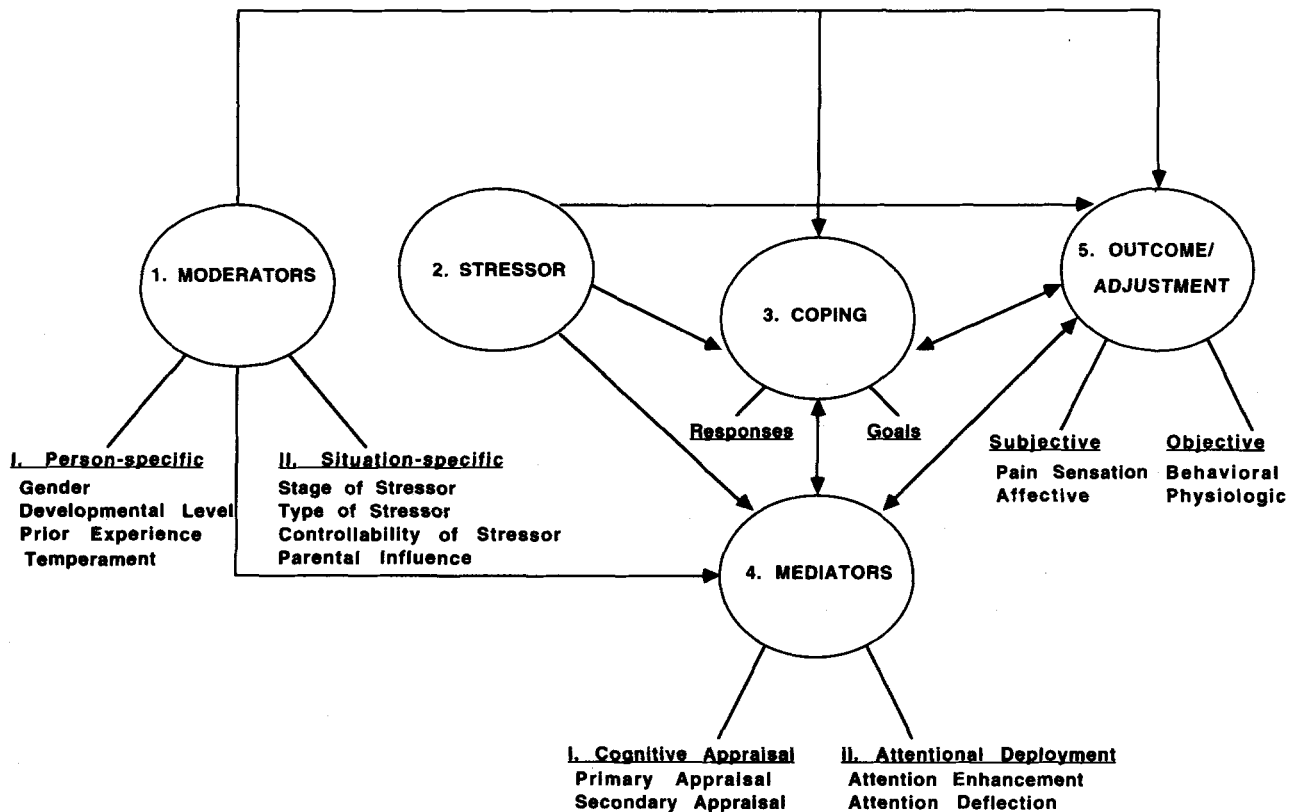


Figure 2. Conceptual model of the relations among stress, coping, moderators, mediators, and outcomes/adjustment. The numbers in the circles are used as reference points in the text and are not meant to reflect a temporal sequence.

procedures increased with age, whereas escape strategies decreased.

With regard to efficacy, Band and Weisz (1988) found that younger children may be less effective in their ability to reduce stress through secondary control strategies (this study involved hypothetical ratings of efficacy and a variety of stressors, only one of which was medical). In a later study, the authors explored coping and adjustment in diabetic children classified according to Piagetian cognitive-developmental level (Band & Weisz, 1990). Differential predictors of outcome emerged in two groups of children. The primary-secondary coping style predicted adjustment to illness in a formal operational group but not in a preformal group.

On the basis of these results, researchers have hypothesized that cognitive or secondary control coping may reflect enhanced awareness of the futility of behavioral or primary control strategies within uncontrollable medical situations or may reflect increased access to more intrapsychic mechanisms of control (e.g., Weisz, 1990). Because older children may be more adept at implementing cognitive coping, they may in turn show less negative responses to medical stressors. Even if younger children were capable of generating cognitive strategies, they may be more likely to regress to primitive coping modes (e.g., relying on external support) in reaction to anxiety and may be less able to ignore salient cues in the environment (Altshuler & Ruble, 1989).

Overall, studies of age differences in adjustment and coping are fairly consistent: (a) Older children may show fewer overt signs of behavioral distress, but when self-reports or more subtle observational measures are used, differences in distress may diminish; and (b) older children generally are more likely to use cognitively based coping responses and are more effective at implementing such responses, but this tendency may depend on the type of stressor being confronted.

Gender. A similar distinction between self-reported pain and anxiety versus distress behaviors must be made when considering gender differences in adjustment associated with painful medical procedures. Using self-report measures, several investigators have found that females endorse more pain and anxiety (Hilgard & LeBaron, 1982; Melamed & Siegel, 1975; Weisz et al., 1994). Mixed findings arose when observed distress is the criterion, with some studies revealing greater expressions of distress in females (Hilgard & LeBaron, 1982; Katz et al., 1980) and others reporting no gender differences (Hubert et al., 1988; Jacobsen et al., 1990; Weisz et al., 1994). As with age differences, these inconsistencies may in part result from the qualitative expression of distress differing by gender, with girls more likely to cry, cling, and seek emotional support and boys more likely to engage in uncooperative behavior, such as stalling (Katz et al., 1980). Moreover, gender may interact with age in determining distress behaviors. Specifically, broader age ranges

Table 3
Findings on Person-Specific Moderators of Coping and Outcomes/Adjustment in the Medical Setting

Study	Type of stressor	Dependent variable/source (measure)	Age (N)	Results
Moderator 1: Age/Developmental Level				
Carpenter (1992)	BMAs	Fear/self (CGRS) Fear/parent (0-5 scale) Distress/observer (checklist)	4-7 (72) 8-18 (37)	- Increased age → less anticipatory fear - NS - NS
Hilgard & LeBaron (1982)	BMAs	Pain/self (0-10 scale) Pain/observer (0-10 scale)	6-19 (63)	Self-reported pain = observed pain in younger; self-reported pain > observed in older
Hubert et al. (1988)	BMAs	Distress/observer (OSBD)	3-11 (43)	Increased age → less distress
Jacobsen et al. (1990)	Venipunctures	Distress/observer (modified PBRs)	3-10 (70)	Increased age → less distress
Jay et al. (1983)	BMAs	Distress/observer (OSBD)	2-20 (42)	Increased age → less distress
Katz et al. (1980)	BMAs	Distress/observer (PBRs)	1-17 (115)	Increased age → less distress
LeBaron & Zelter (1984)	BMAs	Distress/observer (PBCL)	6-18 (50)	NS (when "flinching" and "groaning" are included)
Peterson & Toler (1986)	Surgery	Distress/observer (PBRs)	5-10 (59)	Increased age → less distress and fear
Weisz et al. (1994)	BMAs/LPs	Fear/observer (CBRS) Distress/observer (OSBD)	5-12 (33)	- NS - NS - NS
Altshuler & Ruble (1989)	Injection	Anxiety/self (SRD) Adjustment/parent (CBCL) Cognitive-behavioral/self	5-6 (24) 7-8 (24) 10-11 (24)	Increased age → more cognitive distraction and less escape
Band (1990)	Diabetes related	Primary-secondary/self	8.8 (32) 14.6 (32)	Increased age → more secondary coping
Band & Weisz (1988)	Injection	Primary-secondary/self Problem-emotion focused	6.6 (32) 9.4 (25) 12.0 (24)	- Increased age → more secondary coping - Increased age → more direct problem solving and less problem-focused avoidance
Band & Weisz (1990)	Diabetes monitoring	Primary-secondary/self	8.8 (32) 14.6 (32)	Increased age → more secondary coping
Brown et al. (1986)	Dental procedures	Cognitive-behavioral/self	8-18 (487)	Increased age → more cognitive coping
Bull & Drotar (1991)	Cancer related	Problem-emotion focused/self	7-17 (39)	Increased age → more emotion management
Curry & Russ (1985)	Dental procedures	Cognitive-behavioral/self and observer	8-10 (18)	- Increased age → more cognitive coping - Increased age → more coping strategies
Hubert et al. (1988)	BMAs/LPs	Approach-avoidance/observer	3-11 (43)	NS
Peterson & Toler (1986)	Surgery	Information seeking/self	5-11 (59)	Increased age → more information seeking
Worchel et al. (1987)	Painful medical procedures	Control strategies/self	6-17 (52)	Increased age → more decisional and cognitive control
Moderator 2: Gender				
Band & Weisz (1988)	Injection	Efficacy/observer	8.8 (32) 14.6 (32)	Older female → greater coping efficacy

(table continues)

Table 3 (continued)

