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Abstract and Keywords

The purpose of the present chapter is to provide an overview of key issues involving the definition and assessment of major life events for researchers interested in the effects of life stress on a wide range of disorders. General conceptual and definitional issues are addressed initially, and a conceptual heuristic is proposed for guiding inquiry on major life stress and human disorder. This heuristic is drawn upon to develop principled practices for assessing, operationalizing, and finally quantifying major life events. Throughout the chapter, contemporary approaches for research on major life events are evaluated, their relative merits and shortcomings discussed, and their psychometric credentials formally compared. In closing, we consider future directions for research on major life events and their implications for health and disease.

Keywords: life stress, stressful life events, assessment, human disorder, health, disease

> Central to the concept of natural selection (Darwin, 1859)—the struggle for existence—is the idea that the dynamic physical and social environments are full of obstacles, dangers, challenges, and threats. They must be met with appropriate, discriminated, integrated (organismic) responses that protect the organism. They must be overcome so that the organism survives to reproduce.
>
> —Herbert Weiner (1992, p. 2)

The purpose of the present chapter is to provide an overview of key issues involving the definition and assessment of major life events, which we consider to be the "obstacles, dangers, challenges, and threats" that are imposed by the dynamic physical and social environments people must overcome throughout their lives. Although there are many types of circumstances that are more or less stressful, we focus on major life events given that they typically impose substantial acute, adaptive demands upon the individual and

can have significant implications for mental and physical health. Other forms of life stress, such as early life stress during infancy or childhood, chronic stress, and daily or minor stressors, are covered elsewhere in the volume (see Chapters 2–4, this volume).

We first address general conceptual and definitional issues with which investigators must grapple, and we propose a conceptual heuristic for guiding inquiry on major life stress and human disorder. We then draw upon this heuristic to develop principled practices for assessing, operationalizing, and finally quantifying major life events. Informed by this analysis, throughout the chapter we evaluate common approaches for understanding major life events in contemporary research, discuss their relative merits and shortcomings, and formally compare their psychometric credentials. In closing, we consider future directions for research on major life events and their implications for health and disease. Our intent is to provide an overview of the topic that is useful to researchers interested in the effects of life stress for a wide range of disorders, and we seek to conduct their studies using conceptually informed and methodologically sound procedures.

General Conceptual and Definitional Issues

Historical and Contemporary Considerations

> The present state of knowledge, as I understand it, suggests that if one wishes to study the relation between a social variable and a health variable, one should begin with the hypothesis that both kinds of variables are often loosely and variously defined … and that the results of any investigation may be dependent upon the definitions and methods of measurement that are used…. It follows that one should first make as precise, as complete, and as concrete a definition and measurement of the social variable as one can.
>
> —Hinkle (1974, p. 335)

"Stress" is an extraordinarily popular term, a "social variable" relevant in scientific circles and in common everyday parlance. Many studies have documented a variety of psychological and medical conditions associated with stress (e.g., Cohen, Janicki-Deverts, & Miller, 2007; Slavich, 2016). These sources of evidence, however, are based upon a plethora of assessment and measurement practices. These diverse approaches differ substantially in the procedures adopted, and in turn they yield evidence of varying degrees of scientific evidence. It is probably safe to say that not a day goes by when a person does not hear or use the term "stress" or "stressful" at least once. Indeed, stress is readily invoked in the absence of reliable research evidence, to casually explain away mysterious disorders—an etiological "placeholder" for conditions of unknown or poorly understood origins (Monroe, 2008). Unfortunately, the sheer popularity of the idea of

stress in scientific, clinical, and social circles has become an impediment to understanding what stress might "be" and how it may confer susceptibility to disorder and disease (Monroe & Slavich, 2016).

Current research on life stress continues be such that, in the past words quoted earlier, both the social and health variables are "loosely and variously defined," and much of the existing corpus of evidence is "dependent upon the definitions and methods of measurement that are used." Perhaps most critically, progress has not been made in making "as precise, as complete, and as concrete a definition and measurement of the social variable as one can" (Hinkle, 1974, p. 355). These are humbling observations—first penned nearly a half-century ago—which point to ongoing conundrums regarding "stress."

On Defining Stress

Since its infusion into the modern research culture by Hans Selye, the term "stress" has defied "precise," "complete," and "concrete definitions." Selye himself apparently struggled with the term over his life and lamented, "Everybody knows what stress is, and nobody knows what it is" (Selye, 1973). Indeed, one early critic of Selye's work in the 1950s quipped, "Stress, in addition to being itself, was also the cause of itself, and the result of itself"' (Humphrey, 2005).

One enduring obstacle has been that "stress" often refers to different and distinct components of a sequential process. For example, some theorists and researchers have used "stress" to describe exposures to the external environment—specifically the changing objective circumstances to which the organism or individual is subjected (e.g., relationship loss, job termination, natural disaster, etc.; Dohrenwend & Dohrenwend, 1974). Alternatively, others have focused on the psychological and physiological responses to environmental exposures (e.g., subjective distress, cortisol levels, emotion circuitry of the brain, and so on). Finally, yet others have enlarged the temporal scope encapsulating ongoing sequential iterations between exposures and responses over time, wherein exposures are "coped with" through responses, altering the environmental circumstances and changing the nature of the subsequent adaptive demands requiring further responses (e.g., transactional and whole organism models of stress; Lazarus & Folkman, 1984; Weiner, 1992).

As a result of blurring these related theoretical pieces that represent components of a sequential and progressive process, the concept of stress continues to be unacceptably vague and indistinct. Every decade or so there are renewed clarion calls to terminate the confusion, to abandon or replace the term "stress," along with the cacophony of associated connotations. (For a recent series of such interchanges, see Kagan, 2016, and responses by Cohen, Gianaros, & Manuck, 2016; McEwen & McEwen, 2016.) These dire requests to end the terminology of stress, however, may be premature or too sweeping in

scope. As discussed next, a more productive approach can build upon past work and begin to provide a more secure and productive pathway forward.

The Missing Environment

Recently, Hammen observed, "Ironically, environmental stress has often been a silent player in human studies of stress processes" (Hammen, 2016, p. 335). This eminent life stress investigator noted that the environmental conditions to which individuals are exposed frequently are omitted from the investigative agenda. In its place, many researchers *presume* stress to predominantly represent not "what is going on in the person's world," but rather "what is going on in their minds about their world" (Hammen, 2016, p. 336). In other words, Hammen (2016) contends that stress responses have been accepted as consequences of different physical and social environmental exposures, but without a research agenda explicitly taking into account the nature of the environmental exposures involved. She emphasized that "stress experiences and exposure have been conceptually or empirically neglected or inadequately conceived, or measured poorly, or measured narrowly in psychopathology research" (Hammen, 2016, p. 336).

Relatedly, Harkness and Monroe (2016) recently brought attention to the underappreciated importance of precise and independent specification of the environmental conditions to which individuals are exposed. They complement Hammen's (2016) insights and argue that without explicitly taking the environment into account, information about stress responses is severely compromised and is perhaps rendered meaningless or misleading. We address this paradoxical situation next, outline a conceptual heuristic for prioritizing information about the environmental exposures, and illustrate how such advances could significantly enhance research on life stress.

Prioritizing and Integrating the Environment Into Stress Research

Theoretical models of stress–disorder relations begin with the assumption that environmental challenges and demands elicit responses that are intended to be adaptive for addressing acute, pressing needs. Over more prolonged periods of activation, however, these responses can become detrimental for psychological and physical health (e.g., McEwen & Gianaros, 2011; Shields & Slavich, 2017). From this standpoint, stress exposures *precede* and *precipitate* stress responses, which in turn, eventually result in potential pathogenic processes. Figure 1 provides a schematic illustration of this serial course and the types of factors involved. Several key implications follow from this straightforward characterization of the fundamentally sequential nature regarding the temporal dynamics of the stress process (see Harkness & Monroe, 2016).

