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Historical Perspectives, Theory, and Measurement of Distress Tolerance

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Researchers and clinicians have had a long-standing interest in elucidating the role of distress tolerance focused on aversive internal states (e.g., negative emotions, uncomfortable bodily sensations) in various forms of psychopathology (e.g., Frenkel-Brunswik, 1948, 1951; Hajek, 1991; Hajek, Belcher, & Stapleton, 1987; Linehan, 1993a, 1993b; Simons & Gaher, 2005). Many of these accounts are focused on distinct conceptualizations of distress tolerance among persons with, or at risk for, Axis I and II psychopathology (e.g., Gross & Muñoz, 1995; Lynch & Bronner, 2006; Mennin, Heimberg, Turk, & Fresco, 2002; Zvolensky & Otto, 2007). In the study of substance use and dependence, for example, intolerance of emotional and somatic sensations has been suggested to be a key explanatory mechanism underlying maintenance of use (Brown, Lejuez, Kahler, Strong, & Zvolensky, 2005; Chaney, Roszell, & Cummings, 1982; Otto, Powers, & Fischmann, 2005). In addition, distress tolerance has increasingly been viewed as an important construct in developing new insights about the onset and maintenance of psycho-

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pathology as well as its prevention and treatment (Zvolensky & Otto, 2007). For example, interest in distress tolerance in the context of psychological disorders has been paralleled by the growth and dissemination of psychosocial interventions designed to promote greater degrees of emotional acceptance, mindfulness, and self-awareness (e.g., Barlow, Allen, & Choate, 2004; Hayes, Strosahl, & Wilson, 1999; Orsillo & Roemer, 2005; Linehan, 1993). Many of these psychosocial treatments have begun to show promising outcomes (e.g., Kabat-Zinn, Lipworth, Burney, & Sellers, 1987; Orsillo, Roemer, & Barlow, 2003; Ramel, Goldin, Carmona, & McQuaid, 2004; Roemer & Orsillo, 2002; Williams, Teasdale, Segal, & Soulsby, 2000).

Despite the promise of existing work on distress tolerance in regard to the study of psychopathology, there has not been a comprehensive review of the extant empirical literature focused on the construct. As a result, theoretical and empirical integration of distress tolerance work, or a broad-based perspective as to how this literature is shaping our understanding of psychopathology, is lacking. Thus, there are numerous conceptualizations, assessment tactics, and, presumably, inferences derived from extant bodies of distress tolerance research. Similarly, aforementioned treatments designed to target distress tolerance have approached this construct clinically in a variety of ways (e.g., Barlow et al., 2004; Linehan, 1993; Williams et al., 2000) because, in part, of varying conceptual perspectives on distress tolerance, its putative role(s) in psychopathology, and the optimal means to therapeutically engender change in the construct.

Overall, the lack of an integrative volume on distress tolerance impedes our ability to fully ascertain from the extant literature (1) the scope of distinct and overlapping conceptual models of distress tolerance and methodologies designed to assess them; (2) the roles of distress tolerance in the onset and maintenance of psychopathology; (3) the possible impact of psychological symptoms and psychopathology on distress tolerance; and (4) the most effective means of translating this knowledge to inform prevention and treatment approaches. In an effort to fill this gap, the present book attempts to systematically distill information on the nature of distress tolerance and its associations with related variables as well as psychological symptoms and disorders. In the present chapter, we provide a relatively brief overview of the distress tolerance literature by clarifying its historical underpinnings, theoretical bases, and various measurement tools and techniques. Initially, we highlight distinctions between distress tolerance and theoretically related constructs. Thereafter, we describe key distress tolerance constructs, measures of distress tolerance constructs, and their postulated theoretical bases and summarize how they have been used in empirical research. Our broad intention is

to provide a contextual framework for distress tolerance research as an introduction to the following chapters in this volume.

DISTINGUISHING DISTRESS TOLERANCE FROM OTHER CONSTRUCTS

Perspectives on distress tolerance constructs generally pertain to tolerance of various types of experiential distress. For example, some models are theoretically oriented with respect to tolerance for aversive physical sensations (Schmidt & Cook, 1999), whereas others are focused more generally on noxious emotional states (Simons & Gaher, 2005), or the possibility of personal threat as a result of ambiguous (Furnham & Ribchester, 1995) and uncertain (Dugas, Gagnon, Ladouceur, & Freeston, 1998) life circumstances. Although there are indeed important distinctions between these specific models of distress tolerance, these perspectives are all broadly related to "experiential states" that tend to be subjectively aversive or personally threatening in some way (e.g., negative emotions, bodily perturbations). The degree to which they are experienced as aversive reflects individual differences related presumably to individual differences in tolerance of such states. Such a viewpoint is consistent with basic models of affective processing positing that aversive experiential states (e.g., negative affect) are directly linked to emotional reactivity and to biobehavioral adaptation more generally (Lang, 1994). It should be noted that this focus on experiential distress does not intend to suggest that explanatory or clinical merit cannot ultimately be found for tolerance of appetitive experiential states (e.g., positive affect); rather, it simply reflects the current state of behavioral science focused on the distress tolerance construct.

