# DO ANGER MANAGEMENT TREATMENTS HELP ANGRY ADULTS?

# A META-ANALYTIC ANSWER

by

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**Abstract**

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Poorly managed anger could be a serious social and psychological problem. Despite the need for effective anger treatment models, little is known about what works and what does not work for various categories of angry people, and what could be done to better help them. This study was conducted to assess the efficacy of anger treatments with adults and to test four participant characteristics and three study characteristics presumed to moderate treatment effects. To that end, 74 anger treatment outcome studies were meta-analytically synthesized. The individual reports were included if they tested anger treatment with adults, used measures of anger, and provided data in a format for which an effect size was calculable. There was no limit as to the treatment model or modality, or the study's publication status. Randomized controlled trials, nonequivalent control group studies and single group pretest-posttest studies were included, but single-case studies were not included. A post-hoc decision was also made to include only studies reporting treatments that consisted of 1-18 sessions.

The overall mean effect size was $g = 0.584$. The results were heterogeneous indicating the existence of moderator variables. One of the moderator variables was the population from which the participants were recruited. The treatment effect sizes ranged from large in people with intellectual disabilities and psychiatric outpatients, to small in medical patients, drivers, and

veterans. Another moderator variable was the participants' gender. The effect sizes were larger in women than in men participating in anger treatment. The participants' cognitive and anger severity levels did not moderate treatment effects. There were no moderating effects of study design and treatment modality either. There was an association between the publication status of the individual reports and treatment effect sizes, with published studies reporting larger effect sizes than the unpublished studies.

This meta-analysis confirmed that the majority of people who participate in anger treatment benefit from it. The current study also uncovered two participant characteristics that moderate treatment effects, identified areas that require more research, and indicated what participants' data should be included in individual reports to advance prospective meta-analyses of anger treatment outcomes.

## Dedication

To my parents…

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# CHAPTER I

# RATIONALE AND BACKGROUND

Fear (anxiety), anger, and depression are listed among the most common human emotions (Ekman, 1992; Izard, 1977; Mesquita & Frijda, 1992). Spielberger and Reheiser (2004) compare these three states to pulse rate, blood pressure, and fever, and refer to them as "the emotional vital signs that are most critical to an individual's psychological well-being" (p. 82). While anxiety and depressive emotions have generated a wealth of empirical research, anger is less well researched and less well understood despite the central role it plays in peoples' lives (DiGiuseppe & Tafrate, 2007).

The limited research on anger is puzzling because persistent and/or extreme anger creates a number of problems for the angry person. More specifically, persistent and/or extreme anger is often linked to medical problems, substance abuse, interpersonal violence, child abuse, and risky driving, among other deleterious behaviors (Friedman & Booth-Kewley, 1987; Galovski, Malta, & Blanchard, 2006; Grisso, Davis, Vesselinov, Appelbaum, & Monahan, 2000; Stith, Smith, Penn, Ward, & Tritt, 2004; Stith et al., 2009; Suls & Bunde, 2005).

## The Present Study

Given the deleterious consequences of persistent and/or extreme anger, it is important to determine if anger management treatments actually work. What anger management treatments have been developed? Which anger management treatments have been tested in randomized clinical trials (RCTs)? What variables moderate treatment? How do anger management specialists even define and measure pathological anger?

This study aims to answer these questions. The primary method to be used will be meta-analysis, the quantitative synthesis of previous primary research studies. But, before describing

the study's methods and results, readers must understand (a) how anger is defined; (b) how anger is operationalized/measured; (c) what previous research has shown to be useful for people who have a problem with anger management, and (d) how the current study adds new knowledge to the empirical evidence base of treatments that are useful for anger management.

## What Is Anger?

As we all know, anger is a common experience. Everyone feels angry at some point and some people feel angry all the time or get angry easily (Averill, 1983). Being angry means that someone is dissatisfied with someone else, him or herself, or the current state of affairs (DiGiuseppe & Tafrate, 2007). Furthermore, anger motivates people to initiate a corrective action—to change their state of affairs (Tangney et al., 1996; Zackariasson, 2009). Anger is not inherently pathological, even if it is commonly experienced as unpleasant by either the angry person or by others interacting with the angry person. Anger is sometimes confused with aggression and hostility, but these constructs differ. Anger is an emotional experience, whereas aggression is a behavior, and hostility is an attitude (DiGiuseppe & Tafrate, 2007; Kassinove & Sukhodolsky, 1995; Novaco, 1998).

There are several major models of anger, each with their own definitions of anger. These include cognitive appraisal models of anger (Deffenbacher, 1999; Frijda, 1986; Kassinove & Sukhodolsky, 1995; Lazarus, 1991), the cognitive-neoassociationistic model of anger (Berkowitz, 1990, 1993; Berkowitz & Harmon-Jones, 2004), the systemic model of anger (Novaco, 1998; Robins & Novaco, 1999), and DiGiuseppe & Tafrate's (2007) model of anger. All of them build on Schachter and Singer's two-factor theory of emotions.