Major Life Events: A Review of Conceptual, Definitional, Measurement Issues, and Practices
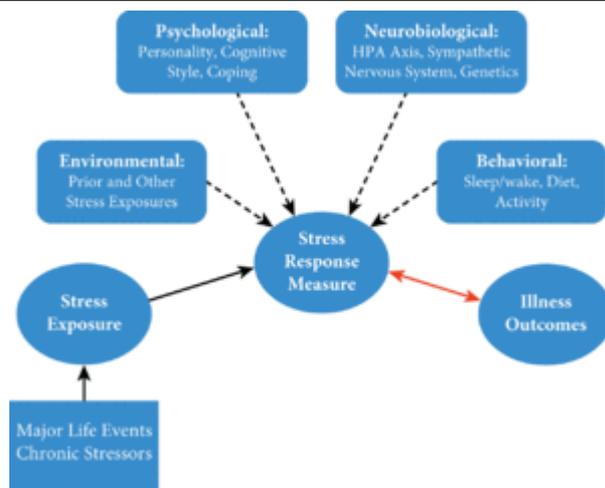

Figure 1 Stress exposure and the multidetermined measures of stress responses

(adapted from Harkness & Monroe, 2016).

First and most apparent, without an initial environmental challenge there is no stress response. But without explicitly taking the environment into account, this matter simply cannot be determined, which leads to serious problems. As indicated in Figure 1, environmental exposures are only one of many factors that influence the ongoing and/or "downstream" psychobiological status of the person that impact stress response measures. Even under tranquil environmental circumstances some individuals will have perturbations in mind or body resulting from influences unrelated to stress, yet still will give rise to an *appearance* of stress activation (i.e., due to the multitude of factors unrelated to stress affecting the person's psychobiological state). For instance, some people will have elevated cortisol or heightened psychological distress for reasons other than a recent stressful exposure. Ironically, by not directly assessing environmental exposures, researchers place themselves in the awkward and ultimately unproductive position of studying people who evidence stress "responses," but who have no discernable stressful exposures.

The multidetermined nature of psychological and biological states that are correlated with stress response indicators places significant constraints on what can be inferred from much of the existing research on life stress. By not incorporating measures of stress exposures and instead relying only on measures of stress responses, it is not possible to evaluate to what degree a particular individual's stress responses is attributable to prior environmental demands versus individual differences in other psychological or biological attributes (see Figure 1). This also means that responses to stressful environmental exposures are easily obscured or masked owing to the diluting effects of the myriad other factors affecting the state of the person. In summary, to be able to reliably detect any stress response, a strong effect of the stress exposure is required—well above and beyond the cumulative effects of the multitude of other influences involved. The attenuation of effects attributable to environmental exposures by the influences of the other factors involving stress response systems could explain the tenuous effects often reported in research on stress responses, and the lack of replicability of findings across studies.

Major Life Events: A Review of Conceptual, Definitional, Measurement Issues, and Practices

Even more scientifically worrisome, researchers are not always able to ensure that the psychological and biological status of the person is independent of the pathological processes attributable to the disorder under study. Indeed, in many instances the psychobiological condition of the individual may be contaminated by, or confounded with, the early antecedents, correlates, or consequences of the psychological or physical disorder in question (see Figure 1). For instance, elevated cortisol levels commonly follow exposure to stressful circumstances (e.g., Dickerson & Kemeny, 2004). However, elevated cortisol levels also are very common in depressed people (e.g., Jarcho, Slavich, Tylova-Stein, Wolkowitz, & Burke, 2013; Stetler & Miller, 2011). If the investigator relies solely upon stress responses (i.e., cortisol as an indicator of stress), he or she cannot determine if the heightened cortisol is a consequence of stressful exposure(s) or an artifact of—and therefore confounded with—the incipient psychobiology of major depression. Concerns such as these are too frequently yet severely limit the causal inferences that can be drawn from studies examining links between stress response and disease (Harkness & Monroe, 2016).

Second, stress response systems evolved over time to enhance adaptation to a wide range of environmental exposures and threatening demands (Weiner, 1992). As a result, stress responses possess little if any inherent meaning independent of stress exposures; rather, they are consequent to, and thereby a function of, the types and degrees of environmental challenges faced by organism. This means that stress responses become meaningful only when understood in the context of the eliciting circumstances or adaptive demands that a person is confronting. Phrased differently, stress responses can only be understood in light of their precipitating social or physical circumstances (Monroe & Roberts, 1990). It is the *interaction* between stress exposures and stress responses that lies at the conceptual heart of stress research (e.g., Hankin, Abramson, Miller, & Haeffel, 2004; Harkness & Monroe, 2016; Monroe & Simons, 1991; Moore & Depue, 2016).

Third, a prerequisite for research on stress responses is the preliminary yet foundational demonstration of a functional relationship between stress exposures and pathological outcomes. Otherwise, research on stress responses has no effects of environmental exposures to explain. If associations are detected with "stress responses" without taking exposures into account, once again such effects can be more parsimoniously explained by other influential factors (e.g., neuroticism) or by confounding factors (e.g., attributable to effects of the disorder) (see Figure 1). As psychologist Ray Hyman once dryly commented, "Don't try to explain how something works until you find out that it works" (Hall, 2014, p. 23).

Lastly, the nature of the environmental exposures faced by the person necessarily delimits and informs the kinds of responses available to address the particular types of challenges imposed. Stress exposures provide very useful theoretical clues about which kinds of stress responses should be considered and assessed. In a sense, conducting research on stress responses without attention to their hypothetical origins can be seen as placing the empirical cart before the theoretical horse (Harkness & Monroe, 2016).

Overall, stress research could benefit greatly from investigating stress responses within the theoretical context of their environmental origins. For present purposes, we focus on major life events as one class of environmental exposures that can be studied to better understanding the implications of stress processes for health and well-being. Along these lines, we now turn to some of the theoretical and methodological considerations for conducting research on major life events.

Assessing, Operationalizing, and Quantifying Major Life Events: Principles and Practices

At a general level, major life events can be defined as "environmental changes that have a definable beginning point in time and that would be expected to be associated with at least some degree of psychological threat, unpleasantness, or behavioral demands" (Harkness & Monroe, 2016, p. 729). Examples include beginning or ending an important personal relationship, starting or terminating employment, incurring a serious illness, changing residence, and so on. An ongoing challenge for stress researchers has been how to translate theoretical examples of life events such as these into scientifically sound operational definitions of the environmental exposures—namely major life events.

One obstacle is that "life events" often have an illusory simplicity about them—a seemingly intuitive obviousness and face validity—that often undermines methodologically credible measurement practices. Marriages, divorces, births, and deaths all have a familiar "ring" to them; all seem to be pretty obvious kinds of experiences to which everyone can readily recognized and relate. But such appearances often are deceiving. For example, when is a life event not a life event? Or perhaps more properly stated, when is an environmental exposure, or change in a person's life circumstances, not sufficiently severe or impactful so as to qualify as a "major life event"? This is a core matter around which opinions vary, over which research traditions have clashed in the past, and indeed about which little resolution has been achieved to this day. The disagreements stem from opposing—and perhaps irreconcilable—assumptions about how the fundamental task of measurement should be undertaken (Brown, 1974, 1989; Monroe, 2008).

A goal for research, therefore, is to provide a standardized system for operationalizing people's recent life experiences as the presence or absence major life events believed to confer susceptibility to disorder. Such a system should be reliable over time and replicable across investigators. To comply with these basic standards, investigators need to adopt sensitive procedures for gathering extensive initial information about people's lives (i.e., assessment), employ reliable decision rules for determining which exposures qualify (or not) as major life events and rate these exposures along theoretically-relevant dimensions (i.e., operationalization), and implement consistent procedures for representing the processed information as a summary index (i.e., quantification) (McQuaid et al., 1992). We adopt these serial phases as a convenient way to represent the overarching measurement process, and we portray the general objectives and specific tasks for each phase in Figure 2.