Study	Type of stressor	Dependent variable/source (measure)	Age (N)	Results
Hilgard & LeBaron (1982)	BMA's	Pain and anxiety/observer (0-10 scale)	6-19 (63)	• Female → greater pain and anxiety
Hubert et al. (1988)	BMA's	Pain/self (0-10 scale)		• Female → greater pain
Jacobsen et al. (1990)	BMAs	Distress/observer (OSBD)	3-11 (43)	• NS
Katz et al. (1980)	Venipunctures	Distress/observer (modified PBRS)	3-10 (70)	• NS
LeBaron & Zeltzer (1984)	BMAs	Distress/observer (PBRS)	1-17 (115)	• Female → greater distress
Melamed & Siegel (1975)	Surgery	Distress/observer (PBCL)	6-18 (50)	• NS
		Anxiety/self (CMAS)	4-12 (60)	• Young female → more anxiety posthospitalization than older female
				• Female → more anxiety posthospitalization
				• Older male → more arousal than younger
				• Younger female → more arousal than older
				• Female → greater distress
				• NS
				• Female → focus on negative affect
Weisz et al. (1994)	BMAs/LPs	Arousal/Palmar sweat		
Brown et al. (1986)	Hypothetical (including dental)	Distress/self (SRD)	5-12 (33)	• Female → more emotion management
		Distress/observer (OSBD)		• Male → more problem solving
		Cognitive/self	8-18 (487)	• NS
Bull & Drotar (1991)	Cancer related	Problem-emotion focused/self	7-17 (39)	• Female → more coping strategies
Weisz et al. (1994)	BMAs/LPs	Primary-secondary/self	5-12 (33)	
Brown et al. (1986)	Hypothetical (including dental)	Coping-catastrophizing/self	8-18 (487)	• NS
Tesler et al. (1981)	Medical procedures	Coping-noncoping/self	9-12 (214)	
		Moderator 3: Prior experience		
Dahlquist et al. (1986)	Medical exam	Distress/observer (OSBD)	3-12 (79)	• Negative prior experience → greater distress and anxiety
		Anxiety/physician (1-7 scale)		• Amount of experience → NS
Jay et al. (1983)	BMAs	Distress/observer (OSBD)	2-20 (42)	• Greater number of past procedures → less distress
Katz et al. (1980)	BMAs	Distress/observer (PBRS)	1-17 (115)	• Amount of experience → NS
Lumley et al. (1993)	Anesthesia induction	Distress/observer (ORBRs)	4-10 (50)	• Negative prior experience → greater distress
Curry & Russ (1985)	Dental procedures	Cognitive-behavioral/observer (BCOS) and self (CCI)	8-10 (18)	• Amount of experience → NS
Smith et al. (1991)	BMAs	Information seeking/self (CCI)	6-18 (44)	• Greater number of past procedures → more information seeking
Tesler et al. (1981)	Medical procedures	Coping-noncoping/self	9-12 (214)	• Hospitalized children → fewer strategies

Note: BMA = bone marrow aspiration; CGRS = Children's Global Rating Scale (Carpenter, 1990); PBRS = Procedural Behavior Rating Scale (Katz et al., 1980); CBRS = Child Behavior Rating Scale (Peterson & Shigetomi, 1981); PBCL = Procedure Behavior Checklist (LeBaron & Zeltzer, 1984); CBCL = Child Behavior Checklist (Achenbach & Edelbrock, 1983); OSBD = Observation Scale Behavioral Distress (Jay & Elliott, 1984); SRD = Self-Reported Distress (Weisz et al., 1994); LP = Lumbar Puncture; CMAS = Children's Manifest Anxiety Scale (Castaneda et al., 1956); ORBRs = Operating Room Behavior Rating Scale (Melamed et al., 1983); BCOS = Behavioral Coping Observation Scale (Curry & Russ, 1985); CCI = Cognitive Coping Interview (Curry & Russ, 1985); NS = nonsignificant.

were included in studies where gender differences were found (e.g., Hilgard & LeBaron, 1982; Katz et al., 1980), rather than in those where they were not (e.g., Hubert et al., 1988; Jacobsen et al., 1990; Weisz et al., 1994). This discrepancy may be linked to socialization experiences: Where boys are encouraged to adopt more stoic attitudes about pain, girls are reinforced for passive, affective expression (McGrath, 1993). Thus, males may become increasingly aware of and responsive to social expectations and may become more reluctant to demonstrate distress, causing a larger gender gap to occur during adolescence.

As for coping, Tesler et al. (1981) reported that 9- to 12-year-old girls identified more strategies to cope with pain than did boys. Brown et al. (1986) found no differences in the overall frequency of girls and boys categorized as predominantly copers versus catastrophizers, but girls were more likely to focus on the negative affect in reaction to a medical stressor. Bull and Drotar (1991) noted that girls demonstrated more emotion management when dealing with cancer-related stressors, whereas boys engaged in more problem solving. Weisz et al. (1994) found no relation between gender and the use of primary versus secondary coping. Finally, Band and Weisz (1988) reported that sixth- and seventh-grade girls generated more effective strategies for coping with an injection than did boys, but these gender differences were absent in younger children.

Age and gender differences in coping responses, coping efficacy, and adjustment have significant implications for future research. First, investigators must continue to examine both main effects and interactions of age and gender with key coping variables. Second, investigators must recognize the potential limitations of applying uniform measures of outcomes/adjustment across groups, as children may vary in their most salient expressions of distress. Third, investigators should include multidimensional assessment methods (e.g., observations and self-report) that capture the diversity of coping responses exhibited by different groups. When both coping responses and outcomes are assessed using multidimensional methods, researchers may discover more consistent results regarding the impact of age and gender.

Other Child Characteristics

Prior experience. Contradictory findings exist regarding the association between previous exposure to medical stressors and children's outcomes/adjustment. In two studies, the amount of experience with medical procedures was found to be unrelated to behavioral distress (Dahlquist et al., 1986; Katz et al., 1980). It has been speculated that habituation to painful procedures may not be achieved because heightened stress may block other cognitions, causing the child to focus on the current painful experience (Katz et al., 1980). However, Jay et al. (1983) suggested that the number of previous BMAs and months since diagnosis was negatively related to observed behavioral distress in pediatric oncology patients.

We might also expect that experience could exert positive or negative influences on children's coping responses. On the one hand, experience may facilitate the development of adaptive

skills. Smith, Ackerson, Blotchy, and Berkow (1991) found that the time since diagnosis and the number of previous BMAs were positively related to increased use of information-seeking strategies. On the other hand, past aversive experiences may increase the negative emotions associated with medical situations and may thereby interfere with coping (Siegel & Smith, 1989). Comparisons of school children and hospitalized children (the majority of whom had previous hospitalizations) suggest tentatively that the latter group may actually have diminished access to coping strategies (Tesler et al., 1981). Spirito, Stark, and Tyc (1994) reported that chronically ill youngsters were less likely to use avoidant (distraction and wishful thinking) and negative (self-criticism) coping strategies than were acutely ill or injured youngsters; these differences are attributed, in part, to the amount of exposure to medical stressors and the hospital environment (although these results were qualified by age effects). Finally, Curry and Russ (1985) found no relation between coping attempts and prior experience with dental work.

On the basis of these opposing results, the impact of prior experience on the coping process remains unclear. Several issues should be considered when interpreting and integrating current research. First, results may differ according to whether previous experience involved the identical type of medical stressor or different types of stressors. Efforts to assess the role of experience also were complicated by the fact that recall of medical events may have been absent or distorted (Peterson, 1989), particularly in younger children. Thus, previous experience in younger children could potentially increase their likelihood of engaging in automatic, conditioned responses to feared stressors without conscious cognitive mediation, whereas older children may be more likely to use memories of past experience in a purposeful manner to reduce current anxiety. Second and relatedly, the impact of prior exposure on coping may change with age, as children become better able to make use of their experiences to formulate an understanding of and to cope with current stressors. In the Spirito et al. (1994) study, chronically ill adolescents engaged in less wishful thinking than did chronically ill children, which may suggest that adolescents have a better capacity for using their experience to develop realistic attitudes toward the usefulness of certain coping responses. Finally, the quality of past experience may be a more accurate predictor than merely the quantity; negative experiences have been found to predict parent, staff, and observer ratings of increased anxiety and distress during medical examinations (Dahlquist et al., 1986; Lumley, Melamed, & Abeles, 1993). Due to memory deficiencies, as mentioned earlier, both parent and child reports of the quality of past experience would be essential.

Results from previous studies also may vary due to methodological differences. Most notably, some researchers have assessed how coping and adjustment are associated with prior experience within a homogeneous group (e.g., Smith et al., 1991), whereas others have compared two groups that presumably differed in their previous experience (Spirito et al., 1994; Tesler et al., 1981). However, the latter methodology may inherently confound prior experience with other key dimensions, such as the type of stressor with which the child is confronted (e.g., ill-

ness vs. nonillness related) and the implications of the stressor. The ideal approach to resolving existing discrepancies would therefore involve longitudinal designs that assess intraindividual changes in coping and adjustment over time.

Temperament. Minimal empirical data are available concerning temperament as a moderator of coping or adjustment in the context of acute medical stressors (this moderator is therefore not included in Table 3). However, many researchers have begun to discuss the possible role of temperament as a moderator of children's reactions to stress in general. Temperament has been viewed from both psychological and biological perspectives. On the one hand, psychological approaches define and operationalize temperament in terms of presumably inborn, dispositional differences in behavioral styles and self-regulation or variability in individual behavioral responses to external stimuli (e.g., Thomas & Chess, 1977; Wertlieb, Wiegel, Springer, & Feldstein, 1987). In the context of medical stressors, the most relevant aspects of temperament would include such dimensions as behavioral adaptability and reactivity to stimuli, threshold for and intensity of behavioral responsiveness to stimuli, and behavioral approach tendencies. Biological approaches, on the other hand, conceptualize temperament in terms of individual differences in physiologic reactivity to stress and focus on such dimensions as cardiovascular and neuroendocrine responsiveness—for example, changes in heart rate, blood pressure, vagal tone, and cortisol levels (e.g., Boyce, Barr, & Zeltzer, 1992; Gunnar, 1986; Kagan, Reznick, Snidman, Gibbons, & Johnson, 1988).¹

Temperamental characteristics may exert a direct effect on children's adjustment to medical stressors or may moderate children's preferences for certain modes of coping. For example, children with temperaments characterized by higher levels of behavioral or physiological reactivity, lower levels of adaptability, and lower thresholds for behavioral or physiological responsiveness to stimuli may demonstrate higher levels of distress when confronted with medical stressors and may prefer coping responses that decrease their perception of the stressor (e.g., information avoiding and distraction). From a physiological viewpoint, such coping responses may lead to decreased discomfort by actually downregulating children's physiological reactions to the stressor. Children with complementary temperaments (i.e., low reactivity, high adaptability, and high threshold) may demonstrate lower levels of distress and may more readily take advantage of coping responses that involve direct confrontation with the stressor (e.g., information seeking and sensory focusing).