There also is variability in the conceptual and operational definition of the term *tolerance* in the existing literature. Most perspectives on tolerance of distress denote an individual difference in the extent to which a person withstands a certain form and degree of personal discomfort or threat (experiential distress; Otto et al., 2005; Simons & Gaher, 2005). It is, therefore, a construct that encompasses cognitive, affective, and behavioral features.

Inspection of the existing distress tolerance literature indicates that this construct is generally theorized to be related to other affect regulation and sensitivity factors and processes (e.g., Brown et al., 2005; Frenkel-Brunswik, 1948; Hajek, 1991; Schmidt & Cook, 1999; Simons & Gaher, 2005). Although related within a broader nomological network of risk and protective processes, distress tolerance is posited to be distinct conceptually from these other variables, as we describe later (Simons &

Gaher, 2005). Distress tolerance has most typically been linked to the following constructs: experiential avoidance (Hayes et al., 1999); emotional suppression (Richards & Gross, 2000); avoidant (Folkman & Lazarus, 1986) or disengagement coping (Compas, Connor-Smith, Saltzman, Thomsen, & Wadsworth, 2001); emotional dysregulation (Kashdan & Steger, 2006; Linehan, 1993; Rottenberg & Gross, 2003); anxiety sensitivity (McNally, 2002); personality-based perspectives on persistence (Barkley, 1997; Cloninger, Przybeck, & Švrakic, 1991); and perseveration (Ames, Cummings, Wirshing, Quinn, & Mahler, 1994).

Although specific conceptualizations of distress tolerance vary in their degree of overlap with putatively related constructs, in general, this construct is primarily focused on the perceived or actual behavioral capacity to withstand exposure to aversive or threatening stimuli (Brown et al., 2005; Simons & Gaher, 2005). At a global level, distress tolerance may be a function of automatic (e.g., unconscious) and effortful (e.g., voluntary) actions. In contrast, *experiential avoidance* theoretically subsumes a larger constellation of responses functionally aimed at altering the form or frequency of aversive internal experiences (e.g., negative thoughts, bodily sensations) and the contexts that occasion them (Hayes, Wilson, Gifford, Follette, & Strosahl, 1996). It is possible that distress tolerance is a specific type of experiential avoidant process (Hayes et al., 1999), although direct empirical work examining this question is currently lacking. Likewise, *emotional suppression* is generally defined as purposively inhibiting ongoing emotional experiences (Gross, 1998), whereas distress tolerance may or may not actually involve the suppression of an elicited affective state. Thus, distress tolerance and emotional suppression are not conceptually identical constructs. Similarly, *avoidant coping and disengagement coping*, although defined in different ways (Compas et al., 2001; Eisenberg, Fabes, & Guthrie, 1997; Skinner, 1995), from a contemporary perspective, generally reflect conscious, voluntary attempts to manage internal or external stressors that an individual perceives as exceeding psychological-based resources (Folkman & Lazarus, 1986). Furthermore, avoidant coping and disengagement coping are not individual-difference variables characterized by behavioral or perceived capacity to tolerate or persist in the experience of distress. Thus, unlike distress tolerance, such coping is a behavioral strategy and cognitive skill set that influences how one responds to unwanted stimuli, including distress. Distress tolerance may theoretically drive a variety of forms of avoidance, such as avoidant or disengagement coping or experiential avoidance such as suppression, but it is not conceptually one in the same as these (related) processes.

Emotional dysregulation involves multiple difficulties in emotional functioning and regulation (Cole, Michel, & Teti, 1994; Mennin, 2004;

Mennin, Heimberg, Turk, & Fresco, 2005; Salovey, Mayer, Goldman, Turvey, & Palfai, 1995). Contemporary perspectives denote that emotional dysregulation reflects (1) difficulties in the self-regulation of affective states and (2) difficulties in self-control over affect-driven behaviors (Carver, Lawrence, & Scheier, 1996; Gross, 1998). From this perspective, tolerance of distress is a much narrower construct relative to emotional dysregulation. For example, distress tolerance could theoretically be conceptualized as a lower-order component of a higher order emotional dysregulation construct but not isomorphic with it. To the best of our knowledge, no research has been conducted that empirically documents that distress tolerance is, in fact, an aspect (component) of emotional dysregulation, although certain models of psychopathology implicitly allude to such an intriguing possibility (e.g., Linehan, 1993).

Distress tolerance also has been related to *anxiety sensitivity* (Bernstein, Zvolensky, Vujanovic, & Moos, 2009; Zvolensky & Otto, 2007). Anxiety sensitivity is the fear of anxiety and arousal-related sensations and their consequences (Reiss, Peterson, Gursky, & McNally, 1986). Although possibly related but distinct lower-order factors of a putative higher order affect tolerance and sensitivity factor (Bernstein et al., 2009), distress tolerance is not empirically or conceptually equivalent to anxiety sensitivity for a number of reasons. For example, distress tolerance is not related principally to the expectation of negative consequences of anxiety and other interoceptive sensations central to the anxiety sensitivity construct. As another example, although correlated, individual differences in anxiety sensitivity do not reflect cognitive or behavioral capacity to behaviorally tolerate and persist in the experience of unwanted distressing states (Bernstein et al., 2009).