Major Life Events: A Review of Conceptual, Definitional, Measurement Issues, and Practices
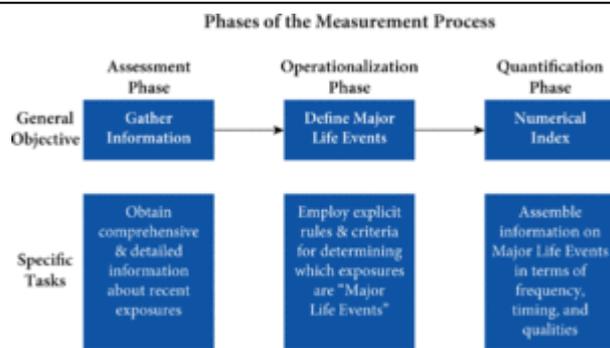

Figure 2 Phases of the measurement process for major life events.

The Assessment of Major Life Events

A guiding principle in the assessment phase of life stress is theoretical: What is it about the social or physical environment that is potentially important for understanding the origins of psychopathology or disease (Harkness & Monroe, 2016; Monroe, 2008)? By focusing on major life events, we assume that large-scale life changes represent reasonable conceptual candidates; consequently, we restrict theoretical attention to environmental changes of sufficient magnitude "that would be expected to be associated with at least some degree of psychological threat, unpleasantness, or behavioral demands" (Harkness & Monroe, 2016, p. 729).[1] Since the focus is on *major* environmental exposures, sufficient information must to be gathered about all possible exposures to provide a basis for subsequently determining what constitutes "major" and what does not. The initial assessment phase, then, refers to the means via which this "front-end" all-inclusive information is obtained about a person's recent life circumstances. This initial stage in turn becomes the foundation upon which the next two stages depend. As next explained, there are two primary approaches for assessing someone's recent life circumstances (see Figure 2).

Major Life Event Assessment Alternatives

One general approach utilizes structured or semistructured interview protocols (Monroe, Slavich, & Georgiades, 2014). Trained interviewers cover a broad and open-ended range of possible exposures, providing multiple openings to help respondents recall and talk about their recent experiences. A calendar commonly is used to assist with recall, help with accurate dating, and thereby ensure ascertained exposures predate the onset of the disorder under study. By design, the interview procures detailed information about a broad range of environmental exposures and situations occurring over the recent past (e.g., 3 months to a year). This is because sufficient information about all exposures will be needed to make judgments about which events qualify as a "major life event." The interviewer is responsible for gathering all of this foundational information, which he or she does by encouraging an open dialogue with the respondent to develop a common understanding regarding the basic meaning, or "spirit," of any particular life event (e.g.,

"collaborative cognition" through discussion to clarify that reports of recent exposures are consistent with the a priori definition of the major life events the researcher intends to assess; Belli, 1998; Monroe, 2008; Schwarz, 2007).

During a life stress interview, for example, an individual might respond affirmatively to a query about a recent "break-up of an important relationship." Upon further probing, however, the interviewer might learn that the event happened to another person (e.g., sibling, child, friend) or that it was not major (e.g., after a date or two, the couple agreed to only be friends). Most important, this example conveys a critical point: any exposure or change is not automatically a "major life event." Indeed, as we discuss later, many exposures reported by study participants do not meet the formal operational requirements to qualify as a major life event (McQuaid et al., 1992; McQuaid et al., 2000; Monroe, 2008).

An alternative approach for assessing the initial information about a person's recent life circumstances utilizes self-report checklists. These contain a variety of commonly experienced life events (e.g., the SRE, Holmes & Rahe, 1967; the Life Experiences Survey, Sarason, Johnson, & Siegel, 1978). This highly popular and convenient approach requires study participants to decide which life events have been recently encountered, thereby eliminating the need for a "middle person" (i.e., interviewer). Life events are typically listed as brief stem descriptors of different exposures (e.g., "change in health of family member," "personal injury or illness," "change in financial status"; Holmes & Rahe, 1967). Since only a finite number of possible exposures can be included (e.g., roughly 40 to over 100 life events), different self-report life event checklists have been developed to assess environmental exposures for specific populations (e.g., adolescents are unlikely to be taking out mortgages; midlife adults are unlikely to be failing important exams at school; etc.; Dohrenwend, 1974). Study participants are instructed to report all of the life events that they have encountered in the recent past (e.g., ranging from the past month through the past year).

Evaluative Comments

The objective of the assessment phase is to gather extensive information about people's lives for making determinations about which exposures qualify as a major life event. With this objective in mind, two distinctions between these alternative research practices can be made. First, in terms of practicality, self-report checklists are without question far less costly in research time and expense. Large numbers of people can be assessed relatively quickly and economically. Second, with respect to the primary objective of the assessment phase, interview-based procedures are without question better able to gather more comprehensive information. Interview-based procedures also are superior in terms of coverage of potential exposures (i.e., checklists only contain a subset of the range of possible exposures), as well as in terms of supplying richly detailed information about the exposures and more broadly about the respondent's general life circumstances.

Pivotal questions concern whether or not the practical conveniences afforded in the assessment phase with self-report checklists are worth the loss of detailed information about participants' lives, or they are worth the potential scientific compromises entailed. These questions, however, can only be fully evaluated within a consideration of the subsequent two phases of the measurement process. We address the operationalization phase next.

The Operationalization of Major Life Events

The objective of this second phase in the measurement process is to cull from the general information about the ongoing ebb and flow of a person's life and to define the kinds of environment exposures that qualify as "major life events" (see Figure 2). When any particular environmental exposure constitutes a major life event, though, is not as intuitively obvious as it might seem, and it can be a surprisingly challenging task. In the following, we first present the basic principles confronting researchers for operationalizing major life events. Throughout we draw upon concrete examples to help illustrate requirements for this definitive phase. We then present the two major approaches—namely, interviews and self-report checklist approaches—and evaluate them in light of these standards.

Basic Principles: Defining and Differentiating Major Life Events

Deciding upon what does and does not constitute a major life event lies at the heart of the research enterprise. In theory and practice, however, there are many ways "major life events" can be defined and operationalized. For research to progress and provide cumulative knowledge, basic research principles dictate that the procedures are standardized and replicable.

Information about environmental exposures gathered from the initial assessment needs to be leveraged in a systematic manner to inform decisions about which recent life changes do or do not constitute a major life event. There are two parts to this task. First are threshold considerations: What determines if an exposure is of a sufficient magnitude to be declared a major life event? Distinctions must be made between what counts as "major," "minor," and "no" events. This is because, as described previously, not all exposures are necessarily major life events (e.g., break-up of an "important relationship" that happens to involve a casual friend, or which occurs after 1–2 dates). To make such decisions reliably, operational criteria and decision rules are used. This increases confidence that different researchers will handle information in similar ways (e.g., requiring that the event directly involves the study participant or a significant other; including only "break-ups" that meet specified criteria, such as duration, intent to marry, etc.).

Second, and less immediately apparent, life events often are not isolated or independent occurrences. They frequently are the causes, consequences, or correlates of other life events or circumstances. On the one hand, apparently different life events may simply

represent the same experiences (i.e., two life events reflect the same exposure, and are redundant). For instance, a participant might respond affirmatively both to questions about a "traffic accident" and about "troubles with the law." However, both events could reflect the identical environmental circumstance. For example, an individual was involved in a traffic accident and received a ticket for a driving infraction that resulted in the accident. Investigators must thus avoid the potential trap of erroneously inflating the stress measure due to inclusion of simple redundancies in the processed information.