As noted earlier, temperament has rarely been explored in the context of painful medical procedures. However, temperamental difficulties have been found to predict poorer behavioral and emotional adjustment in chronically ill children (Lavigne, Nolan, & McLone, 1988; Wallander, Hubert, & Varni, 1988; see also Garrison, 1992, for a discussion of the role of temperament in relation to coping and adjustment in the medical setting) and in children undergoing other types of daily stressors or negative life events (Wertlieb et al., 1987). In a later section on interactional models, some initial evidence demonstrates the importance of a match between child temperament and environmen-

tal influences in determining outcomes/adjustment specifically in the context of acute medical stressors.

Moderator 2: Situation-Specific Variables

Contextual approaches underscore the temporal and changing nature of coping and its responsiveness to environmental demands and have stimulated attempts to identify situation-specific determinants of coping and adjustment (Compas, Malcarne, & Fondacaro, 1988; Folkman & Lazarus, 1988; Peterson, 1989). Unlike dispositional approaches, which emphasize person-specific moderators and the search for variables underlying cross-situational *consistency* in coping, contextual approaches concentrate on variables underlying cross-situational *variability*. Despite a growing consensus as to the importance of situational variables, reviews of the literature on coping with painful medical situations often have summarized findings across very different stressors. (Indeed, we plead guilty in this review, but we do attempt to specify the relevant stressors.) In one study that directly examined cross-situational coping, Lumley, Abeles, Melamed, Pistone, and Johnson (1990) reported a moderate degree of similarity in observed behavior between venipuncture procedures and anesthesia induction. Although there was some overlap in children's reactions to these two stressors, there was also a large amount of unexplained variance. Understanding such inconsistencies requires the identification of critical situational influences.

Studies examining situational moderators are presented in Table 4. The table lists the type of stressor (column 2), the type and source of the independent variable (column 3), and the type and source of the dependent variable—either outcomes/adjustment or coping mode (column 4). The final column shows the relationship between the moderator and the dependent variable. As in Table 3, outcomes/adjustment is the dependent variable in the top part of each section, and coping is the dependent variable in the bottom part of each section. Because discussions of the moderating roles of the type and controllability of stressors are largely speculative, empirical results are not included in the table.

Characteristics of the Stressor

Stages of the stressor. To understand fully the context in which coping takes place, researchers have begun to conceptualize coping as a stagelike process. Three stages have been emphasized, including *anticipation or appraisal*, *encounter*, and *recovery* (Folkman & Lazarus, 1988; Peterson, 1989; Peterson et al., 1990). These phases may differ in the nature of the stressor,

¹ Although both of these approaches to the study of temperament may be useful in different contexts, confounds may arise when using behavioral styles as predictors of coping responses and coping or stress outcomes. That is, several of the behavioral dimensions used to operationalize individual differences in temperament overlap with dimensions of coping (e.g., approach-withdrawal tendencies) and outcome (e.g., threshold and intensity of responsiveness and reactivity). Thus, to avoid circular findings, we advocate the use of physiological markers of temperament in future research in this area.

Table 4
Findings on Situational Moderators of Coping and Outcomes/Adjustment in the Medical Setting

Study	Type of stressor	Independent variable/source	Dependent variable/source (measure)	Age (N)	Results
Moderator 1: Stages of Stressor					
Field et al. (1988)	Blood tests and injections	Sensitizer-repressor/parent	Anxiety/child (STAIC) Distress/parent (CBQ) Fear/self (Faces Scale)	4-10 (56)	• Repressor → greater state anxiety prior to procedure • Sensitizer → greater distress during procedure • Sensitizer → greater fear during the procedure • Secondary control strategies → less distress during preparation • Secondary control goals → less distress during recovery • NS • Nonpainful → more verbal coping • Painful → more deep breathing
Weisz et al. (1994)	BMAs/LPs	Coping/self	Distress/observer (OSBD)	5-12 (33)	• Information seeking during appraisal → more proactive coping during encounter
Blount et al. (1990)	BMAs/LPs	Painful-nonpainful phases	Amount of coping/observer (CAMPIS) Type of coping/observer (CAMPIS)	5-13 (22)	
Peterson et al. (1990)	Blood test (hypothetical)	Coping/self	Coping/self	4-9 (60)	
Moderator 2: Parental Influence					
Adult behavior-child distress					
Jacobsen et al. (1990)	Venipuncture	Parent coping/observer	Distress/observer (modified PBRs)	3-10 (70)	• Parent explaining → greater child distress
Lumley et al. (1990)	Anesthesia induction	Parent coping/observer	Distress/observer (DPIS)	4-10 (71)	• Maternal distraction and low informing prior to procedure → greater distress in children with approaching temperaments and less distress in children with withdrawing temperaments • Adult distraction during procedure → decreased child distress • Adult explaining and criticism during preparation → increased crying • Parental absence → greater distress (younger children only) • Maternal presence → greater child distress
Manne et al. (1992)	Venipuncture	Parent coping/observer	Distress/observer (CAMPIS)	3-10 (43)	• Maternal absence → greater child distress
Frankl et al. (1962)	Dental procedures	Parental presence-absence	Distress/observer (Frankl Scale)	3-5 (112)	
Shaw & Routh (1982)	Injectons	Parental presence-absence	Distress/observer (1-5 scale)	1-5 (40)	
Vernon et al. (1967)	Anesthesia induction	Parental presence-absence	Distress/observer (PHBRs)	2-6 (32)	
Adult anxiety-child distress					
Fishman et al. (1989)	Dental procedures	Parent anxiety/self Parent presence-absence	Distress/observer	NA (39)	• Presence of high-fear mother or absence of low-fear mother → greater child distress

(table continues)

Table 4 (continued)

Study	Type of stressor	Independent variable/source	Dependent variable/source (measure)	Age (N)	Results
Jacobsen et al. (1990)	Venipuncture	Parent anxiety/self	Distress/observer (modified PBRs)	3-10 (70)	• High parent state anxiety → greater child distress
Jay et al. (1983)	BMA's	Parent anxiety/self	Distress/observer (OSBD)	2-20 (42)	• High parent trait anxiety → greater child distress
Adult behavior-child coping					
Blount et al. (1990)	BMAs/LPs	Parent behavior/observer	Child coping/observer (CAMPIS)	5-13 (22)	• Adult talk and humor → child verbal coping • Adult breathing instruction → child breathing • Maternal information provision → child exploration • Parent distraction during procedure → increased child coping
Bush et al. (1986)	Medical procedures	Parent behavior/observer	Child coping/observer (DPIS)	4-10 (50)	
Manne et al. (1992)	Venipuncture	Parent coping/observer	Child coping/observer (CAMPIS)	3-10 (43)	

Note. BMA = bone marrow aspiration; LP = Lumbar Puncture; CBQ = Coping Behavior Questionnaire; CAMPIS = Child-Adult Medical Procedure Interaction Scale (Blount et al., 1989); STAIC = State-Trait Anxiety Scale for Children (Spielberger et al., 1973); OSBD = Observation Scale of Behavioral Distress (Jay & Elliott, 1984); PBRs = Procedure Rating Scale (Katz et al., 1980); PHBRS = Post-Hospital Behavior Rating Scale (Vernon, Foley, & Schulman, 1966); DPIS = Dyadic Prestressor Interaction Scale (Bush et al., 1986); NS = nonsignificant.

the demands placed on the child, the types of coping responses elicited, and the likely efficacy of various responses. During a medical procedure, for example, the anticipation and recovery stages may be associated with apprehension and psychological distress; coping responses during these stages may be directed toward managing anxiety or fear. The encounter stage is linked not only with distress but also with physiological sensations of pain, and the stage requires coping that reduces pain or regulates reactions to pain. Empirical data indeed suggest that children may cope in different ways during different stages of medical stressors. Blount, Sturges, and Powers (1990) found that, although the amount of observed coping did not differ across nonpainful and painful phases of BMAs, the predominant type of coping shifted across stages. Specifically, children engaged in verbal coping (e.g., humor) more frequently during the non-painful stages and audible deep breathing more frequently during the painful stages.

A few investigators have applied a stagelike framework to the exploration of children's coping with medical stressors. For example, Peterson et al. (1990) distinguished between dimensions of coping relevant to appraisal versus encounter phases. Appraisal coping is viewed in terms of the information-seeking versus avoidance dimension discussed earlier, whereas encounter coping is viewed in terms of two orthogonal dimensions of reactive-proactive coping (i.e., being influenced by the threatening stimulus vs. being guided by a plan to mitigate responses to the stressor) and stimulus blocking-stimulus approach (i.e., attempting to shield oneself from the stimulus vs. attempting to alter the stimulus). For example, children who are high on proactive coping and stimulus blocking would have a plan to distance themselves from the stimulus using distraction or imagery. Children who are high on proactive coping and stimulus approach would have a plan that involves monitoring or altering the stimulus, such as observing the needle going in or redefining the sensation (Peterson et al., 1990). Initial data supported these dimensions as valid characterizations of healthy children's self-reported coping during a hypothetical blood test. Furthermore, a relationship emerged between endorsement of information seeking during the appraisal phase and proactive coping during the encounter phase (Peterson et al., 1990).

Another study attempted to discern differences in adjustment during the three stages of invasive medical procedures (i.e., blood tests and preoperative injections) in children who were classified by their mothers as sensitizers or repressors (Field et al., 1988). Repressors were found to exhibit higher levels of anxiety prior to procedures and remained longer in intensive care following surgery, but sensitizers were more fearful and disruptive during procedures and rated themselves as more distressed following procedures.

Weisz et al. (1994) reported findings specific to the three stages of BMAs and LPs—preparation, procedure, and recovery. Using behavior observations as their outcome measure, the authors found that children who reported using secondary coping strategies ("say to yourself, 'I'll get better'") showed less distress only during the preparatory phase, whereas those who described secondary coping goals (e.g., "gives you confidence")

showed less distress only during the *recovery* phase. Neither strategies nor goals were related to distress during the actual *procedure*. These findings highlight the importance of discriminating between coping responses and goals and raise the question of whether secondary coping is equally effective at all stages of a stressor.

These studies provide a glimpse into the possible stage-dependent nature of coping responses and outcomes, but additional research is needed. At the very least, investigators must take advantage of coding systems that capture the most significant aspects of coping at each stage (e.g., see Peterson et al., 1990). Furthermore, assessment techniques must be sensitive to potential differences in relevant measures of outcomes/adjustment during the various stages (e.g., apprehension prior to the procedure vs. sensation of pain during the procedure vs. adjustment subsequent to the procedure).