The construct of *persistence* has been operationalized as an individual trait-like dimension of temperament related to propensity to maintain a behavior related to reward contingencies (Barkley, 1997; Cloninger et al., 1991). Models of personality, particularly those of Cloninger and colleagues (1991; Cloninger, Švrakic, & Przybeck, 1993), often suggest that persistence is a subtrait of higher order reward dependence construct. Similar perspectives have been offered in the context of learned industriousness theory (Eisenberger, Kuhlman, & Cotterell, 1992). Individuals at the higher end of variability on this trait tend to persist on tasks despite frustration and fatigue and to increase their task-specific responding when a reward is anticipated (Kose, 2003). From this perspective, persistence would be expected to be related to distress tolerance in the sense that persistence could involve features of distress tolerance (e.g., a propensity to be persistent may involve a willingness to tolerate negative subjective states such as frustration). However, these constructs also are distinct in that persistence typically focuses on reward achieve-

ment (Cloninger et al., 1991), whereas distress tolerance is not necessarily reward dependent.

Finally, distress tolerance can be distinguished from *perseveration*. Perseveration involves the tendency to persist in a behavioral pattern beyond a point where the activity is adaptive or rewarding (Ames et al., 1994). Perseveration is closely linked to certain safety-oriented behaviors that attempt to prevent a threat from being realized (e.g., agoraphobic avoidance aimed at preventing panic attacks in public situations; Salkovskis, 1996).

DISTRESS TOLERANCE PERSPECTIVES: THEORY AND MEASUREMENT

Numerous distress tolerance constructs have been operationalized and studied in the psychopathology literature. As such, there is no single overarching theory that informs all of the work on this topic. As we discussed in the foregoing sections, most distress tolerance perspectives are informed to varying degrees by personality, self-regulation, coping, and, more recently, experiential avoidance literatures. Yet, given the diversity of distress tolerance research, it is important for reasons of clarity and specificity to narrow the focus and define the specific variables and how they are assessed. In this context, the theoretical basis of particular conceptualizations of distress tolerance can be better understood and, ultimately, competing perspectives compared, contrasted, and potentially integrated. Thus, we highlight (1) various perspectives on distress tolerance in the empirical literature and (2) how the constructs have been conceptualized and measured.

Tolerance of Ambiguity

Perhaps the earliest conceptualization of a distress tolerance construct is *tolerance of ambiguity* (TOA; Frenkel-Brunswik, 1948, 1951, 1959; Hoffeditz & Guilford, 1935). TOA is operationalized as the way people perceive or process information about a situation or stimulus when faced with a set of complicated, foreign, and vague stimuli (Furnham & Ribchester, 1995). At a basic level, TOA is theorized to help "orient" individuals to social and other life situations, influencing affective (e.g., emotional reactivity), cognitive (e.g., how one perceives specific stimuli), and behavioral (e.g., how one copes with specific life events) processes. Informed largely by traditional personality theory, TOA is conceptualized as a stable (trait-like) individual-difference characteristic varying by degree across a single dimension (Budner, 1962). To the extent that indi-

viduals have relatively lower levels of TOA, they are expected to react with greater degrees of emotional distress (e.g., anxiety) and in a more impulsive or dysregulated manner (e.g., reactive cognitions and impulsive behaviors) when faced with an ambiguous situation. Furthermore, it is theorized that these individuals may be more apt to avoid such ambiguous stimuli in the future (Furnham & Ribchester, 1995). In contrast, individuals with relatively higher levels of TOA are theorized to perceive ambiguous stimuli as relatively nonthreatening and more personally challenging (Furnham & Ribchester, 1995).

A number of self-report instruments have been developed to assess TOA from a personality-oriented perspective (Budner, 1962; O'Connor, 1952; Rydell & Rosen, 1966). The assessment of TOA, therefore, has presumed a large volitional and self-awareness component. Available TOA measures are listed in Table 1.1. These instruments include the Walk's A Scale (O'Connor, 1952), the Scale of Tolerance–Intolerance of Ambiguity (Budner, 1962), the Rydell–Rosen Tolerance of Ambiguity Scale (Rydell & Rosen, 1966), the Measure of Ambiguity Tolerance Scale—20-item (MAT-20: MacDonald, 1970), the MAT-50 (Norton, 1975), a revision to the Rydell–Rosen scale and the MAT-20 by Kirton (1981), and the Situational Test of Intolerance of Ambiguity (Bhushan & Amal, 1986).

Historically, researchers have attempted to improve TOA scales listed in Table 1.1 by building on from one scale to the next in order to enhance the psychometric properties of such tools and refine the TOA construct (see Furnham & Ribchester, 1995, for a review). Thus, the TOA literature has had a relatively high degree of conceptual interconnection as it developed over time (Furnham & Ribchester, 1995). Despite this historical interconnection, TOA scales have been consistently criticized for lacking a clear operational definition and maintaining relatively poor psychometric properties (see Table 1.1; Ehrlich, 1965).