On the other hand, different kinds of associations between life events frequently are even less apparent and thus more methodologically challenging. One common situation pertains to how some exposures increase the likelihood of other exposures happening (e.g., serially related events). For instance, a close friend or relative may become seriously ill, a week later he or she is hospitalized, and 2 weeks later he or she dies. Does such a scenario count as one, two, or three major life events? There are many variations on this same theme that arise in people's lives that need to be handled in a consistent manner. For example, some life "calamities" incorporate a number of intrinsic facets that, on the surface, might appear to be several different major life events (e.g., one very major event and its rippling out into additional exposures). A marital break-up may or may not involve serious arguments with one's spouse, changes of residence, loss of income, infidelity, reconciliation, loss of friends, and so on. Should these changes in someone's recent life circumstances be defined by one overarching major life event or by several major life events that are causally intertwined components or consequences of the overarching event?

Another type of association between major life events and people's life circumstances involves chronic stressors. Chronic stressors are distinct from acute life events with regard to their recurring and/or enduring nature, and they have different effects than acute life events (Muscatell, Slavich, Monroe, & Gotlib, 2009). Examples include prolonged marital strife, chronic illness, persistent financial difficulties, and unemployment (Hammen, 2005; Harkness & Monroe, 2016). Many exposures can appear superficially to be acute major life events. However, as one learns more about the person's life situation, it becomes apparent that there is an enduring environmental problem that occurs repeatedly or unendingly over time. For instance, "troubles at work" or "arguments with spouse" may reflect single, acute major life events; however, they may also be indicators of something more enduringly troublesome, persistent, or chronic in a person's employment or marital life.

Conceptually, acute and chronic stressors have distinct theoretical implications with respect to the psychobiology of stress and potential susceptibility to illness (e.g., Hammen, Kim, Eberhart, & Brennan, 2009; Monroe, Slavich, Torres, & Gotlib, 2007). Consequently, acute and chronic environmental exposure should be assessed and evaluated independently. Measurement practices need to avoid confounding acute life events and chronic stressors, which could inadvertently inflate either category. Standard practices are required for determining when to collapse repeated exposures into one overarching chronic stressor (e.g., marital disputes occurring on a regular basis become

part of the rating of chronic stress and are not each rated also as separate acute life events). Measurement practices, though, still need to provide guidance for determining when acute life events, even if associated with a chronic stressor, represent a substantial acute change in the chronic stressor stressful exposure and thereby merit an independent rating (e.g., physical violence for the first time within an ongoing marital difficulty) (Harkness & Monroe, 2016).

A different form of interconnectedness that is important to take into account pertains to major life events that are concomitants or consequences of illness. As pointed out many years ago (Hudgens, 1974), major life events can reflect the presence (e.g., changes in eating, sleeping, or social habits) or the consequences (e.g., problems at work or with relationships) of disorder. Another methodological imperative is to establish that such confounding does not spuriously inflate the number and kinds of major life events, and speciously account for associations between major life events and illness.

Interview-Based Approaches

Interview-based approaches can be divided into two common practices for operationalizing major life events: interviewer-scored and investigator-based systems (Brown, 1989; Harkness & Monroe, 2016). In the interviewer-scored systems, interviewers decide which exposures qualify as a major life event. Typically, at least some prespecified operational rules, decision criteria, or guidelines are provided to assist the interviewer with, and promote standardization of, the operational system. Examples of interviewer-scored systems include the Kendler Life Stress Interview (LSI; Kendler et al., 1995), the Brief Life Event List (ISEL; Paykel, 1997), and the Structured Life Events Inventory (SLI; Wethington, Kessler, & Brown, 1993)

Investigator-based systems differ from interviewer-scored systems in that the stress exposure information gathered is subsequently presented to a blind panel of independent trained raters. The presenter, who is typically the person who conducted the interview, withholds information about participants' reactions to the exposures, as well as their clinical status (i.e., whether or not he or she developed the disorder under study). The purpose of this intermediate step is to ensure that decisions about defining exposures are kept separate from knowledge about a participant's subjective responses or subsequent morbid status (see Figure 1). Indeed, if raters are aware that a person was upset by a particular exposure, or that he or she has or has not become ill, then they could be biased in their ratings (e.g., elevating a minor event to a major event). Without such methodological precautions, it cannot be assured that confounding biases, and not the exposures, account for any associations between the stress measures and adverse outcomes.

Investigator-based approaches also differ from interviewer-scored approaches with respect to how decisions concerning recent exposures are made. In general, investigator-based systems provide raters with opportunities to consult written materials, as well as time to discuss and clarify decisions before final consensus judgments are rendered. As in the case of the interviewer-scored systems, typically there are at least minimal

operational rules, criteria, and guidelines that are prespecified to standardize ratings (see later). Examples of such systems include the Life Events and Difficulties Schedule (LEDS; Brown & Harris, 1978), the UCLA Episodic Life Event Interview (Hammen, 1991), and the Standardized Event Rating System (Dohrenwend, Raphael, Schwartz, Stueve, & Skodol, 1993).

As indicated, both interviewer-scored and investigator-based systems typically incorporate manuals that provide a priori guidelines, criteria, and examples for deciding when an exposure counts as a major life event. Probably the most elaborate and widely known system is the Life Events and Difficulties Schedule (LEDS), developed by George Brown and Tirril Harris (Brown & Harris 1978). The LEDS includes an extensive manual that provides explicit decision rules and operational criteria for (1) defining and rating acute and chronic life stress, (2) distinguishing between complex constellations of acute and chronic forms of stress, and (3) rating the severity of major life events and chronic difficulties using a comprehensive, 500-page manual that includes approximately 5,000 case exemplars to help raters anchor and standardize their assessment decisions. Some examples help to illustrate how such procedures are implemented.

With respect to defining and distinguishing major life events, a number of guidelines have been established within the LEDS system. For instance, one issue concerns the person who was the primary "focus" of the event (i.e., who was mainly affected by the exposure?). As noted previously, respondents often are very inclusive in reporting recent exposures and bring up life events that mainly happened to others in their social sphere (e.g., friends, family members). The LEDS distinguishes between self- and other-focused events, setting higher criteria for inclusion of the latter (with case exemplars provided to assist with such decisions). Another issue concerns how associated exposures are addressed in the measurement system (e.g., event sequences and "overarching" complex events that have many other associated events, as explained earlier). For instance, how might the example of an illness followed by a hospitalization be handled? Is this one event or two?

More generally, elaborate determinations involving sequences of exposures, multifaceted or compound exposures, and associations between acute major life events and chronic stressors are processed with the application of similarly designed prespecified rules and guidelines (see Brown & Harris, 1978). These operational guidelines are based on rationale assumptions about the types and severity of the exposures, but they are inevitably arbitrary to some extent. For example, with regard to major depression, substantial evidence indicates that only major life events that include the respondent as a "focus" of the event are critical for onset, and not major life events that primarily impact other individuals within the respondent's social field (see Brown & Harris, 1978). The virtue is that any arbitrary element is treated in a standardized manner, which can allow for further research to evaluate the validity of the presumption. Overall, these procedures guide decisions and enhance the standardization of operationalizing major life events.

The LEDS and related interview-based systems take the measurement of major life events one step further by incorporating procedures to make the objective ratings more personally sensitive to the unique characteristics of the individual's life situation (Brown & Harris, 1989; Hammen, 2005). Drawing upon the wealth of information from the interview, raters can use both the "big picture" and the personal details of the respondent's biographical circumstances to operationalize a major life event and to adapt and fine-tune the scoring of each life event. These "contextual ratings" serve to place the exposure in the broader life circumstances for each individual, thus increasing the likelihood that the personal meaning and impact of the life event will be represented in the final ratings.

The rating of a woman's pregnancy provides an example of how contextual ratings work. This event has a standard base value in the LEDS manual, but it can be modified depending upon the particulars of the respondent's life situation. For example, if the woman is in a stable relationship, the pregnancy was planned, and there are adequate financial resources, then the event "pregnancy" typically will be rated in a standard manner. However, the event would be rated more severely for a woman with an unplanned pregnancy, without a partner, without financial resources, and with four other children. In essence, raters draw upon the wealth of information from the interview to infer the meaning and impact of the exposure for the average person in a similar life situation, but without compromising the independence of measurement for exposures and responses.