Type of stressor. Investigations of coping with medical procedures include many types of stressors, ranging from routine childhood injections and dental treatments to the severe pain of BMAs. Some studies also have been based on isolated pain stemming from internal causes (e.g., headaches) or typical child injuries with no associated medical context. Clearly, both the painful stimuli themselves and the accompanying psychological implications cover a wide spectrum. In terms of the discrete stimuli, medical stressors may vary along such dimensions as frequency, duration, severity, and novelty (Siegel & Smith, 1989). Within any given situation, certain aspects of the stressor may differ. For instance, Curry and Russ (1985) found that the number of cognitive coping strategies reported by children undergoing dental treatments was significantly correlated with the number of anesthetic injections they received. Procedures may also have very different meanings for the child in terms of preventative (e.g., injections), diagnostic (e.g., BMAs), or curative (e.g., surgery) functions. Empirical research is therefore needed to explore the relation between stressor type and the coping process.

Controllability of the stressor. In this section, we focus on how the actual controllability of stressors may influence the coping process; later in the section on *Secondary Appraisal*, we discuss children's perceptions of control. Both the ways-of-coping and the primary-secondary control models predict that the efficacy of coping strategies is dependent on the degree to which a stressor can be modified. Pain-related medical stressors that are inherently unalterable might well evoke the use of emotion-focused or secondary control coping, and such strategies might be more adaptive (e.g., Band & Weisz, 1988; Curry & Russ, 1985). However, assessing the controllability of stressors may be more complicated than meets the eye.

Acute medical stressors are composed of several elements, characterized by differing levels of controllability. For example, if we consider the stressor to be an injection by the doctor or the actual BMA, then the overall stressor is for the most part unchangeable. As discussed earlier, however, stressors may differ along many dimensions, such as duration. Thus, a child who lies very still to shorten the length of the procedure may in some sense be invoking a primary control response, with the goal of modifying the situation itself.

Another aspect of medical stressors is pain sensation. A child

who engages in activities that actually lessen the experience of pain (e.g., distraction) may be viewed as exerting control over the stimulus, rather than adapting to the situation to manage emotional distress (e.g., "this really hurts, but it will help me to get better"). This distinction touches on the very nature of pain, which as suggested earlier can be regarded as partly objective and partly subjective-emotional. When determining the impact of controllability on the coping process, researchers must therefore recognize the multiple subcomponents that comprise any given medical stressor.

Characteristics of the Environment

Parental influences. Data on the effect of parental presence during stressful medical procedures are mixed (reviewed by Blount, Davis, Powers, & Roberts, 1991). On the one hand, parental support may facilitate children's coping responses (Siegel & Smith, 1989). This perspective is supported by evidence that children's behavior prior to and during painful medical procedures is influenced by the parents' direct efforts to promote certain types of coping (Blount et al., 1989; Bush, Melamed, Sheras, & Greenbaum, 1986). Parental presence may likewise have a positive influence on the children's outcomes/adjustment. For example, Vernon, Foley, and Schulman (1967) observed that children's separation from their mother during anesthesia induction resulted in increased unhappiness and distress behaviors.

On the other hand, Shaw and Routh (1982) demonstrated that children's distress behaviors during injections are reinforced by the presence of a comforting figure. Sequential analyses of specific parental behaviors that precede, and possibly trigger, children's distress during painful medical procedures have yielded interesting results (Blount et al., 1989; Jacobsen et al., 1990; Manne et al., 1992). Blount et al. identified six parental behaviors during BMAs and LPs that were followed by increased child distress: empathic comments, apologies to the child, criticism, reassurance, and giving the child control over when the procedure begins.

The discrepant nature of these findings underscores the need for more explicit analyses of parental influences. Several variables may account for differences across studies. First, inconsistencies may result from the method of assessing outcome. Children whose mothers were absent in the Shaw and Routh (1982) study may have experienced distress but inhibited the overt expression of their feelings. Thus, future investigations should examine both observable behaviors and subjective distress. Additionally, Frankl, Shiere, and Fogels (1962) noted age differences in the level of anxiety associated with separation from parents prior to dental procedures, with younger children displaying greater fear and negativity. In this regard, Blount et al. (1991) underscored the need to distinguish separation anxiety from distress associated with the procedure itself. Age also may interact with parental presence-absence due to differences in the acceptability of needing parental support to deal with stressors. Variability in the findings may also stem from parental characteristics. Preliminary work has suggested that children with anxious mothers exhibit greater anxiety in their parents' presence, whereas children with low-fear mothers show more distress in

their parents' absence (Fishman, Cook, Hammock, Gregory, & Thomas, 1989; Jacobsen et al., 1990; Jay et al., 1983).

Finally, contextual variables may determine the ultimate impact of parental attitudes and behaviors. For example, similarity in parents' and children's coping styles or temperament may influence the degree to which parental behaviors facilitate or interfere with children's coping efforts and adjustment (e.g., see the section on the match between parent behaviors and child characteristics). Understanding the precise nature of interactions among parental reactions to stressors, parental attempts to promote coping, children's coping responses, and children's outcomes/adjustment would be facilitated through the application of methods such as sequential analyses, which allow for fine-grained examination of temporal effects of parent and child behaviors.

Other environmental influences. For the most part, empirical studies of environmental variables have focused on the issues of parental presence-absence and behavior. Yet one might imagine many other influential aspects of the context or surroundings in which medical procedures take place (other environmental moderators are not included in Table 4 due to the lack of empirical data). For instance, children's reactions may in part depend on physical features of the room. In fact, a classical conditioning phenomenon may occur, whereby the room in which medical procedures are conducted assumes the role of a feared stimulus linked with pain and anxiety (Zeltzer, Jay, & Fisher, 1989). Additionally, the impact of health care practitioners who are involved in the procedures cannot be underestimated. Professionals may vary along such dimensions as familiarity with the child, behaviors during the procedure, expectations of the child, experience, and skill. Despite their obvious effects on children's coping and adjustment, such variables have received little attention as targets of assessment or intervention in psychological research.

Moderator 3: Interactional Approaches

Theoretical formulations and empirical investigations of coping clearly must take into account characteristics of both the child and the stressful event or situation. However, a true transactional model must also capture the interaction between person- and situation-specific variables in determining the nature and success of coping. Coping must be viewed as a *relational* process, in which the person and the environment participate in a dynamic, mutually influential relationship (Folkman, 1984; Folkman & Lazarus, 1988). Two such transactional approaches have been explored in the area of medical stressors: interactions between types of stressors and coping responses and interactions between child and parent characteristics. Although we focus on these two approaches because of the presence of relevant empirical data, child characteristics and coping responses most likely also interact with other contextual variables discussed earlier, such as characteristics of health care providers and the physical environment.

Stressor-Coping Match

The preceding discussion of stressor controllability moves toward an interactional conceptualization, in that the goodness of

fit between the controllability of a stressor and children's use of particular strategies is viewed as essential to successful coping (Compas et al., 1988; Folkman & Lazarus, 1988; Forsythe & Compas, 1987; Weisz, 1990). Attempts to use problem-focused or primary control coping in uncontrollable circumstances are viewed as maladaptive because active attempts to alter conditions ultimately are futile and likely to lead to frustration. Likewise, the use of emotion-focused or secondary control coping in controllable circumstances, which are amenable to change, may interfere with the application of more active techniques to alter the objective situation (Compas, 1987; Folkman, 1984; Forsythe & Compas, 1987; Weisz, 1990).

Empirically, relatively little is known about the importance of a match between stressor characteristics and children's attempts to cope with medical stressors. However, two studies reported earlier provide some initial clues. Although the studies appear to yield inconsistent findings, one can make sense of them from an interactional perspective. In their investigation of juvenile diabetes, Band and Weisz (1990) found a relationship between primary control coping and better adjustment. The authors proposed that the extensive use of secondary control strategies may have resulted in reductions in appropriate primary control strategies, such as strict adherence to an acceptable diet and a prescribed medical regimen. In contrast, Weisz et al. (1994) found that increased use of secondary control coping predicted fewer behavioral and emotional problems and decreased self-reported distress during painful medical procedures. The authors therefore suggested that secondary control strategies may be more adaptive for coping with the uncontrollable stressors associated with leukemia.

Thus, goodness of fit (e.g., match between coping goals or responses and stressor controllability) and flexibility in the application of coping responses may prove more useful in predicting outcome than the implementation of certain types of coping. The efficacy of a particular coping response would therefore not be inherent in the response itself but would be a function of its suitability within a given situation (Folkman, 1984). Moreover, the adaptive value of a strategy may depend on the specific stage of the stressor experienced.

Child-Parent Coping Match

In an alternative attempt to explore the validity of a transactional approach to coping, Lumley et al. (1990) examined the relative influence of child temperament and maternal behavior during a presurgical waiting period on children's distress during anesthesia induction. Results indicated that outcome was determined by neither child nor maternal characteristics alone but an interaction of the two. Specifically, maternal use of high distraction and low informing regarding medical topics led to elevated distress behavior for only those children with approaching temperaments. Conversely, the opposite pattern of maternal behavior resulted in increased distress for only those children with withdrawing temperaments. These findings are particularly interesting in light of previous attempts to link children's information-seeking and -avoidant dispositions directly to outcome.

In a similar vein, preliminary findings from intervention research have indicated that the match between children's pre-

ferred coping style and the type of pain management technique in which they are trained may have a significant impact on the efficacy of intervention. For example, Fanurik et al. (1993) reported that *distractors* who are provided with a matched intervention (i.e., imagery) demonstrate greater pain tolerance than both *distractors* and *attenders* in mismatched conditions (i.e., sensory focusing and imagery, respectively).

Mediators: An Overview

As described earlier, mediators are variables that explain the relations among different components of a coping episode—stressors, coping responses, and outcomes/adjustment. We consider three mediational pathways (see Figure 2): (a) variables that mediate directly between stressors and associated stress outcomes—Why do certain outcomes occur as a result of exposure to medical stressors? (the path from Circle 2 to 4 to 5); (b) variables that mediate between stressors and coping responses—Why do children select certain coping modes? (the path from Circle 2 to 4 to 3); and (c) variables that mediate between coping responses and outcomes—How do particular coping responses operate? (the path from Circle 3 to 4 to 5).