Intolerance of Uncertainty

Intolerance of uncertainty (IU) has been studied most systematically and extensively in regard to generalized anxiety disorder (GAD), worry more generally, and to a lesser extent obsessive–compulsive and panic psychopathology (Dugas et al., 1998; Dugas, Buhr, & Ladouceur, 2004; Hedayati, Dugas, Buhr, & Francis, 2003; Tolin, Abramowitz, Brigidi, & Foa, 2003). IU is operationalized as individual differences in the tendency to react with limited tolerance (emotionally, cognitively, or behaviorally) to uncertain situations and events (Buhr & Dugas, 2002; Dugas, Schwartz, & Francis, 2004). IU has historically been theorized to be relatively stable and, therefore, akin to a trait-like factor (Dugas et al., 1998).

TABLE 1.1. Self-Report Measures of Distress Tolerance

Distress tolerance construct	Format	Items	Internal consistency
Tolerance of ambiguity (TOA)			
Walk's A Scale (O'Connor, 1952)	6-point Likert-type scale ranging from *agree* to *disagree*	8	α = .08–.10 (Ehrlich, 1965)
Scale of Tolerance–Intolerance of Ambiguity (Budner, 1962)	Forced choice: true–false *or* 6-point Likert-type scale ranging from *strongly agree* to *strongly disagree*	16	α = .49–.59
Rydell–Rosen Tolerance of Ambiguity Scale (AT-16; Rydell & Rosen, 1966) from the Self–Other Test, Form C	Forced choice: true–false	16	No evidence of internal reliability (Furnham & Ribchester, 1995)
Measure of Ambiguity Tolerance Scale (MAT-20; MacDonald, 1970)	Forced choice: true–false	20	α = .63–.73
MAT-50 (Norton, 1975)	7-point Likert-type scale or forced choice yes–no	55	α = .75
Tolerance of Ambiguity Scale—Revision to Budner, Rydell & Rosen, and MacDonald measures (Kirton, 1981)	Forced choice: true–false	18	α = .71
Situational Test of Intolerance of Ambiguity (STIA; Bhushan & Amal, 1986), based on sample from India	4-point Likert-type scale ranging from *always* to *never*	40	Not reported
Intolerance of uncertainty (IU)			
Intolerance of Uncertainty Scale (IUS—French Version; Freeston et al., 1994)	5-point Likert scale ranging from *not at all* to *entirely* characteristic	27	α = .91
IUS—English Version (Buhr & Dugas, 2002)	5-point Likert scale ranging from *not at all* to *entirely* characteristic	27	α = 0.94
IUS—short version (IUS-12; Carleton et al., 2007)	5-point Likert scale ranging from *not at all* to *entirely* characteristic	12	α = .91

TABLE 1.1. (*continued*)

Distress tolerance construct	Format	Items	Internal consistency
Discomfort intolerance			
Discomfort Intolerance (Schmidt et al., 2006)	6-point Likert-type scale ranging from *not at all* to *extremely much like me*	5	α = .70
Distress tolerance			
Distress Tolerance Scale (Simons & Gaher, 2005)	5-point Likert scale ranging from *strongly agree* to *strongly disagree*	15	α = .82
Frustration–Discomfort Scale (Harrington, 2005)	5-point Likert scale ranging from *absent* to *very strong*	28	α = .94

The IU construct has been largely informed by cognitive-behavioral perspectives of GAD (Borkovec & Roemer, 1995; Craske 1999; Davey & Tallis, 1994). This GAD work has indicated both theoretically and empirically that worry often involves the prediction of potential future negative outcomes, and that such a prediction may permit a greater sense of perceived control or predictability over these outcomes (Borkovec & Roemer, 1995); such a process, for example, may conceivably foster greater preparatory time to problem solve or avoid the expected outcome (Stöber, 1998). Because day-to-day life experiences often involve uncertain events and outcomes, individual variation in the ability to tolerate uncertainty may be a central construct in understanding the degree to which persons may worry about and experience emotional distress (e.g., elevated state anxiety) in response to such stimuli (Dugas, Buhr, & Ladouceur, 2004). Although the IU construct may share some similarity to TOA, it is distinct from it in the sense that IU is expressly focused on tolerance for uncertain, future-oriented, rather than ambiguous, "here-and-now" life events (Greco & Roger, 2001; Grenier, Barrette, & Ladouceur, 2005). A basic distinction here is that uncertain life events are not necessarily ambiguous (e.g., the relative success of a relationship could involve unexpected outcomes, but the relationship itself is not ambiguous; Greco & Roger, 2001).