Lastly, the LEDS and similar systems provide a foundation of information on major life events, which can serve as the basis for enlarging inquiry into other methodological and theoretical topics. Major life events possess many characteristics and qualities that may be conceptually meaningful. Distinctions between these theoretical characteristics can be very useful for expanding knowledge about different types of stress–disorder relations. For example, some life events are "fateful," occurring entirely independent of the respondent's actions or control. Distinctions between "fateful" and "nonfateful" events can be important for enhancing prediction of disorder onset (e.g., for depression, see Shrout et al., 1989), as well methodologically for ensuring that relations between major life events and adverse outcomes are not artifacts of confounding associations (e.g., personality or pre-existing disorder generating the life events and causing the adverse outcome; Brown & Harris, 1978; Kendler, Karkowski, & Prescott, 1999). (See Figure 1.)

Interestingly, this extended capability of interview-based systems means that they can provide a foundation for research on specific social or psychological dimensions of major life events that may be more etiologically relevant for different forms of pathology. Rating schemes for these more specific and refined dimensions of potential adaptive demands and personal consequences can be developed. For instance, the likelihood of depression onset increases substantially as more refined dimensions are evaluated for specific types, severities, and qualities of stressful exposures (e.g., see Brown & Harris, 1989), with effects being strongest for severe life events involving attributes such as interpersonal loss, social rejection, and humiliation (Kendler, Hettema, Butera, Gardner, & Prescott,

2003; Slavich, Thornton, Torres, Monroe, & Gotlib, 2009). Qualities of "loss" versus "danger" also may be illuminating for distinguishing the onset of depressive versus anxiety-related conditions (e.g., fired versus threatened with job loss; Finlay-Jones & Brown, 1981; Monroe, 1990).

Self-Report Life Event Checklists

As described previously, self-report life event checklists have study participants respond to brief descriptors of life events that they may have encountered in the recent past. The assessment of the general information about a person's life circumstances, and any decisions about the criteria for defining life events, are not separate or independent phases in the measurement process. Consequently, the assessment of the general information about the person's life is synonymous—simultaneously fused—with the actual operational definition. Each study participant performs both measurement tasks simultaneously—that is, participants (a) assess their exposures and (b) decide whether each exposure qualifies as a "life event." This approach, therefore, directly violates the methodological mandate to ensure independence in assessing and defining major life events, and individuals' responses to such stressors (see Figure 1).

More specifically, each study participant is charged with interpreting what each very brief life event description means (e.g., what the exposure "is"), whether he or she recently experienced such a situation, and (if deciding affirmatively) whether the exposure was "major." Furthermore, study participants are responsible for deciding if apparently different descriptors of life events reflect the same exposure (i.e., event redundancies), if sequential events should be counted as one or more events, or how multifaceted events should be handled. The respondent is the sole and decisive arbiter of, and authority over, what ultimately counts as a major life event and what does not. Ultimately, therefore, the utility of self-report checklists depends upon how research participants make critical definitional and operational decisions, a task for which they have received no training.

Evaluative Comments

A primary objective of the operational phase is to provide a reliable means for determining which recent experiences in a person's life qualify as major life events and which do not. Ideally, this phase provides sufficient structure and guidance for condensing the wealth of information about someone's life, and for handling the tangled interconnections between various experiences, into the presence or absence discrete major life events. A primary *requirement* of the operational phase is to ensure independence in measurement of exposures and responses. Importantly, the procedures for defining which exposures do or do not qualify as a major life event, as well as rating qualities of the exposures, cannot be subject to influence by confounding information regarding the person's psychological or biological responses to the exposure (see Figure 1).

Interview-based procedures typically incorporate operational criteria, rules, and guidelines for making determinations about which types of exposures qualify as major life events. These practices are prespecified, typically codified in written manuals, and implemented by trained raters. In contrast, self-report life event checklists present only brief descriptors of a variety of major life events for each study participant to evaluate. These practices depend upon their ability to determine (1) if an experience counts as a life event (or not); (2) when an endorsed life event actually occurred; (3) if sequentially related events count as one or more separate events; and (4) if complex events count as one or more separate events. On common-sense grounds, the interview-based methods rest upon firmer methodological grounds as compared to self-report checklists for reliably determining which recent experiences in a person's life qualify as major life events.[2]

Regarding the primary requirement to ensure independence in measurement of exposures and responses, the research approach must control for influences that could spuriously explain associations between major life events and illness. In this regard, the distinction drawn within the interview-based methods becomes important to recognize. With investigator-based systems, raters are blind to both the participant's response to major life events and to whether the participant developed any pathological outcomes. However, with interview-based systems, the rater is not necessarily blinded to either possible source of influences.[3] Raters' awareness of participants' responses or clinical outcomes could inadvertently bias their exposure ratings and thereby confound them. Strictly speaking, the researcher has no basis for refuting these alternative explanations for any association found between major life events and the adverse outcome.

Self-report life event checklist measures have similar, but even more glaring methodological limitations and sources of potential bias. Study participants obviously are aware of their responses to the exposures they have faced. They also generally know their health status and potential risk for adverse health outcomes. A serious concern, therefore, is that minor or trivial life events can become imbued with special meaning by the respondent and be idiosyncratically elevated to the definitional status of major life events.[4] A related concern is that, even if the exposure would qualify as a major life event, the participant's ratings of the severity or other qualities of the exposure are equally likely to be influenced by his or her perceptions or knowledge about the matter.[5] In both instances, the potential for confounding between exposures and responses is very high and cannot be ruled out. Under these methodological circumstances, associations between major life events and disorder may be readily affirmed, but only because of confounding in measurement.

Another problem for self-report checklists is that they introduce considerable error variance into the definition and operationalization of major life events (Dohrenwend, 2006). When left to their own devices, for example, study participants inevitably differ in their interpretations of the life event descriptors and, consequently, in their definition and operationalization of major life events. Much of this "intracategory variation" problem can be attributed simply and directly to the naivety of study participants in deciding which of their recent life experiences match the life event descriptors on the checklist

(Dohrenwend, 2006). For example, two persons may report a "lost driver's license" (Dohrenwend, Askenasy, Krasnoff, & Dohrenwend, 1978); one of these individuals may have been convicted of drunk driving (the intended exposure), whereas another simply may have misplaced the item. Consequently, there is no assurance that a major life event reported by one person corresponds to that reported by another; moreover, either or neither may match the type of life event that the researcher had in mind. More generally, this means that within any particular life event category (1) participants commonly endorse a variety of qualitatively distinct exposures, and (2) many of these endorsed exposures differ significantly from the type of exposure intended by the investigator (see also Monroe, 2008).

Lastly, we note consequences of the idiosyncratic motivations of study participants as they complete self-report checklists. Respondents may stretch definitions of major life events to satisfy the perceived needs of the researcher (e.g., they want to be "good subjects" and provide useful information) or to avoid embarrassment (e.g., they don't want investigators to think their lives are uneventful or boring). The extent of a mismatch between the information sought by the investigator and the interpretation by the respondent can be bewildering. Indeed, in prior research we inquired about events that may have happened but were not listed on a life event checklist. One participant, for instance, noted that her husband recently had a heart attack. When asked why she didn't report a "Serious illness in close family member," she said the event wasn't stressful. As a result of his heart attack, her husband had quit smoking, become more patient, and was easier to get along with (also see Monroe, 2008). Valid associations between major life events and disorder become very difficult to detect with extraneous "noise" contaminating measurement practices.

The Quantification of Major Life Events

The purpose of this culminating phase is to abstract the attributes and qualities of major life events that hypothetically confer vulnerability and to quantify the information into a final numerical index. Simply stated, how is the extensive material processed and parsed to develop a decisive integrative index? What goes into the resultant indicator? Curiously, this phase has received little (if any) critical attention. Yet, since the utility of all prior information depends on the integrity of this final phase in the measurement process, and since alternative quantification procedures can yield very different final indices, it is a topic overdue for analysis. The basic task is how to combine the wealth of information about major life events in a principled and powerful manner (see Figure 2).