The dearth of research on mediators of children's coping and outcomes in the context of medical stressors forces reliance partly on theory and empirical data from the adult literature. By doing so, however, it is not suggested that adult theories can be applied indiscriminately to children, but they can be of heuristic value in efforts to construct developmentally appropriate models. Table 5 presents findings from studies that explored the role of mediators in the context of medical stressors. Under the heading of primary appraisal, the available studies involved variables (e.g., age or developmental level) that may influence children's appraisals; thus, mediators represent dependent variables in this section. In the section on *Secondary Appraisal*, the available studies involved the impact of mediators on coping and outcomes/adjustment; thus, mediators represent independent variables in this section.

Mediator 1: Cognitive Appraisal

Appraisals are beliefs that presumably influence adjustment to a stressor, the selection of coping strategies, and the nature of the coping outcome; they may therefore operate in each of the three mediational roles delineated earlier. Lazarus and colleagues (Folkman, 1984; Folkman & Lazarus, 1988; Lazarus & Folkman, 1984) postulated that the relations among stress, coping, and outcomes/adjustment may be mediated by two key phases of appraisal: primary appraisal or the attribution of meaning to an event, and secondary appraisal or the evaluation of coping resources and options.

Primary Appraisal

Primary appraisal involves the determination of what is at stake in any given encounter—the potential meaning or implications of a stressor (Folkman & Lazarus, 1988). Folkman (1984) described three types of stressful primary appraisals: harm/loss, threat, and challenge. *Harm/loss* refers to some type

of injury or damage that has already been done; *threat* refers to concern about the implications of an event for future harm/loss; and *challenge* refers to the opportunity for future growth, mastery, or gain resulting from an event. These consequences may occur in different domains, including, for example, changes in one's self-esteem, well-being and health, or role performance. Applying this conceptualization to the domain of medical stressors, medical procedures and associated pain may be perceived in varying ways. For instance, harm/loss appraisals may be reflected in a child's view of repeated BMAs as a punishment or reminder of an illness. Threat appraisals may be reflected in a child's view of an impending surgery as potentially interfering with the opportunity to participate in activities or favorite sports with peers. Challenge appraisals may be reflected in a child's view of a medical procedure as an opportunity to conquer fears and, perhaps, an illness.

In terms of the first mediational pathway, primary appraisals may have a direct effect on children's general adjustment, in that harm/loss or threat appraisals often are linked to negative emotions, such as anger, fear, or resentment, whereas challenge appraisals often are linked to more pleasurable (or at least less aversive) emotions (Folkman, 1984). Primary appraisals likewise may influence children's approach to coping: A child who perceives a painful injection as threatening may be more likely to adopt an antagonistic coping response, whereas a child who appraises an injection in terms of its preventative or curative value may engage in more adaptive coping. Finally, primary appraisals may mediate between coping responses and outcomes. For instance, coping techniques such as cognitive restructuring or selective attention to positive aspects of an experience may change the subjective meaning of a stressor, which may then influence outcome (Folkman & Lazarus, 1988). We do not know of any empirical data directly assessing the role of primary appraisals in mediating coping responses or outcomes in children encountering painful medical stressors. Outside of the medical stressor domain, however, one study of college students demonstrated that primary appraisals of harm prior to an exam predicted avoidance coping following the exam (Carver & Scheier, 1994).

Folkman (1984) emphasized that the nature of primary appraisals may depend on—be moderated by—a variety of individual and contextual variables. Several researchers have focused on the impact of cognitive-developmental level on children's appraisals of pain and medical procedures (reviewed by Burbach & Peterson, 1986). Less mature cognitive development may place limitations on children's memory of previous medical stressors, their capacity to define the parameters of procedures (e.g., intensity or duration), and their ability to understand the complex functions of pain and procedures (Peterson, 1989; see also the section on children's conceptualization of pain). For example, Spirito et al. (1994) found that adolescents were more likely to focus on the implications of the disease or injury, whereas children were more likely to focus on symptoms (i.e., pain). As children move from magical thinking toward a more accurate understanding of illness and treatment, they also may acquire a greater sense of responsibility for their health and, in turn, engage in self-control strategies that may facilitate treatment (Maddux, Roberts, Sled den, & Wright, 1986).

Table 5
Mediators of Coping and Outcomes/Adjustment in the Medical Setting

Study	Type of stressor	Independent variable/source	Dependent variable/source (measure)	Age (N)	Results
Mediator 1: Primary Appraisal					
Beales et al. (1983)	Injections	Age	Beliefs about treatment/self	7-11 (39)	• Decreased age → more likely to think procedure "makes you worse"
Brewster (1982)	Medical procedures	Cog-devel. level (Piaget task)	Understanding of procedures/self	12-17 (36)	• Preoperational → view procedures as punishment
Harbeck & Peterson (1992)	Injection	Age	Descriptions of pain/self	5-12 (50)	• Increased age → more complex descriptions of pain, why it hurts, and its value
Kister & Patterson (1980)	Hypothetical illness/accident	Age	Explanation of illness/self	3-23 (100)	• Decreased age → greater use of immanent justice explanations
Mediator 2: Secondary Appraisal					
Band & Weisz (1990)	Diabetes related	Perceived coping efficacy/self	Socio-behavioral adjustment/parent (SBAS)	8.8 (32)	• Increased perceived coping efficacy → better adjustment in formal operational children
Carpenter (1992)	Blood draw	Perceived control/self	Psychosomatic problems/parent (CPQ)	14.6 (32)	• Increased perceived control → better adjustment in formal operational and fewer psychosomatic problems in preformal children
		Perceived control/self (modified MMCP)	Fear/self (CGRS) Fear/parent (0-5 scale) Distress/observer (checklist)	4-18 (73)	• "Unknown" perceived control → greater fear and distress
Goertzel & Goertzel (1991)	Cancer-related stress	Locus of control/self (CHLOC, RMHLOC)	Anxiety/self (Piers-Harris)	8-18 (38)	• Internal locus of control → less anxiety
LaMontagne (1984)	Surgery	Locus of control/self (NSLOCSC)	Active-approach coping/self	8-12 (51)	• Internal locus of control → more active coping
Worchel et al. (1987)	Medical procedures	Perceived control/self (control questionnaire)	Adjustment/parent (CBCL)	6-17 (52)	• Decreased decisional control → poorer adjustment
			Depression/self (CDI)		• Increased behavioral control (more behaviors) → more depression

Note. SBAS = Sociobehavioral Adjustment Scale (Band & Weisz, 1990); CPQ = Connors Parent Questionnaire (Goyette et al., 1978); CGRS = Children's Global Rating Scale (Carpenter, 1990); MMCP = Multidimensional Measure Children's Perceived Control (Connell, 1985); CHLOC = Children's Health Locus of Control (Parcel & Meyer, 1978); RMHLOC = Revised Multidimensional Health Locus of Control (B. Thompson et al., 1987); NSLOCSC = Norwick-Strickland Locus of Control Scale for Children (Norwick & Strickland, 1973); CBCL = Child Behavior Checklist (Achenbach & Edelbrock, 1983); CDI = Children's Depression Inventory (Kovacs, 1983); Cog-devel. = cognitive-developmental; Piers-Harris (Piers & Harris, 1964).

Researchers also have borrowed from Piaget (1930) to explain how primary appraisals may shift as a function of cognitive-developmental level. Three concepts are relevant: (a) finalism, the belief that natural events occur to serve a purpose; (b) immanent justice, the belief that people get what they deserve; and (c) syncretism, the belief that co-occurring events must be causally related. Younger children's heightened susceptibility to these types of thinking may result in their assumption that illness or injuries are caused by personal wrongdoing and, consequently, that treatment is a punishment. Empirical data support such trends, in that children at earlier developmental levels tend to be more likely to view medical procedures as assaultive and less likely to understand the beneficial aspects of the procedures, whereas older children are less likely to view procedures as punishment, more likely to recognize the usefulness of treatment and the empathy of the medical staff, and better able to comprehend the long-term benefits of the procedures (Beales, Holt, Keen, & Mellor, 1983; Brewster, 1982; Harbeck & Peterson, 1992; Kister & Patterson, 1980). In the context of clinical experience, we have noted similar tendencies. For example, young children often attribute their development of cancer to some personal transgression (e.g., "I ate a piece of food from the floor even though my mother told me not to") or to an illogical source (e.g., "the doctor who operated on me didn't wash his hands").

These differences highlight the impact of developmental level on children's health- and pain-related appraisals. As noted earlier, however, events also may be appraised with regard to their impact on other areas, such as one's self-esteem. For example, older children may view medical procedures as a potential threat to their self-esteem if they fear that they will be unable to respond in a mature fashion (e.g., they may scream or cry), whereas younger children may be less likely to fear a loss of self-esteem in the face of similar reactions. The implications of physical interventions on children's sense of self may also shift with transitions in their cognitive-developmental level. Self-definition tends to proceed from a primary reliance on physical characteristics to a reliance on more abstract social and psychological qualities (Damon & Hart, 1982, 1986; Harter, 1988). Children with more concrete self-concepts may be less able to separate their sense of self from their bodies and therefore may be more likely to perceive physical interventions as threatening or assaultive.

Thus, understanding changes in children's interpretations of medical procedures and their implications for self-concept is essential to the study of coping across development. Clearly, although the external stressors faced in medical settings may be relatively similar across youngsters, children's appraisals of the meaning or implications of stressors shift quite dramatically, creating unique challenges at different developmental stages.

The attribution of meaning may also be moderated by situational parameters, such as the type or novelty of the stressor. For instance, disease-related pain may be more likely to elicit primary appraisals of pain as threatening or harmful than would everyday injections or pain associated with an injury (Siegel & Smith, 1989). Such differences in appraisal may account in part for differences noted earlier between coping strat-

egies used by chronically and acutely ill or injured children (Spirito et al., 1994).

Secondary Appraisal

The next step in formulating an understanding of a stressor is secondary appraisal or judgments concerning the extent to which one can influence the outcome of a stressful event. These appraisals are often viewed as a combination of overall self-efficacy expectations or generalized beliefs about one's ability to achieve desired outcomes, and perceived control or situational beliefs about the possibilities for control within a specific stressful encounter (Folkman, 1984; Siegel & Smith, 1989). Weisz and colleagues (e.g., Weisz, 1990; Weisz & Stipek, 1982) further refined the construct of perceived control in terms of a two-dimensional model that emphasizes the joint function of perceived contingency—perceptions of the degree to which particular outcomes are dependent on people's behavior—and perceived competence—perceptions of one's own ability to manifest the necessary behaviors (for related notions, see Bandura's, 1977, distinction between "outcome expectancy" and "efficacy expectancy").