Historically, IU has been studied through self-report inventories primarily among adult populations. Freeston, Rhéaume, Letarte, Dugas, and Ladouceur (1994) developed the Intolerance for Uncertainty Scale to measure the construct; both French and English versions of the scale have

been successfully developed and tested (Buhr & Dugas, 2002). There have been a variety of factor solutions reported for the IU scales, with most indicating a four- to five-factor solution (see Table 1.1) (Buhr & Dugas, 2002; Freeston et al., 1994; Norton, 2005). It is likely that some of this variability in factor structure may be due to differing sample selection techniques used across studies and factor analytic approaches utilized to explore latent structure (Norton, 2005). Nonetheless, because of the varied factor structures reported in past work, in conjunction with the high interitem correlations, researchers have argued for a more refined IU scale (Carleton, Norton, & Asmundson, 2007). In one such pursuit, Carleton and colleagues (2007) developed an empirically promising 12-item IU scale. Their Intolerance of Uncertainty Scale (IUS-12) includes two factors: prospective anxiety (e.g., "Uncertainty keeps me from having a full life") and inhibitory anxiety (e.g., "Unforeseen events upset me greatly"). Initial work on the IUS-12 indicated it maintained acceptable degrees of internal consistency, and the two observed factors are moderately correlated with one another (Carleton et al., 2007).

Discomfort Intolerance

Discomfort intolerance is operationalized as individual differences relating to the capacity to withstand uncomfortable physical sensations (Schmidt & Lerew, 1998; Schmidt, Richey, Cromer, & Buckner, 2007; Schmidt, Richey, & Fitzpatrick, 2006). In contrast to constructs that are delimited to specific internal stimuli such as pain (Feldner et al., 2006; Geisser, Robinson, & Pickren, 1992), discomfort intolerance has been conceptualized as relating to interoceptive (bodily) sensations that are uncomfortable, though not necessarily painful, to the individual more generally. Discomfort intolerance is theorized to be a relatively stable (trait-like) construct (Schmidt et al., 2006).

The core idea driving the study of discomfort intolerance is that persons less able to tolerate aversive physical sensations may be motivated to escape or avoid stimuli (e.g., public settings) or activities (e.g., exercise) that may trigger them (Schmidt & Lerew, 1998). If individuals high in discomfort intolerance consistently were unable to withstand physical stress and discomfort associated with fear and anxiety and, by extension, escaped or avoided it, they may place themselves at greater risk for maladaptive anxiety-relevant learning. For example, greater ability to tolerate physical stress (e.g., bodily sensations) may theoretically permit certain people to experience unwanted and feared sensations and/or develop a perceived sense of self-efficacy in experiencing and managing these otherwise unwanted states. This type of perspective is consistent with integrative theoretical models and intervention strategies that attempt to

modify anxiety and other problematic emotional states by changing one's maladaptive (typically avoidant or change-oriented) responses to aversive interoceptive (e.g., bodily sensations) and exteroceptive (e.g., stressful life occurrences) events (Hayes & Shenk, 2004; Orsillo et al., 2003; Ramel et al., 2004).

To measure this construct, Schmidt and colleagues (2006) developed the Discomfort Intolerance Scale (DIS), a five-item self-report instrument that examines how much one can tolerate uncomfortable physical sensations. Factor analytic study, using principal-axis factoring, has indicated that the DIS is composed of a global higher order discomfort intolerance factor and two subfactors: intolerance of discomfort or pain (e.g., *"I can tolerate a great deal of physical discomfort" [reverse scored]*) and avoidance of physical discomfort (e.g., *"I take extreme measures to avoid feeling physically uncomfortable";* Schmidt et al., 2006). Although limited in overall scope, the DIS has thus far demonstrated high levels of internal consistency (see Table 1.1).

Distress Tolerance (for Negative Emotional States)

Simons and Gaher (2005) conceptualize distress tolerance as an individual's ability to withstand negative psychological states.[1] Whereas other distress tolerance concepts focus on how information is processed (TOA), worry as a consequent of uncertainty (IU), and unpleasant physical discomfort (discomfort intolerance), this perspective focuses on the capacity to withstand negative emotional states (Simons & Gaher, 2005). Simons and Gaher suggested that this distress tolerance construct is multidimensional in nature, involving an individual's anticipation of and experience with negative emotions, including (1) ability to tolerate the negative emotion, (2) assessment of the emotional situation as acceptable, (3) the individual's regulation of the emotion, and (4) the amount of attention absorbed by the negative emotion.

To measure distress tolerance from this perspective, Simons and Gaher (2005) developed the Distress Tolerance Scale (DTS), a 15-item self-report measure that examines one's perceived ability to tolerate emo-

[1]Distress tolerance is the general label most frequently given to the body of work reviewed in the current chapter (Zvolensky & Otto, 2007). It is important to recognize that Simons and Gaher (2005) use this same term to reflect a specific type of distress tolerance, as described in this review. Thus, distress tolerance has been used to represent (1) a global area of work and (2) a specific type of tolerance construct. In this section, we use the term *distress tolerance* to refer to the Simons and Gaher (2005) conceptualization. From this point forward in this chapter, however, we clarify whether we are referring to the Simons and Gaher (2005) perspective of the specific construct. In all other instances, it should be presumed we are referring to the putative higher order distress tolerance concept.

tional distress, with questions related to tolerance, appraisal, absorption, and regulation. Factor analytic work based on a relatively healthy college sample indicates a single higher order distress tolerance factor as well as four additional first-order factors: tolerance, appraisal, absorption, and regulation. Although independent psychometric evaluations of the DTS are currently lacking, the measure has thus far demonstrated promising initial psychometric properties (see Table 1.1). Consistent with the trait-like perspective of distress tolerance, the DTS appears to be relatively stable over a 6-month time period (Simons & Gaher, 2005).