To begin with, a monolithic or singular approach to quantifying major life events is unlikely to be universally useful for all pathological outcomes. Not all disorders are necessarily related to life stress, and those that may be are unlikely to be a consequence of generic life stress. Rather, different kinds of stress will likely prove to be more or less influential for different kinds of pathological outcomes. Consequently, the quantification

phase should target the types of exposures and the suspected impacts that are most theoretically consistent with the particular disorder of interest under investigation (McQuaid et al., 1992).

In what follows, we first outline theoretical and temporal distinctions that need to be drawn, and next we confront combinatorial challenges researchers face for assembling the final summary index. These matters involve basic decisions investigators make, explicitly or implicitly, about what kinds of life events are to be included, or excluded, from all of the information gathered, and how to optimally represent such information. In principle, these decisions are similar across the major measurement systems (e.g., interview procedures or self-report checklists). However, in practice, differences from the assessment and operationalization phases carry through into the quantification phase, resulting in characteristic differences across the systems, which we then discuss and evaluate.

Major Life Events and Disorders: Theoretical and Temporal Qualities

Major life events commonly differ with regard to the kinds of adaptive demands entailed. The death of a close friend has different meanings and personal consequences than the dissolution of a marriage; each of these "losses" has qualitatively distinct implications relative to "additions" of the birth of a child or getting married (both of which also differ considerably in their personal consequences); and moving to a new city, being fired from work, or winning the lottery also point to contrasting social, psychological, and biological ramifications. Even the same life event (e.g., divorce) can have very different meaning and implications depending on an individual's specific role in the event (e.g., as the initiator of a divorce vs. the target of the rejection; Slavich, O'Donovan, Epel, & Kemeny, 2010). What is it about major life events that might predispose someone to pathology? More specifically, what is it about particular *kinds* of major life events that predispose to a range of and/or specific *types* of disorders?

Viewed in this manner, it can be appreciated that many conceptual alternatives exist for processing the information from the prior measurement phases and finally quantifying life stress. Whereas the operational phase of measurement supplies a broad landscape of opportunities for rating a range of theoretical qualities associated with major life events, the quantification phase selectively draws from and implements these theoretical distinctions to fine-tune and tailor the measurement process for the final summary index for the particular disorder in question. For instance, different types of major life stress have been found to predict the onset of diverse pathological conditions, such as anxiety disorders (e.g., Finlay-Jones & Brown, 1981), coronary heart disease (e.g., Neilson, Brown, & Marmot, 1989; Schneiderman, Ironson, & Siegel, 2005), appendectomy (e.g., Creed, 1989), and even bipolar disorder (Johnson, 2005) and psychosis generally (e.g., Mansueto & Faravelli, 2017). Such a system for operationalizing major life events provides a flexible and powerful system for investigating the environmental origins of a wide variety of psychological and physical disorders (Brown & Harris, 1989).

Major Life Events: A Review of Conceptual, Definitional, Measurement Issues, and Practices

Another key theoretical dimension is that of *time*. This topic touches upon several considerations. First are questions about the duration of heightened susceptibility. Major life events can have a significant immediate impact, but they also can have longer term consequences. For instance, losing a job often has a profound and prolonged impact, whereas incurring a brief period of being laid-off typically would be less likely to have significant enduring effects. The impact also is likely to change over time as the person recovers and adapts. For example, the loss of a significant relationship is likely to be more acute and painful immediately after it happens, and typically less, or much less, a year later. Further, the impact and its duration may be moderated by subsequent major life events. For example, losing a job and being hired into a new position shortly thereafter usually has less enduring pernicious consequences than becoming permanently unemployed.

Assessing the precise timing of life event exposures is critical for two additional reasons. First and most important, it enables investigators to ensure that the life events that are included in the final stress exposure indices occurred before, and not after, the outcome(s) being studied. Second, it allows researchers to study whether life events occurring during certain times or periods of life are more or less influential.

Overall, generic measures of environmental exposures will be insensitive for quantifying effects of causal relevance for physical and psychological disorders. What these points and examples make clear is that major life events (1) differ theoretically with regard to the kinds of adverse consequences they initiate, which may be more or less associated with different disorders; (2) vary with regard to the duration of adverse consequences they propagate over time; and (3) interact with other major life events in moderating the adverse consequences over time. These theoretical and temporal distinctions have direct implications for developing the final summary index. Specifically, how is such variation in the adverse effects of major life events best represented for probing stress–disorder relations?

A Variety of Calculi for Quantifying Major Life Events

Innumerable approaches exist for the final quantification of major life events. At one end of the spectrum, investigators have simply summed all events occurring in the recent past (e.g., last month or past year) (Holmes & Rahe, 1967). At the other end of the spectrum, researchers have designated one type of life event occurring within a specific interval (e.g., e.g., severe life events within 3 months of depression onset; Brown & Harris, 1989). Between these two practices, much methodological creativity and inconsistency are evident, with many opportunities for questionable decisions at best, and shameless *p*-hacking at worst, resulting in methodological chaos and inconsistent results.

At the heart of the matter is the question of how optimally to assemble varied and diverse characteristics of major life events that are hypothetically linked to pathogenic processes. A common operating procedure has been "additivity": that major life events can be summated to represent the cumulative adverse effects. As explained previously, however, not all major life events are theoretically comparable or similar with respect to their

pathogenic potential; rather, they vary by kind, recency, interactions with other major life events, and the type of disorder under investigation. These points raise grave concerns about the common practice of simply adding up all recent major life events.[6]

Methodologically, too, an additivity assumption is challenging. Without guidelines for standardizing the interrelations between sets of complex events (e.g., event sequences, superordinate events, etc.; see earlier discussion), final summary indices for theoretically similar circumstances vary tremendously across studies. For example, one investigator may subsume a number of affiliated events constituting a marital break-up as one exposure, whereas another may rate each of the affiliated events as separate exposures (e.g., arguments, move, separation, divorce, changes in friendship, altered economic circumstances, etc.). Overall, the summation of all major events, without attention to these distinctions, results in an insensitive final indicator at best and a misleading one at worst.

All of these points raise a combinatorial conundrum for stress research regarding how to optimize the aggregation of information about major life events in terms of qualities, time, and outcomes. Ironically, this culminating endpoint is perhaps the most imperfectly understood and most variably implemented component of the measurement process. Decisions about these matters should be grounded in an understanding of the disorder under study, particularly with regard to the types of exposures of theoretical interest, as well as to the temporal dynamics of exposure impact over time. With greater awareness of these issues, we hope that the field can move toward more theoretically coherent and standardized procedures.

Evaluative Comments

Interview- and investigator-based approaches supply a rich array of information facilitating selection of the kinds of exposures and their timing in relation to the onset of the disorder under study. Concerns over "intracategory" variation are minimized, handling of complex exposures and event sequences is standardized, and timing of life events and disorder onset is established. Based upon the disorder under study, theory or past precedent can guide researchers to optimize the final index. Overall, the requisite ingredients are available to provide a flexible and reliable final index for the particular disorder of interest. However, to be methodologically pristine, the final index should be constructed a priori, or at least independent of the researcher's knowledge of the participant's reactions and disorder status.

Turning to self-report checklist measures, constraints and concerns from the prior phases become ever more apparent and magnified. Problems in assessing and operationalizing major life events from the prior two phases remain, as potential biases and extraneous noise are carried through. But these problems can also be exacerbated as they are aggregated into the final index. First, the final index across study participants represents an unknown amalgamation of major and minor life events, major and minor life event sequences, and major and minor life event complexes. Second, the final index is confounded with the respondent's reactions to the exposure, as well as awareness of his

or her clinical status. Third, the timing of exposures and the timing of disorder onset are not reliably established (Harkness & Monroe, 2016). Finally, in deciding which exposures to include or not, for methodological purity the researcher should not be aware of the respondent's reactions to exposures or clinical status. Overall, it is difficult to escape the conclusion that, with self-report checklists, the investigator has lost control over the core operational responsibilities in the research enterprise, raising grave doubts about the utility of the final summary index.