Secondary appraisals conceivably could function in each of the three mediational roles described. First, secondary appraisals may directly alter general adjustment to stressful medical procedures. For example, anxiety may be tempered by beliefs that one is generally competent at dealing with pain. Second, self-efficacy and control beliefs may influence the selection of particular types of coping. For instance, children who recognize that getting an injection is not contingent on their behavior may be more likely to use secondary control coping. Third, certain coping responses, such as information seeking or coping self-statements, may instill a greater sense of control and thereby favorably affect children's outcomes.

In the adult literature, researchers have demonstrated the effects of secondary appraisals on pain tolerance and adjustment, either through direct impact on well being—Path 1 discussed in the section *Mediators: An Overview*—or through increased use of available coping strategies—Path 2 in this same section (Jensen & Karoly, 1991; Litt, 1988; Marino, Gwynn, & Spanos, 1989; S. Thompson, 1981). Conceptually, many researchers have considered the role of secondary appraisals in relation to medical stressors during childhood (e.g., Peterson, 1989; Siegel & Smith, 1989), yet only minimal empirical evidence exists. Band and Weisz (1990) found that greater perceived coping efficacy (specific to medical stressors) was associated with more favorable illness-related adjustment and fewer conduct problems in formal-operational diabetic youngsters. Greater perceived control was associated with better illness-related adjustment in formal-operational youngsters and with fewer psychosomatic problems in preformal children. Worchel et al. (1987) found that decreased perceptions of decisional control over medical treatments were related to higher levels of internalizing (e.g., depression and anxiety) and externalizing (e.g., acting out and aggression) symptoms. Similarly, Carpenter (1992) found that children who endorsed an unknown source of control (as opposed to personal control or control

from powerful others) when dealing with painful medical procedures reported and displayed higher levels of fear and distress. Increased perceived control over general health in pediatric oncology patients also has been found to predict decreased anxiety (Goertzel & Goertzel, 1991).

LaMontagne (1984) provided information regarding the second type of mediational role—mediation between stressors and coping responses—in a sample of 8- to 12-year-olds undergoing surgery. Results suggested that children who were more internal in their general locus of control exhibited more active coping styles (defined as seeking knowledge about their impending surgery, retaining information provided, and exhibiting readiness to discuss the operation). To our knowledge, there are no direct empirical investigations of the third mediational pathway—mediation between coping responses and outcomes. However, it is often assumed in the treatment literature that promoting coping efforts may serve to enhance perceived control, leading to a modification of the perception of pain and to decreased anxiety (e.g., Tarnowski, McGrath, Calhoun, & Drabman, 1987).

Remaining Questions Regarding the Role of Secondary Appraisal

The available research implicates secondary appraisal as a potentially important mediator of coping and adjustment, yet the complex relationships among stress, appraisals, coping, and outcome require further elaboration. We identify five key areas for future inquiry.

Studying temporal shifts in appraisal. Folkman (1984) pointed out that “appraisals of personal control are likely to change throughout a stressful encounter as a result of shifts in the person-environment relationship” (p. 840). In terms of the stage-oriented approach discussed earlier, appraisals may fluctuate across phases of the coping process. For example, whereas a child may feel able to control anxiety prior to a medical procedure, pain and distress during the actual procedure may be viewed as uncontrollable. Examining the changing nature of appraisals and the variables that influence these shifts should be a part of future research.

As discussed earlier, the appraisal process is intimately linked to coping responses and outcomes—not only may appraisals at one stage of a stressful encounter influence future coping and associated outcomes, but children’s success at coping and associated outcomes during an earlier phase may also influence appraisals during later phases. Knowledge about the appraisal process would therefore enhance one’s understanding of coping. Insight into the dynamic nature of appraisals may also have important implications for the development of effective interventions. That is, the appropriateness of treatment strategies may vary according to the stage of the stressor. For instance, cognitively based strategies focused on altering appraisals may be helpful only during certain parts of medical procedures, and the helpfulness of these techniques at different stages may vary according to the child.

Learning when perceived control helps and when it hurts. Researchers have suggested that perceived control does not consistently predict decreased distress (and, in this case, increased

pain tolerance) but may instead heighten distress (Folkman, 1984). Thus, identifying situations in which perceptions of control have beneficial versus detrimental effects on adjustment may be important. In particular, the match between perceptions of control and the actual controllability of the stressor may be a key determinant of adjustment (Folkman, 1984). The extent to which this match is achieved may explain the potential advantages and disadvantages of perceived control.

Research in this area has significant theoretical and practical ramifications. First, attempts to establish the superiority of appraisals of controllability versus uncontrollability are probably counterproductive. Second, assessment procedures should include evaluations not only of children’s global appraisals of controllability but also of the accuracy of their judgments. Third, intervention attempts that incorporate the goal of influencing appraisal processes must be tailored to specific stressors and must train children in how to use both prior knowledge and situational cues to assess the controllability of particular stressors.

Identifying optimum belief combinations. Secondary appraisal is clearly a multidimensional process that includes beliefs related to general self-efficacy, perceived contingency, and perceived competence. It may therefore be useful in future studies to examine differing patterns of secondary appraisal, as well as the relative predictive value of each component. For instance, Litt (1988) discovered that the combination of high self-efficacy and perceived control resulted in the highest pain threshold in adults.

A better understanding of the impact of different types of belief combinations may aid in the development of treatment programs. Consider two children: One believes that distraction may lessen the experience of pain (high perceived contingency) but feels unable to enact the appropriate strategy (low perceived competence); the other feels able to implement suggested strategies (high perceived competence) but believes that no matter what children do, nothing will help diminish the pain (low perceived contingency). Although on the surface these two children may appear to behave in similar ways (e.g., neither one engages in deep breathing exercises), they may require interventions that focus on different aspects of appraisal.

Studying moderators of appraisal. Few researchers have examined the influence of personal and situational variables on children’s secondary appraisals in the context of medical stressors (see path between Circles 1 and 4 in Figure 2). One study did reveal that increasing age is related to a shift from a more passive experience of pain toward a position of greater perceived control over painful events (Gaffney & Dunne, 1986). Additional work examining possible moderators of the appraisal process is necessary. For example, we might expect that children’s judgments about stressor controllability would become more accurate over time, as they gain more experience and their cognitive capacities increase. Children may therefore become better able to match their coping goals and responses to the demands of the situation, resulting in increased coping efficacy. Situational variables likewise may be influential. Behavior of parents or comments made by health care practitioners during medical procedures may directly affect a child’s appraisals. Thus, knowledge about situation-specific moderators of appraisal may provide information about how best to promote

adaptive and accurate appraisals, while working within the constraints imposed by person-specific moderators (e.g., prior experience and developmental level).

Exploring the impact of appraisal on immune functioning. A growing body of literature on adults implicates the secondary appraisal process as playing an integral role in determining immunological responses to stress. In one study, increased self-efficacy was linked to enhanced immunocompetence, including decreases in cortisol levels and increases in T cells; lower perceived self-efficacy was linked to an immunosuppressive effect (Wiedenfeld et al., 1990). Likewise, in laboratory experiments that manipulate perceptions of control, "high control" conditions precipitated cortisol suppression (in combination with catecholamine release); "low control" conditions precipitated cortisol release (in combination with catecholamine release), resulting in anxious and depressive responses (Frankenhaeuser, 1986). These results are reminiscent of animal research linking the experience of uncontrollable stressors with compromised immune system functioning (e.g., Laudenslager, Ryan, Drugan, Hyson, & Maier, 1983; Shavit, Lewis, Terman, Gale, & Liebeskind, 1984; Weiss, 1968). These promising leads indicate that it may be useful to examine the physiological and immunological consequences of children's appraisals in the context of painful medical stressors.

Mediator 2: Deployment of Attention

In terms of the three mediational pathways, allocation of attentional resources most often has been explored in relation to the third pathway, namely the link between coping responses and outcomes. Coping responses can be viewed on a continuum, ranging from those that promote attention toward stressors to those that deflect attention from stressors. Interestingly but paradoxically, studies have suggested that both coping efforts aimed at enhancing attention to stressors and those aimed at reducing attention may have beneficial effects on children's adjustment to medical stressors.²

On the one hand, a positive relationship has been discovered between increased attention, vigilance, or stimulus approach and adaptive outcomes (Lumley et al., 1990; Melamed, 1982; Peterson & Toler, 1986). Furthermore, evidence supports the general effectiveness of interventions designed to promote attention-enhancing coping responses, including patient education (Peterson & Ridley-Johnson, 1980), sensory information (Siegel & Peterson, 1980), modeling (Melamed & Siegel, 1975), and rehearsal (Jay et al., 1987; Nocella & Kaplan, 1982). On the other hand, interventions that train attention-diverting responses have been shown to be equally successful in facilitating children's adjustment (e.g., Hilgard & LeBaron, 1982; Siegel & Peterson, 1980). Research with adults also suggests that experimentally manipulated distraction from painful stimuli, in comparison with attention, leads to a decreased subjective pain experience, lower physiological responsiveness (i.e., skin conductance and heart rate), and greater subjective habituation to pain (Arntz, Dressen, & Merckelbach, 1991).

We offer some initial speculations about the variables underlying these inconsistencies on the basis of a stage-specific formulation of coping and the impact of a stressor-coping match.

That is, coping responses that enhance attention may be more adaptive in the preparatory phase or in situations where the stressor is controllable (e.g., seeking information about the nature of upcoming medical procedures), whereas coping responses that reduce attention may be more adaptive in the encounter phase or in situations where the stressor is less controllable (e.g., receiving an injection or undergoing a BMA).

Additionally, the relevant mechanisms may differ in relation to specific outcomes. For example, relaxation may reduce both anticipatory anxiety and psychological distress during a procedure as a result of increased perceived control and may decrease actual sensations of pain and pain behaviors as a result of distraction. Future research efforts should therefore be directed toward discriminating among the mechanisms underlying changes in the sensory, affective, cognitive, behavioral, and physiological response systems.