Frustration Tolerance

Harrington (2005) created a self-report measure of frustration tolerance, the Frustration-Discomfort Scale (FDS), the development of which was informed by rational-emotive behavior therapy and the associated conceptualization of intolerance of frustration and discomfort. The scale consists of 28 items and was developed and evaluated on a sample of 254 clinical and 79 nonclinical individuals. Initial work suggests the FDS is multidimensional, consisting of four seven-item subscales, each with good internal consistency: Discomfort Intolerance (α = .88)—demands that life should be easy, comfortable, and free of hassle; Entitlement (α = .85)—demands for immediate gratification; Emotional Intolerance (α = .87)—beliefs regarding uncertainty, controllability, and aversiveness of emotion; and Achievement Frustration (α = .84)—experiencing difficulties when seeking a specified goal. It is noteworthy that psychometric analysis did not indicate a higher order FDS factor or a global variable of frustration tolerance; however, the full-scale mean interitem correlations for the four-factor model demonstrate strong internal consistency (Table 1.1; α = .94; Harrington, 2005).

Physical Tolerance Tasks

In addition to self-report measures, there have been a number of approaches used to measure the duration of time an individual can withstand exposure to a specific type of aversive stimulus or task. These assessment procedures, namely thermal stress tolerance and biological challenge (reviewed later), have been used to reflect a behavioral or biologically informed perspective of distress tolerance. *These tasks have been developed without specific reference to a particular conceptual model or theory of distress tolerance.*

One line of work focused on tolerance for physical distress is *thermal stress tolerance*. Research within this area has addressed how individuals tolerate stressful thermal conditions (Hancock, Ross, & Szalma, 2007);

this work is, therefore, oriented on acute physical distress tolerance to specific (thermal) stimuli. There has been little described about the relative stability of this type of thermal stress tolerance over time. However, this body of work implicitly operates from the perspective that variation in thermal stress tolerance is relatively stable for an individual over time, although it could be impacted (e.g., increased or decreased) through exposure-based learning (e.g., repeated exposure to thermal stress exposure may increase the ability to withstand thermal stress) and other contextual factors (e.g., current stress level; Hancock et al., 2007).

Thermal tolerance has primarily been induced through partial body exposures or water immersion (e.g., cold pressor) (Hines & Brown, 1932). The cold-pressor task, for example, involves continual application of an aversive, but safe (i.e., no permanent tissue damage), cold stimulus. Most procedures involve the immersion of an individual's hand, at least up to the wrist, in ice water, typically 1°C (33°F), with instructions to keep the hand still (e.g., Burns, Bruehl, & Caceres, 2004; Hines & Brown, 1932; Neufeld & Thomas, 1977; Willoughby, Hailey, Mulkana, & Rowe, 2002). Pain *threshold* is determined by measuring the time it takes for the individual to indicate to the experimenter that he or she feels "pain" (e.g., Burns et al., 2004; Hines & Brown, 1932; Willoughby et al., 2002) or "discomfort" (Neufeld & Thomas, 1977). *Tolerance* is defined as the time it takes for an individual to report that the pain or discomfort is no longer tolerable and/or to terminate the procedure by removing his or her hand (e.g., Burns et al., 2004; Hines & Brown, 1932; Neufeld & Thomas, 1977). *Endurance* is measured as tolerance minus threshold (Neufeld & Thomas, 1977). It should be noted that, for the purposes of the present review, the tolerance variable and perhaps the endurance variable are most relevant to distress tolerance processes. If the participant has not demonstrated intolerance within 5 minutes, the procedure is generally terminated in order to prevent possible harm (Hackett & Horan, 1980; Neufeld & Thomas, 1977; Willoughby et al., 2002). Some procedures prompt participants to assess their level of discomfort periodically throughout the procedure using a rating scale (e.g., Hackett & Horan, 1980; Willoughby et al., 2002).

Thermal stress has additionally been induced experimentally through whole-body air temperature exposures (see Hancock et al., 2007; Pilcher, Nadler, & Busch, 2002, for reviews). Whole-body methods of examining cold thermal stress (temperatures typically less than 65°F [18.33°C]) (e.g., Sharma & Panwar, 1987; Thomas, Ahlers, House, & Schrot, 1989; van Orden, Benoit, & Osga, 1996) are less common than methodologies used to induce heat thermal stress (temperatures of at least 70°F) (e.g., Hocking, Silberstein, Lau, Stough, & Roberts, 2001; Hygge & Knez, 2001; Razmjou, 1996; Razmjou & Kjellberg, 1992). These procedures

typically include exposure to cold (less than 65°F) or hot (greater than 70°F) stimuli over an extended period of time. Temperatures of 90°F or above or 50°F and below are most reliably and strongly related to detrimental cognitive-related task performance (Pilcher et al., 2002).