Empirical Evidence: Reliability and Validity Studies

In the early days of research, much discussion focused prematurely upon advanced theoretical issues involving stressful life events, with "only relatively scant attention to the foundation issue of the dependability of the data being reported" (Jenkins, Hurst, & Rose, 1979, p. 382). A tendency remains for the mundane but fundamental matters of reliability and validity to be overshadowed by impulsive excitement about theoretical possibilities. Yet the differences we have pointed out in the principles and procedures for measuring major life events strongly point to the likelihood of differences in their psychometric qualifications. Although in theory questions about reliability and validity are relatively straightforward, the answers too often have been littered with partial truths and selective reporting. The "foundation issue of the dependability of the data being reported" merits much greater scientific respect (Jenkins et al., 1979, p. 382).

In the following, we initially clarify the information needed to inform psychometric decisions for research on major life events. We next discuss the psychometric properties of self-reports checklists and interview-derived procedures separately, and finally directly compare the different approaches.

Psychometric Properties: Reliability and Validity

With regard to test-retest reliability, early psychometric research on self-report life event checklists documented that, as the period of recall increases (e.g., beyond 7–14 days), "reliability drops precipitously for both total scores and individual events" and is "particularly poor when the checklist is self-administered" (Dohrenwend, 2006, p. 481; e.g., .30–.60, Neugebauer, 1984; see also Paykel, 1983; Rabkin & Struening, 1976). Low reliability has been found, too, when participants report repeatedly over short longitudinal intervals (e.g., monthly), and then report on life events for the entire retrospective time period. For example, there was agreement on only 25% of the events using such a method, with many more events reported in the monthly assessments (Raphael, Cloitre, & Dohrenwend, 1991; see also Monroe, 1982). Finally, very low co-informant agreement has been found (e.g., 33% for the SRRS; Yager, Grant, Sweetwood, & Gerst, 1981; Neugebauer, 1983) (see also Harkness & Monroe, 2016; Monroe, 2008).[7] There are few recent reports addressing these psychometric topics, yet since the basic format of these measures has not changed, there is no reason for optimism about the matter (see Dohrenwend, 2006).[8] In summary, the available evidence strongly indicates

that respondents do not provide reliable information about their recent life events when using self-report life event checklists.

Given problematic psychometric underpinnings for self-report life event checklists, many articles address these core issues in oblique and misleading ways. "Cosmetic psychometrics" sidestep disclosure of basic psychometric information and thereby elude criticism (Harkness & Monroe, 2016). For example, a common practice in large-scale epidemiological studies is simply to omit psychometric information altogether, relying solely on the face validity or on a long-standing tradition of using checklists such as the SRRS (e.g., Kalmbach et al., 2016; Määttänen et al., 2015; Tamers et al., 2015). Another strategy is to claim "good reliability and validity," either with no evidentiary basis provided or by referring to studies that, when examined, do not furnish the implied psychometric support (e.g., Kindt, Kleinjan, Janssens, & Scholte, 2015). Some recent reports are even bold enough to proclaim the SRRS to be the "gold standard" for stress assessment (e.g., Marchetto et al., 2016).

In contrast, interview-based procedures are more successful in documenting acceptable levels of reliability.[9] For example, early research on the LEDS indicated 81% agreement for any life event between patients with schizophrenia and relatives, and 79% agreement between depressed patients and relatives (Brown & Harris, 1978, p. 71). Early work with the UCLA Episodic Life Events Interview found interjudge correlations of .77 for objective threat ratings and .85 for independence ratings (Hammen, 1991). For ratings of the same severe life events occurring in the past year, Brown, Sklair, Harris, and Birley (1973) reported 91% rater agreement, and Monroe et al. (2007) indicated high interrater agreement for severe events corrected for chance (e.g., for pair-wise comparisons of 2–4 raters ranged from 0.72 to 0.79, mean = 0.76; Cohen's k, corrected for differences in the number of raters per event; Uebersax, 1982). Examining the "falloff" or diminishing frequency of life events over progressively longer retrospective intervals (presuming the diminishing frequency is due to forgetting or underreporting), there is evidence that severe events are reported reliably for at least 1 year, whereas events of a lesser degree of severity may begin falloff slightly after 5 or more months (Brown, 1989, p. 37).

Finally, studies directly comparing checklist and interview methods are most central and revealing. Comparisons between respondent- and investigator-defined major life events indicate very low concordance between the two (e.g., perhaps less than 40% of the time; Gorman, 1993; Lewinsohn, Rohde, & Gau, 2003; McQuaid et al., 1992; Monroe, 2008). McQuaid et al. (1992) found that only 38.5% of life events reported with a self-report checklist were the same as life events defined by the LEDS (Brown & Harris 1978). Further, Lewinsohn et al. (2003) made similar comparisons between self-report and interview-based methods. For life events primarily involving the study participants, they found that 67.5% of events reported on the checklist met the criteria for their stress interview. Yet for life events primarily involving other individuals, the concordance rate was only 19.7%. Because life events primarily involving other people were reported about twice as often as those involving the participant, the overall percentage of life events based on the interview criterion that matched the self-report measure was well below

50%. It is noteworthy that this lack of agreement between methods is also found when restricting reporting to highly significant life events. For instance, Duggal et al. (2000) found that only 32% of severe life events occurring prior to the onset of major depression were endorsed on a self-report checklist (see also Harkness & Monroe, 2016; Monroe, 2008; Simons, Angell, Monroe, & Thase, 1993). Finally, with regard to falloff of event reporting over time, Neilson et al. (1989, p. 322) estimated a rate of 5% per year with the LEDS in their 10-year study, compared to a rate of 5% per *month* for retrospective reporting with life events checklists.

The situation is more complex with respect to predictive validity. Given that self-report procedures have a high error rate for identifying major life events (e.g., exceeding 50%, as noted earlier), the utility of comparative validity studies is questionable (Monroe, 2008). Nonetheless, a handful of studies provide relevant data. On the one hand, interview-based methods have been found to be superior in studies of life stress and depression (e.g., predicting greater depressive symptoms or lower probability of remission, McQuaid et al., 2000; detecting severe events typically found to precede depression onset, Duggal et al., 2000). On the other hand, self-report measures of life events sometimes have yielded similar or different associations when compared with interview-based measures (e.g., McQuaid et al., 2000; see also Wagner, Abela, & Brozina, 2006).

As Dohrenwend (2006) observed, studies suggesting comparable ability for the two approaches to discriminate between disordered and nondisordered groups occur despite the two approaches often identifying different major life events (Costello & Devins, 1988; Duggal et al., 2000; Katschnig, 1986; Raphael et al., 1991). How might such seemingly discrepant findings be reconciled with respect to validity considerations? It must be recalled that investigator-based approaches methodologically ensure that exposures, responses, and outcomes are not confounded. In contrast, self-report life event measures do not provide such methodological safeguards. Consequently, a parsimonious interpretation is that such findings reflect different underlying associations for the two measurement approaches and outcomes: one valid, one confounded.

Summary and Conclusions

Comparisons of psychometric characteristics for interview-based and self-report checklists differ substantially. Comparative research conclusively favors the scientific credibility of interview-derived procedures and points to unacceptably poor performance for self-report checklists. Reports favoring the latter typically supply only superficial or "a la carte" psychometric information and overlook or ignore the well-documented psychometric limitations. In recognition these matters, Harkness and Monroe (2016) recently averred, "To be very clear about this matter, based on all available evidence we cannot envision any circumstances under which self-report checklists of life events, in good scientific conscience, can be recommended or justified" (p. 737).