Finally, individual differences in preference for attention enhancement versus distraction may determine the types of outcomes associated with attentional deployment (e.g., see Lumley et al.'s, 1990, findings cited earlier regarding goodness of fit between child temperament—approach vs. withdrawal—and maternal behavior—distraction vs. informing).

Remaining Issues and Avenues for Future Research

Our final goal in this article is to delineate what are perceived to be some of the central questions that should guide future research on coping with medical stressors during childhood. Whenever possible, we try to complement the discussion of conceptual and empirical gaps with suggestions for ways to bridge these gaps.

Investigating the Nature and Direction of Stress-Coping-Outcome Relations

One important unresolved issue concerns causal relations among the variables displayed in Figure 2. Several studies have linked specific coping styles, such as secondary control (e.g., Weisz et al., 1994) and information seeking (e.g., Katz et al., 1980; Peterson & Toler, 1986), to positive short- and long-term outcomes/adjustment. Accordingly, some investigators have concluded that particular types of coping may lead to more favorable outcomes/adjustment. However, an alternative explanation may be that children's prior level of adjustment determines how they cope (this bidirectional relation is represented by the two-way arrow between Circles 3 and 5). That is, in studies using global measures of adjustment (e.g., Brown et al., 1986; Weisz et al., 1994; Worchel et al., 1987), emotional or behavioral difficulties may lead to, rather than result

² The role of attention during a coping episode is actually quite complex. Here, attentional deployment is conceptualized as the mechanism of action through which certain coping responses may exert their effects on outcome. However, allocation of attention can also at times represent a type of coping response itself (e.g., distraction). Although attention is discussed primarily as a mediator between coping responses and outcomes, Figure 2 portrays attentional deployment as functioning in diverse mediational roles.

from, maladaptive coping. In studies using specific indexes of procedure-related distress (e.g., Hubert et al., 1988; Katz et al., 1980), negative affect, such as anger or anxiety (often used as a measure of outcome), may actually precede and interfere with adaptive coping (see Folkman & Lazarus, 1988, for a general summary of the complex relations among stress, coping, and emotion).

Mechanisms underlying the link between coping and outcome also require clarification. For instance, Peterson (1989) points out that improved outcomes associated with information seeking may result from the type of child who seeks out information, rather than from the information itself. Thus, studies of dispositional characteristics, such as tendencies toward approach versus avoidance, may confound predictors and outcomes—well-adjusted children may be more likely to possess the skills necessary to engage in adaptive coping and, independent of their coping responses, may be less likely to manifest distress during procedures. Disentangling these alternative explanations would therefore require an experimental paradigm in which the provision of information is randomly determined.

Relatedly, the direction of relations between mediators and outcomes may be even more complicated than described (see two-way arrow between circles 4 and 5). For example, it is suggested that certain types of primary and secondary appraisals may promote better adjustment to medical stressors. Alternatively, children with and without emotional and behavioral difficulties may differ in their appraisals of situations. For instance, disturbed children may be more likely to view stressors as threatening and may possess lower levels of self-efficacy, perceived control, and perceived competence than do nondisturbed children.

Determining the direction of the causal arrows and understanding the mechanisms underlying the coping process require longitudinal designs that include assessment of coping, mediators, and outcome at multiple time points. Moreover, statistical analyses should examine changes in children's adjustment as a function of coping, particularly in light of findings suggesting that problems during and after hospitalization may be explained by prior levels of functioning (Siegel, 1983), and should include direct tests of mediation. Clearly, this ideal methodology is somewhat compromised by the constraints of reality. Pure comparisons of pre- versus poststressor adjustment are possible only when the stressor is predictable, as in the case of routine medical procedures. When the onset of the stressor is unpredictable, as in the case of leukemia, assessment could at least begin prior to the experience of specific acute illness-related medical stressors.

Refining Coping Constructs

In writing this review, we frequently encountered inconsistencies in the way in which coping constructs are conceptualized and operationalized by researchers. These discrepancies seem evident among different domains of coping research and within the medical stressor domain. One major confound, previously mentioned, is a tendency to obscure the boundary between coping responses and outcomes. To use coping as a predictor of adjustment and to avoid circular findings, coping must

be separated from its outcome (Folkman, 1984; Peterson, 1989). Although conceptually this point can hardly be challenged, investigators often differ in their empirical interpretations. For example, physiological measures, such as heart rate, can be viewed as indexes of both coping tendencies (e.g., Melamed, 1982) and outcome (e.g., Hubert et al., 1988). Similarly, information-seeking versus -avoiding tendencies have been viewed as indexes of both approach-avoidance coping style and degree of behavioral distress (Hubert et al., 1988).

As noted earlier, the task of disentangling predictor and outcome variables in the coping literature is quite challenging. As a salient example, see discussions (Folkman, 1984; Folkman & Lazarus, 1988) of the difficulties in distinguishing between cognitions as precursors of coping (e.g., primary appraisals); mediators between stress, coping, and adjustment (e.g., secondary appraisals); actual coping attempts (e.g., emotion-focused or secondary control strategies); or by-products of the coping process (e.g., positive reappraisals). Although by no means a solution to this complex issue, using more precise terminology may help to clarify important distinctions. For instance, because the term *response* alternately has been used to imply *coping response* and *response to stressors*, it is often unclear which construct is being discussed or examined. More important, this lack of clarity in usage translates into methodological ambiguity when predictor and criterion variables become intertwined. Our working definition of coping should lay the groundwork for developing more consistent and precise distinctions among different components of the coping process.

A final related point concerns the need to elucidate the differences between dispositional and situational approaches. Again, standardizing both terminology and assessment methods could advance the field toward this goal. Coping *styles*, *tendencies*, *attempts*, and *strategies* are often used interchangeably, but the connotations of these terms and the way in which they would be operationalized are quite distinct. Specifically, labels such as *styles* and *tendencies* presuppose cross-situational consistency in children's coping, reflecting a dispositional perspective, and they would be better assessed with scales that tap generalized ways of coping. Labels such as *attempts* and *strategies* more readily lend themselves to a situational perspective and would be better assessed with measures that tap coping with specific stressors. Empirically, the dispositional versus situational nature of coping could be evaluated by examining the degree of consistency in children's coping responses across stressors that differ on such dimensions as type, severity, and duration.

Enriching the Assessment of Outcome

Another area that needs further refinement is the definition of positive or adaptive versus negative or maladaptive outcomes associated with medical stressors. As noted earlier, the great diversity in outcome measures and sources of information complicates the task of consolidating results across studies. We do not advocate simplifying this task by standardizing assessment techniques because each technique makes a unique contribution to our knowledge. However, we urge researchers to be cautious in drawing wide-ranging conclusions on the basis of a single type of measure.

To illustrate this point, consider the many components that comprise children's outcomes in the context of painful medical stressors: (a) objective measures of immediate outcome, which may include observations of distress behaviors or physiological indexes of arousal; (b) subjective measures, which may include self-reports of pain sensation or affective arousal prior to, during, or subsequent to a procedure; (c) global measures of short-term adjustment and functioning; and (d) long-term consequences.

For the most part, investigators have focused on objective measures of children's distress during medical procedures or on global adjustment. Yet coping researchers have pointed out that successful outcomes may be "in the eye of the beholder" (Siegel & Smith, 1989, p. 111). In fact, Folkman et al. (1986) defined the immediate outcome of a stressful encounter as "the person's judgment of the extent to which the encounter was resolved successfully" (p. 993). Furthermore, studies have demonstrated discrepancies between children's overt manifestations of distress and their self-reported anxiety and pain (Hilgard & LeBaron, 1982), especially in older children, as well as inconsistencies in the relations between coping and objective versus subjective outcomes (Hubert et al., 1988; Weisz et al., 1994).

In addition, findings regarding short- versus long-term benefits of certain forms of coping (Suls & Fletcher, 1985) indicate that one must be careful in making generalizations about long-term impact on the basis of cross-sectional findings. For example, researchers are only beginning to consider the possible long-term neurophysiological repercussions of early exposure to painful stressors. Because the central nervous system may be altered by nociceptive experiences, repeated exposure to painful stressors may redirect the growth of neural pathways and result in a "nociceptive neural architecture that renders the individual 'pain vulnerable' or 'pain resilient'" (Barr et al., 1994, p. 209). Specifically, it is hypothesized that an increase in dendritic branching may accompany the experience of pain, producing a permanently lower pain threshold (Barr et al., 1994). Therefore, psychological variables could contribute to future pain vulnerability versus resilience through their impact on neurophysiological development. Analogous theories have been proposed to explain how experiences of psychosocial stress early in life may lead to neurochemical and neuroendocrine changes that increase one's sensitivity to later stress (Gold, Goodwin, & Chrousos, 1988; see also "kindling" effect in the depression literature of Post, Rubinow, & Ballenger, 1984).

In support of the hypothesized psychophysiological linkages, preliminary data described earlier demonstrate that coping style and cognitive variables (e.g., secondary appraisal and attention deployment) do influence concurrent nociceptive experiences (e.g., pain sensation and tolerance), physiological responsiveness, and neuroendocrine functioning (Arntz et al., 1991; Barr et al., 1994; Frankenhaeuser, 1986; Litt, 1988; Weidenfeld et al., 1990). The challenge for future researchers is to incorporate knowledge about psychological aspects of pain and coping into theories of developmental neurophysiology. Exploring these processes may be particularly important with young children, whose less mature central nervous systems may allow for increased neural plasticity (McGrath, 1993).

These considerations underscore the importance of advancing beyond attempts to find unidimensional links among stres-

sors, coping, and outcome to a more refined level of analysis that includes exploring which stressors and which ways of coping predict which types of outcome. Furthermore, as discussed earlier, researchers need to examine how the role of specific moderating and mediating variables may differ as a function of specific outcomes. Achieving these goals requires more comprehensive approaches to assessment that reflect the multidimensional nature of pain. Specifically, investigators need to use multiple outcome measures, which assess the sensory, affective, cognitive, behavioral, and physiological-immunological response systems and vary along several key dimensions—for example, objective-subjective, specific-global, short-term-long-term, and stage of the stressor.