Radiant heat stimulation also has been used in various procedures to induce cutaneous (skin surface) pain and to measure related tolerance and threshold ratings. Most methods include the application of lightbulb heat to a darkened area of the forehead (Kane, Nutter, & Weckowicz, 1971; Wolff & Jarvik, 1963), wrist (Orbach et al., 1996; Procacci, 1979), or finger of the dominant hand (Rhudy & Meagher, 2003). Participants are asked to indicate when a feeling of warmth changes to a feeling of pain or induces notable bodily sensations (Kane et al., 1971; Rudy & Meagher, 2003); this measurement has been typically referred to as a measure of thermal heat tolerance (Wolff & Jarvik, 1963). To the extent that the measurement is focused expressly on the detection of body temperature changes, however, it may possibly be more akin to an index of sensitivity to thermal heat.

Furthermore, distress tolerance has been examined with respect to behavioral responding to several other procedures, collectively described as *biological challenge tasks*. These are procedures used to manipulate individual oxygen and carbon dioxide (CO_2) levels in order to induce physiological activity associated with anxious arousal (Zvolensky & Eifert, 2000). For example, breath holding, voluntary hyperventilation, and inhalation of normal room air with higher concentrations of CO_2 have all been used as paradigms to measure tolerance to anxious arousal and related distress or discomfort (Zvolensky & Eifert, 2000).

Breath holding is typically measured with the functional residual capacity estimate of breath-holding duration, whereby participants breathe normally for 30 seconds, completely exhale on the experimenter's instruction, and then inhale and hold their breath for as long as possible; this procedure is then repeated after a 60-second rest period. The longer duration for the two trials is used as the index of maximum breath-holding duration (Hajek, 1991; Hajek et al., 1987; Zvolensky, Feldner, Eifert, & Brown, 2001).

The CO_2 challenge task developed by Brown and colleagues (2005) to specifically assess distress tolerance lasts 15 minutes and includes two 20% CO_2 presentations set to occur at 7 minutes and 12 minutes. The first presentation lasts 25 seconds, while participants determine the length of the final presentation. That is, once the final presentation has begun, participants may opt to terminate the presentation by pressing a button on the provided computer keyboard. The duration of time to the button press is the behavioral measure of distress tolerance. Unbeknownst to participants, if a button press is not made within 60 seconds, the task

self-terminates (i.e., at maximum duration, the presentation automatically terminates). This same type of distress tolerance format also has been adapted for voluntary hyperventilation (Marshall et al., 2008).

Cognitive Tolerance Tasks

Like physical tolerance tasks, a number of approaches have been used to measure the duration of time an individual can withstand exposure to specific types of difficult or frustrating tasks designed to tax cognitive or related psychological resources. The paced auditory serial addition task (PASAT), mirror-tracing task, and anagram persistence task (APT) have been applied as measures of tolerance for psychological or cognitive frustration. The PASAT is a visual and auditory serial addition task originally developed by Gronwall and Sampson (1974) as an index of information processing. Subsequent work suggested that it is better described as an index that taps multiple cognitive functions such as attention, working memory, and ability to perform under time constraints (e.g., Madigan, DeLuca, Diamond, Tramontano, & Averill, 2000). Although the PASAT has been used primarily as an index of sustained attention and concentration, researchers have noted the difficulty associated with its use and its tendency to elicit perceived stress and negative affect as well as unwillingness to engage in—or propensity to terminate—the task early among participants (Tombaugh, 2006). For example, Holdwick and Wingenfeld (1999) found that self-reported negative affect, as measured by the Multiple Affect Adjective Checklist (Zuckerman, Lubin, & Rinck, 1983), increased as a result of PASAT administration.

With the original PASAT, participants are presented, either visually or orally, with a series of single-digit numbers and are instructed to continually sum the two most recently presented digits (Tombaugh, 2006). They must correctly respond prior to the presentation of the next digit in order to receive a correct response score. Each set typically consists of 60 trials, or opportunities to correctly respond, and each trial consists of a set interstimulus interval (ISI), which is the amount of time between digit presentations. Many researchers use several ISIs across several trials and may choose certain trial lengths based on the population being investigated and the potential of ISIs to detect group differences (Tombaugh, 2006).