Future Directions

Looking forward, several broad issues could be addressed to improve research on life events and health. First, despite recognition that life events can occur in several life domains (e.g., romantic relationships, financial, education, work, crime, etc.) and involve different social-psychological characteristics (e.g., interpersonal loss, physical danger, humiliation, entrapment, etc.), very few studies to date have investigated the effects of different life event types. This has occurred even though the few studies that examined such effects have found notable differences in associations between specific types of life events and psychological, biological, and behavioral outcomes (e.g., Brown, Harris, & Hepworth, 1995; Keller, Neale, & Kendler, 2007; Keller & Nesse, 2006; Kendler et al., 2003; Murphy, Slavich, Chen, & Miller, 2015). Because such *stressor characteristic* studies are rare, however, the current empirical literature on life events largely obscures potential stressor-specific effects, leaving the impression that life stress is a singular, unitary construct. To address this issue, more studies are needed that characterize different types of life events and, in turn, examine their effects. Such research will help identify when and for what outcomes different life events exert the same versus different effects, which will ultimately help advance theoretical formulations of stress.

Because identifying different types of life events requires quality measurement systems that obtain contextual details, the second issue we raise has to do with the usability and scalability of existing gold standard systems for assessing life events. Presently, there is an inherent and rather dramatic trade-off between usability versus reliability and validity in life event instruments. Whereas self-report measures that produce relatively low-quality data are inexpensive, easy to administer, and therefore simple to integrate into studies of stress and health, investigator- and interview based-systems that produce high-quality data require extensive training and expertise, and substantial financial support to implement. Therefore, we should not be too surprised that more investigators choose the former over the latter, especially when research funding is limited and other expensive procedures (e.g., fMRI, GWAS, etc.) are often involved. Valuable goals, therefore, would be to (1) improve the usability and scalability of high-quality life event instruments so they can be used more widely and by investigators who want to assess life events well, but who are not stress assessment experts, and (2) encourage collaborative relations between investigators interested in stress, but without expertise in measuring life stress, with investigators possessing such expertise (Harkness & Monroe, 2016).

Finally, attention should be paid to a growing mismatch between contemporary theories of stress and health, and the instruments that are most commonly used to assess life events. More specifically, whereas numerous theories have recently proposed that cumulative life stress occurring over the entire life span plays a role in shaping many aspects of mental and physical health (e.g., Graham, Christian, & Kiecolt-Glaser, 2006; Lupien, McEwen, Gunnar, & Heim, 2009; McEwen, 1998; Slavich & Cole, 2013), the instruments most commonly used for assessing life events typically only capture

exposures occurring over the past few weeks or 1–2 years maximum, leaving the rest of the person's life unexamined. As a result, while it is easy to find theoretical articles on how life events might accumulate over time to shape human health and behavior, the empirical basis for such conjecture is almost nonexistent since only a few studies have actually assessed lifetime stress exposure.

The development of the Stress and Adversity Inventory (STRAIN) has been impactful in this regard as it provides investigators with a tool for quickly assessing individuals' exposure to a variety of acute life events and chronic difficulties that are known to impact health (Slavich & Shields, 2018). The system has been found to predict a number of health-related outcomes, including sleep difficulties, memory, cognitive function, metabolic activity, fatigue, depression, and mental and physical health (Cuneo et al., 2017; Dooley, Slavich, Moreno, & Bower, 2017; Goldfarb, Shields, Daw, Slavich, & Phelps, 2017; Kurtzman et al., 2012; Shields et al., 2017; Toussaint, Shields, Dorn, & Slavich, 2016). The system shows good immunity from factors that are known to bias self-reporting (e.g., social desirability, personality), and it also demonstrates excellent concurrent validity, discriminate validity, and test-retest reliability over 2–4 weeks (rs = .90–.92 for the main stress indices; see Slavich & Shields, 2018). To maximize efficiency, though, the STRAIN does not generate independent stress exposure ratings, meaning there still is room for achieving the ultimate goal of simultaneously maximizing both instrument scalability *and* objectivity.

Conclusions

Although life stress is accorded a central role in many contemporary models of psychopathology and physical health, the conceptualization and assessment of a key form of stress exposure—namely, major life events—remains in practice too frequently unstandardized and crude. Put simply, major life events are defined and assessed in a multitude of different ways, and measurement error (e.g., due to poor reliability, confounding of predictor with outcome, etc.) is all too common. A few gold-standard instruments exist for obtaining high-quality reports of individuals' major life event exposure, but these systems are used infrequently, with a majority of studies instead using instruments that suffer from critical limitations. These measurement concerns can produce findings that are confounded or difficult to replicate, or, in the worst cases, ethnically questionable. Looking forward, we believe the field can benefit from additional clarity around the conceptual and definitional issues we have discussed, as well as from the more frequent implementation of stress assessment systems that yield high-quality life event information. For while there is no question that major life events can play a key role in shaping human health and behavior, opportunities for enhancing definitional and conceptual clarity, and improving measurement, abound.

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Major Life Events: A Review of Conceptual, Definitional, Measurement Issues, and Practices

Notes:

([1]) Note that this is a "first-pass" attempt to distinguish a class of major life events (as opposed to more minor kinds of exposures). As we will see, further distinctions can be made in the operationalization phase with respect to more specific dimensions associated with major life events that may be especially relevant for understanding different psychological or physical health conditions. For example, major life events involving loss may be especially important for the development of major depression, whereas major life events entailing "danger" may be more relevant for anxiety-related conditions (Monroe, 1990).

([2]) We will, however, review herein the research with regard to reliability considerations and direct comparisons of the two approaches.

([3]) With regard to independence in rating exposures and responses, it is not possible for the interviewer to be aware of, and potentially influenced by, the respondent's reactions to the life event as the respondent recounts the story. With regard to the independence for rating exposures and outcomes, confounding is a major concern with cross-sectional research designs, but with appropriate precautions it may be less of a concern for prospective designs.

([4]) Note a companion concern that major life events may be "downgraded" and dismissed as being inconsequential from the perspective of the participant (see Monroe, 2008).

([5]) Such a tendency to inflate (or to underestimate) exposures could be an interesting response characteristic that moderates the stressful consequences of exposures (see Monroe & Kelley, 1995). But as we have emphasized, a cardinal methodological requirement is that the measurement of exposures and responses be performed separately and independently.

([6]) One strategy to crudely address such concerns has been to provide subjective or personal ratings of major life events. However, as indicted in Figure 1 and discussed previously, without the use of blinded scoring this strategy compromises the research in terms of the likelihood of confounding exposures, responses, and outcomes.

([7]) Some articles report Cohen's kappa reliability statistics, reflecting internal consistency of the measure. But as pointed out by several critics, this form of reliability is not appropriate for life event measures, as there is no a priori rationale for why different life events should co-occur (Cleary, 1981; Monroe, 1982). Stress is the product or

consequence of event exposures, not a common latent variable that "creates" the event exposures.

([8]) An advocate for life event self-report checklist methods might cite the List of Threatening Experiences (LTE) as counterexample to our argument, representing an abbreviated measure with acceptable psychometric properties (Brugha & Cragg, 1990). The reported test-retest and interrater reliability were indeed very good, but these statistics were based upon a test-retest interval of 1-day for the 12-item measure. As indicated previously, test-retest reliability for self-administered life events checklists "drops precipitously for both total scores and individual events" as the period of recall increases (e.g., beyond 7–14 days) (Dohrenwend, 2006, p. 481). Further, there is no protection against "double-reporting" (e.g., "You became unemployed … ," "You were sacked from your job," and "You had a major financial crisis"; see Brugha & Cragg, 1990, p. 78). And, of course, the participant's determination of what constitutes a major event can be influenced by his or her response and/or health status.

([9]) Given the lengthy time requirements for interview-based procedures (e.g., 1–2 hours for the interview alone, and additional time for ratings), test-retest reliability studies are essentially nonexistent for these measures. Psychometric information for these measures is based predominately upon agreement across informants and interrater reliability.

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