Integrating Coping Typologies

As summarized earlier, researchers have constructed numerous systems for classifying coping responses. This conceptual diversity simultaneously provides the benefits derived from a multidimensional framework and introduces confusion as to how these systems map on to each other. Such confusion hampers efforts to integrate diverse findings. One important objective for researchers therefore may be to pool their efforts. Although it may be unrealistic to expect researchers to sacrifice their preferred theoretical frameworks, one realistic step in the future research agenda could involve the formulation of an overarching conceptualization that incorporates the critical dimensions of coping and allows for some uniformity in the interpretation of results.

As an example of how this process may work, we summarized findings regarding one key question addressed in this article, namely the relative efficacy of particular coping modes in predicting children's outcomes. To be included in this summary, we required that each study: (a) pertain specifically to coping with medical stressors; (b) contain discrete measures of coping responses and outcomes/adjustment; and (c) specify the stage of the stressor during which coping was assessed. Nine studies fulfilled these inclusion criteria (Band & Weisz, 1990; Burstein & Meichenbaum, 1979; Field et al., 1988; Hubert et al., 1988; Melamed, 1982; Peterson & Toler, 1986; Siegel, 1983; Weisz et al., 1994; Worchel et al., 1987). Because coping responses were classified according to different systems across studies, two overarching categories were created that best captured the parallels among the systems (although there is clearly not a one-to-one correspondence among the systems): (a) outer-directed coping modes, including behavioral, problem-focused, primary control, and information-seeking or approach coping; and (b) inner-directed coping modes, including cognitive, emotion-focused, secondary control, and passive or avoidant coping.

As noted earlier, contradictory results have been found for the efficacy of these two general coping modes. We hypothesize that this inconsistency can be explained by the fact that coping has been assessed at different stages of the stressor (i.e., preparation vs. encounter). Thus, we reexamined the findings using a 2×2 (Coping Mode $\times$ Stage of Stressor) table. As expected, outer-directed coping predicted better outcomes/adjustment in the six studies that assessed coping prior to the onset of the stressor, whereas inner-directed coping predicted better outcomes/

adjustment in the three studies that assessed coping during the encounter phase.³ This pattern is consistent with an interactional perspective, which emphasizes the impact of the match between coping response and stage of stressor (stage, of course, may also be associated with stressor controllability). Although relatively simplistic, this exercise demonstrates the potential value of finding commonalities among different coping paradigms. In this case, collapsing across studies provided a means to understand apparent inconsistencies in the literature.

Expanding the Conceptual Models

As the literature on children's coping advances toward a level of greater complexity, more refined models of coping will be needed. Constructing such models requires moving from approaches that view coping in terms of single, mutually exclusive categories to approaches that view coping as a multifaceted process. For example, Dennig (1994) developed a multidimensional conceptual model for characterizing children's coping in the context of painful medical stressors. Her "COPE" system classifies coping responses and goals along four separate, nonorthogonal dimensions: (a) *Control*—primary versus secondary; (b) *Orientation* (toward or away from the stressor)—attention versus distraction; (c) *Process* (specific categories of coping thoughts and behaviors)—information seeking, support seeking, emotion regulation, and direct action; and (d) *Environmental match*—the degree of match or mismatch between the child's coping goals or responses and the parent's method of facilitating coping.

The COPE system—an elaboration of previous models proposed by Weisz and colleagues (e.g., Weisz et al., 1994)—is among the first to incorporate a method for coding both coping responses and goals. This feature may be an important component of multifaceted theoretical models because the same coping response may be implemented for multiple purposes, even within the same situation. For example, a child who cries before receiving an injection may be striving for primary control in the form of avoiding the shot but may realize that, even if the injection occurs, crying will at least elicit emotional support and, perhaps, a lollipop. As this example suggests, studying coping may require studying multiple aims underlying a single response.⁴

More sophisticated conceptual models may also need to consider children's overall coping repertoires, profiles, or temporal sequences of coping responses, not just their primary modes of coping. To capture this complexity, Weisz and Dennig (1993) suggested the term *layered coping*, defined as "the use of a hierarchy of ordered strategies." For instance, a child receiving a BMA may first attempt to use distraction to reduce the experience of pain. If unsuccessful, this response may be replaced by coping self-statements that emphasize the child's ability to withstand the pain.

Finally, coping episodes may involve concurrent or reciprocal coping responses. Such combinations of responses may exert either potentiating or competing influences. For instance, Folkman (1984) pointed out the inevitable interplay between problem-focused and emotion-focused coping in most stressful encounters. Because heightened arousal or negative emotions may

impede one's ability to implement problem-focused strategies effectively, children may simultaneously use multiple coping responses to address different aspects of the stressor. Thus, rather than studying various forms of coping in isolation, researchers must address the interdependence of children's attempts to exert control over painful situations and to regulate their distress.

Differentiating Knowledge and Performance

Another issue that few coping researchers have addressed is the distinction between children's knowledge of appropriate coping techniques and their capacity for successfully executing them (see Weisz & Dennig, 1993). To date, the preponderance of information about children's coping comes from self-report measures, but these reports may not always reflect reality. Several variables may differentiate children's self-reports from their actual coping. On the one hand, children's cognitive and linguistic abilities may be less advanced than their behavioral competence, thereby restricting verbal descriptions of their coping. For example, decreased introspective ability and memory capacity may interfere with accurate reporting. Alternatively, comprehension of adaptive coping does not necessarily ensure that children will be able or willing to use appropriate strategies. For instance, cognitions (e.g., appraisals of controllability or self-efficacy) and emotions (e.g., anxiety or anger) may mediate between children's knowledge and production of coping responses. Finally, social desirability or response bias effects may lead children to misrepresent their typical coping patterns.

Several steps can be taken to remedy this problem. First, researchers need to provide empirical data concerning the link between children's hypothetical generation and in vivo implementation of coping responses. Second, researchers should explore the relative usefulness of self-reports, reports by significant others, and behavioral observations in predicting outcomes. Finally, because children's perspectives are essential to learning about their coping repertoires, researchers should develop alternative self-report methods that allow for more accurate descriptions of coping. For example, self-reports may be facilitated in younger children by including the opportunity to respond both verbally and behaviorally (e.g., using role-plays or props).

Applying a Developmental Framework

Throughout this review, we underscore the role of development as a moderator of stress-coping-outcome relations. Developmental approaches generally have assumed the form of examining interindividual differences—for example, assessing the main effects and interactions of age with coping variables. We note age differ-

³ In one of the three studies (Field et al., 1988), coping was assessed in terms of a generalized style (i.e., sensitizers vs. repressors), but validation data indicated a significant relation between this style and actual coping during the medical procedures, so this study was included.

⁴ In this particular example, crying is viewed conceptually as a volitional coping response because it is associated with a purposeful intention to achieve specific goals. At times, however, crying may reflect a spontaneous emotional reaction to stress exposure.

ences in children's conceptualizations of pain, use of specific coping responses, coping efficacy, cognitive appraisals, and outcomes/adjustment. Other aspects of children's coping may also change with increasing maturity. For example, as internal resources for coping become more sophisticated, children may rely less on external sources of support. This transition may diminish the role of parental influences at later developmental stages. Furthermore, children's coping goals may change over time as they emphasize different aspects of the challenge presented by medical stressors (e.g., avoiding pain, maintaining control, and protecting self-esteem). Empirical work will be needed to examine changes in these and other aspects of children's coping across development.

An alternative developmental approach would be to examine the unfolding of coping processes over time. For example, what is the impact of past exposure to medical stressors on future coping? How do experiences and coping outcomes at one developmental stage influence appraisals of and reactions to later stressors? Does experience in coping with other types of stressors facilitate or impede children's coping with medical stressors? What is the process by which children acquire adaptive or maladaptive styles of coping? Finally, does exposure to medical stressors have a long-term impact on physiological processes and immune system functioning? Answering questions such as these will allow researchers to place children's coping into a broader context that takes into account the reciprocal influences between coping and adjustment across the life span.

A third developmental perspective could focus on the interaction between interindividual differences and intraindividual changes. To illustrate this approach, we consider two earlier questions: (a) How do experiences and coping outcomes at one developmental stage influence appraisals of and reactions to later stressors? and (b) Does exposure to medical stressors have a long-term impact on physiological processes and immune system functioning? With regard to the first question, the influence of prior exposure may be markedly different, depending on children's cognitive constructions of their experiences. For instance, self-concept tends to be more situationally bound and less global at earlier developmental stages and becomes increasingly integrated over time (Harter, 1988; Schorin & Hart, 1988). Consequently, whereas an older child may view a perceived failure to cope with a stressor as indicative of overall incompetence and as predictive of later similar failures, a younger child may place less importance on a single experience. Additionally, as self-concept and cognitive appraisal processes crystallize over time, youngsters may become less able to reshape their beliefs in reaction to feedback from later experiences. Negative beliefs about, for example, self-efficacy or control may then alter future coping responses by leading to passivity (e.g., relinquished control) or to catastrophization.

A similar developmental analysis can be applied to the second question. The physiological impact of previous stressors may depend on the stage at which the original stressors are experienced. First, stressors may be more or less physiologically damaging, depending on the maturity of children's central nervous systems (as discussed earlier). Second, timing of the initial stressors would be linked to children's cognitive-developmental level and, as noted earlier, cognitive appraisals of stressors may actually alter physiological processes.

Clearly, to advance understanding children's coping, psycholo-

gists must construct developmentally sensitive models, rather than assuming continuity between child and adult processes or between functioning in youngsters at different developmental levels. Such developmental models will need to consider interindividual differences (i.e., the impact of age or other aspects of development on the coping process), intraindividual influences (i.e., the impact of children's own prior experiences on their future coping and adjustment), and interactions between the two.

Adopting a Multidisciplinary Approach

Finally, we must emphasize the potential benefits of integrating diverse bodies of literature. In this review, we attempted to assume a multidisciplinary perspective, encompassing theory and empirical data from research on children's coping with painful medical procedures, the general coping literature, and investigations of psychological and physiological components of pain. Such an approach may not only aid in the identification of key theoretical and methodological issues but also have critical ramifications for intervention with children undergoing painful medical procedures. We hope the current review stimulates interdisciplinary efforts toward understanding and enhancing children's coping and alleviating pain and distress in the medical setting.

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Received June 28, 1994

Revision received January 12, 1995

Accepted January 13, 1995 ■