Lejuez, Kahler, and Brown (2003) proposed a modified, computerized version of the PASAT, or PASAI-C, consisting of three corresponding levels: Level 1—low difficulty (3 minutes); Level 2—medium difficulty (5 minutes); and Level 3—high difficulty (10 minutes). Two formats have been used: in one participants select their response using the computer mouse, and in the other participants provide their response verbally (e.g.,

Daughters, Lejuez, Kahler, Strong, & Brown, 2005). During administration of the PASAT-C, Level 1 transitions immediately into Level 2. Level 2 is followed by a 2-minute rest period before participants are prompted to complete Level 3. Participants are told that at some point during Level 3 they will be given the option to terminate the procedure, but that their reward is contingent on their level of performance. Psychological distress tolerance using the PASAT-C is indexed as time in seconds until task termination of Level 3 (Lejuez et al., 2003). Participants are told they will be awarded one point for each correct response, and incorrect scores or failure to respond will not impact their score. Unbeknownst to the participant, the task self-terminates within 7 to 10 minutes (Daughters et al., 2005; Lejuez et al., 2003). Prior to the task as well as after Level 2, measurement of dysphoria, including self-reported anxiety, difficulty concentrating, bodily discomfort, and irritability, can be obtained to ensure that levels of psychological stress are adequate (demonstration of significant difference between baseline and post–Level 2 dysphoria ratings) (Brown, Lejuez, Kahler, & Strong, 2002). This dysphoria scale has demonstrated acceptable internal reliability ($\alpha = .69$) (Daughters et al., 2005). In addition, Lejuez and colleagues (2003) have found evidence for the PASAT-C in increasing physiological arousal, most strongly evidenced in skin conductance changes but also in heart rate response.

Mirror tracing is another task used to index tolerance to cognitive or psychological frustration or distress. This methodology requires participants to trace the outline of a geometric figure, often a star, while viewing it through a mirror—or as though they are viewing the object through a mirror—thereby demanding a high degree of motor control (Matthews & Stoney, 1988; Quinn, Brandon, & Copeland, 1996). Because of the mirror viewpoint, participants must move the tracer in the exact opposite direction of where they intend for it to go while tracing the star. Each time the tracer falls off the outline of the star, an irritating auditory tone is emitted (Matthews & Stoney, 1988). Performance on this task is determined as the percentage of time during the trial that the tracer is off the figure (Matthews & Stoney, 1988). Research indicates that engagement in this task results in a substantial increase in blood pressure, heart rate, and self-reported stress as well as frustration (Krantz, Manuck, & Wing, 1986; Matthews & Stoney, 1988; Tutoo, 1971).

In research utilizing mirror tracing as a measure of distress tolerance, participants are typically given two practice trials consisting of simple line images that help orient them to the task (Daughters et al., 2005; Quinn et al., 1996). These lines are followed by one or more complex drawings that are extremely difficult, or practically impossible, to trace with accuracy (Daughters et al., 2005; Quinn et al., 1996). Participants are encouraged to try their best and, in some cases, told that their level

of performance will impact their monetary compensation (Daughters et al., 2005; Strong et al., 2003). When faced with the complex figures, participants are given the option of discontinuing at any time or moving on once they have completed the figure (Daughters et al., 2005; Quinn et al., 1996). Similar to the PASAT task, after 5 minutes, presentation of the object terminates. When using the task as a measure of distress tolerance, tolerance is measured as the average time spent on tasks that the individual was unable to complete (Daughters et al., 2005; Quinn et al., 1996). Brandon and colleagues (2003) found that the mirror tracing demonstrated good internal consistency when used among a sample of daily smokers ($\alpha = .92$).

A final cognitive task used to induce distress is the APT (Eisenberger & Leonard, 1980). Participants are presented with anagrams, which may range in level of difficulty (Mayzner & Tresselt, 1966), and are told by the experimenter that each presentation contains letters that can be rearranged to form a word. Participants are then asked to either indicate to the experimenter (e.g., by raising hand or verbally; Postman & Solomon, 1950) that they have reached a solution in order to receive a point or to move on to the next presentation stimulus if they cannot solve the word (Eisenberger & Leonard, 1980). It is noteworthy here that the points were simply given as an indication of the number of anagrams accurately solved and not as a reward. Participants are typically given a distinct amount of time in order to solve the anagram (e.g., 3 minutes; Brandon et al., 2003) and are directed to move on to the next card if they do not respond within the time allotted (Eisenberger & Leonard, 1980). For procedures in which the APT is used as a measure of persistence or tolerance, the average time spent on difficult or not-completed anagrams before giving up and proceeding to the next is used as the individual's score (e.g. Quinn et al., 1996). Brandon and colleagues (2003) found that the APT demonstrated good reliability ratings across six trials each when used with a sample of smokers ($\alpha = .85$).

SUMMARY

Distress tolerance has increasingly been viewed as a potentially important construct in developing new insights about the onset and maintenance of adult psychopathology as well as its prevention and treatment (Zvolensky & Otto, 2007). In the current chapter, we discuss conceptual distinctions between distress tolerance and theoretically related variables, provide an overview of the historical development of distress tolerance research, and highlight a variety of conceptual models and multimethod measures of the constructs. Given the diversity in conceptual models and

indices of distress tolerance in the extant literature, our intention for the present chapter was to specifically define the constructs and their measurement because doing so may be imperative to advancing the empirical and theoretical literature on this topic. The remaining chapters in this volume help elucidate the ways in which distress tolerance may relate to specific psychopathological processes and disorders. In the final chapter, we return to the key issues raised within this volume in an effort to synthesize knowledge gained to date and to inform possible future directions in the study of distress tolerance.

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