Briefly, Schachter and Singer (1962) posit that in emotion-evoking situations people first feel general physiological arousal, and then they look for environmental cues as to what might

have caused that arousal. They then label their emotions according to those cues. In their seminal experiment, Schachter and Singer (1962) exposed the participants to either a euphoric cue (someone acting happy) or an anger cue (someone acting angry). Prior to the exposure, half the participants received an adrenaline injection, which created physiological arousal, while the other half received a placebo injection. The participants who received an adrenaline injection were significantly more likely to act in accordance with the situational cue and experience increased happiness or anger compared with participants who received a placebo injection. Schachter and Singer concluded that participants' emotions resulted from a combination of the state of arousal and their cognitive interpretations of the situation. This is the essence of their two-factor theory of emotions, which generated numerous research studies (see Cotton, 1981, for review) and contributed to the development of the contemporary understanding of emotions. It is now possible to discuss the four models of anger mentioned above that build on the two-factor theory of emotion: The cognitive appraisal model, the cognitive- neoassociationistic model, the systemic model, and the integrated model.

**Cognitive Appraisal Models of Anger**

According to cognitive appraisal models (Deffenbacher, 1999; Frijda, 1986; Kassinove & Sukhodolsky, 1995; Lazarus, 1991; Smith & Kirby, 2004), cognitions strongly influence emotions, and in any given situation, our interpretation of the situation determines our feelings. People develop cognitions (memories, associations, schemas, and/or construals) that alter their subsequent perceptions and evaluations of their life experiences via social experiences. People also develop culture-specific behavior scripts, which facilitate responses to emotionally-charged situations. For example, a woman who is unjustly criticized by her boss might feel guilty or she might feel angry, depending on her appraisal of the situation. If feeling angry, she might respond

in a subdued, an assertive, or an aggressive manner, depending on the behavioral script which she adopted as a result of her previous experiences in similar social situations.

Research indicates that anger arises when a person perceives the situation as unjust, preventable, and resulting from someone else's intentional action (Deffenbacher, 1999; Frijda, 1986; Kassinove & Sukhodolsky, 1995; Lazarus, 1991). These commonly-agreed-upon determinants of anger are sometimes included in definitions of this emotion. Two definitions which emerged from the cognitive appraisal model of anger will be discussed here.

**Kassinove and Sukhodolsky's definition of anger.** Kassinove and Sukhodolsky (1995) conceptualize anger as a subjective feeling, which is associated with corresponding cognitions, physiological reactions, and readiness to act on the angry feelings. They propose the following definition of anger:

> [Anger is] a negative, phenomenological (or internal) feeling state associated with specific cognitive and perceptual distortions and deficiencies (e.g. misappraisals, errors, and attributions of blame, injustice, preventability, and/or intentionality), subjective labeling, physiological changes, and action tendencies to engage in socially constructed and reinforced organized behavioral scripts (p. 7).

Kassinove and Sukhodolsky's (1995) definition implies that anger arises because of distorted or deficient cognitions. Although that might be true most of the time, this definition does not take into account multiple situations of anger that might be an adaptive response to a situation and might be related to accurate appraisals and attributions, not necessarily misappraisals and misattributions. Kassinove and Sukhodolsky's definition seems to be too specific to encompass all instances of anger. However, it likely defines pathological anger well and, therefore, might be appropriately used in a clinical context.

**Deffenbacher's definition of anger.** Deffenbacher (1995) conceptualizes anger as a phenomenon that develops simultaneously on emotional, cognitive, and physiological levels, but his definition of anger separates anger-related behavior ("action tendencies," Kassinove & Sukhodolsky, 1995) or behavioral components from the experience of anger. According to Deffenbacher (1995):

> Anger is an experiential state consisting of emotional, cognitive and physiological components that co-occur, rapidly interacting with and influencing each other in such a way that they tend to be experienced as a singular phenomenon. The individual also behaves in reaction to precipitating events and to experienced anger (p. 296).

Deffenbacher (1995) does not explain how anger affects behavior and he is not consistent in situating the anger experience in the sequence leading from the precipitating event to behavior. The above definition might suggest that the anger experience and the precipitating event are two parallel processes that generate subsequent behavior. However, in his later writings, Deffenbacher (1999) also lists eliciting events, along with the individual's pre-anger state and his/her appraisals, as "contributors to anger" (p. 295). Therefore, it is not clear if the author views the anger experience as a moderator variable that alters the person's response to the precipitating event or a direct source of the person's reaction.

There are similarities between each definition of anger: Anger is a multifaceted experience that has affective, cognitive, and physiological components. Each definition also differs in its emphasis on whether anger is a moderator or mediator of the relationship between perception and action, although neither definition clarifies this issue.

## Cognitive-Neoassociationistic Model of Anger

The interconnectedness of all the components of human internal states is evident in

Berkowitz's cognitive-neoassociationistic model of emotions (Berkowitz, 1990, 1993; Berkowitz & Harmon-Jones, 2004). This model combines cognitive appraisal ideas (that people construe their understanding of situations and react accordingly) with associationistic models of mental processes (that all mental processes create a net of associations and can influence each other).

In accord with Averill (1982), Berkowitz (1990, 1993) refers to anger as a feeling, which is part of the "emotional syndrome." According to Berkowitz, "any given emotional state is best regarded as an associative network in which specific types of feelings, physiological reactions, motor responses, and thoughts and memories are all interconnected" (1993, p. 9). Thus, each emotional state, including anger, might be influenced and evoked by explicit cognitions, physiological states, or automatic processes.

In contrast to cognitive attribution theories, Berkowitz contends that anger can arise in response to the activation of any of those subsystems, with no particular order or priority. For example, the person might become angry because of heat or noise that affects the individual's physiological processes (e.g. increased heartbeat or blood pressure), which, by association with cognitive attributions, might evoke a full episode of anger. This episode could be initiated in cognitive or behavioral components of the anger syndrome as well, which means that anger-provoking thoughts or memories, as well as aggressive actions, might evoke angry feelings that the person had not felt previously.

According to Berkowitz (1993), an aversive event, be it external or internal, at first evokes negative affect, which is associated with fight-or-flight tendencies. The fight tendency is commonly associated with anger, while the flight tendency is commonly associated with anxiety. The fight tendency consists of motor reactions, physiological changes, memories, thoughts, and feelings of displeasure. This lower-level and highly automatic processing of an aversive event

generates rudimentary anger, which might be blended with rudimentary fear. Cognitive appraisals, attributions, schemas, interpretations, and strategies act quickly after this initial rudimentary emotion develops. Those complex, higher-level cognitive processes generate a fully-constructed emotional experience. Anger is entirely differentiated from fear and other emotions at this level of emotion formation.

Berkowitz (1990, 1993) understands anger as a complex syndrome, which stems from automatic survival-related responses and is shaped by higher-level cognitive processes into a fully-differentiated emotion. His model evolved from a narrow understanding of anger "only as a feeling" (Berkowitz, 1990, p. 494), a feeling which was somewhat artificially attached to the negative affect-aggression link, into a broader conceptualization of anger that he presents in his recent writings (Berkowitz & Harmon-Jones, 2004). Berkowitz and Harmon-Jones define anger as "a syndrome of relatively specific feelings, cognitions, and physiological reactions linked associatively with an urge to injure some target" (p. 108). The specific feelings included in this definition vary in intensity from slight annoyance to irritation, fury, and rage. The cognitions, which are part of an anger syndrome, might be automatic or they might be controlled by awareness. They include appraisal processes as well as behavior scripts and coping or inhibitory processes.

**Systemic Model of Anger**

Novaco's conceptualization of anger places the angry individual in an environment or a system in which the individual lives and acts. Novaco (1998) defines anger as "a negatively toned emotion, subjectively experienced as an aroused state of antagonism towards someone or something perceived to be the source of an aversive event" (p. 13). This characterization of anger, in contrast to Kassinove and Sukhodolsky's (1995) definition, is general enough to

include commonly experienced and possibly adaptive anger. The weakness in Novaco's definition, however, lies in its inclusion of a concept of "antagonism" which is not subsequently defined or specified. Because "antagonism" could be understood as resentment or hostility, the use of this term to define anger makes the reasoning behind the definition tautological.

Regardless of this vagueness in the definition of anger, Robins and Novaco (1999) present an interesting conceptualization of anger as a contextual phenomenon in which cognitive, physiological, and behavioral "personal dispositional systems of anger" (p. 325) constantly interact with environmental systems. This interplay of personal characteristics, interpersonal components, and other environmental systems results in anger being either adaptive or dysfunctional. According to Robins and Novaco, "people become angry because of the function that it serves" (1999, p. 331). Anger-related behaviors persist because they are frequently embedded in personal identity and influenced by the person's life history, and, within their environmental systems, these reactions usually serve an adaptive function. With time, the frequently-utilized responses become automatic. Thus, in people who frequently perceive their environment as threatening, anger can become an automated response, which can be activated by subtle environmental cues. This might result in an anger-prone person's feeling a lack of control over his/her angry feelings and responses, as evidenced in posttraumatic stress disorder (Chetomb, Novaco, Hamada, & Gross 1997).

Robins and Novaco incorporate the concept of "excitation transfer" (Zillman & Bryant, 1974) to demonstrate how anger arousal in one environmental system affects people's ability to regulate anger in other environmental systems. As demonstrated by Zillman and Bryant, each episode of anger has its own arousal curve with excitation, plateau, and dissipation. However, undissipated arousal can carry over to the next episode of anger and can accumulate, contributing

to an anger reaction that is stronger and more difficult to regulate. For example, a person who had a stressful day at work and a difficult commute might accumulate annoyance or anger arousal during the day and might lose control over his/her anger reaction to a relatively mild stressor at home. According to Robins and Novaco (1999), this is a mechanism that explains how physiological components of anger can transfer from one situation to another. The authors contend that similarly, the cognitive and behavioral components of anger can transfer across situations and time.

**Towards an Integrated Understanding of Anger**

DiGiuseppe and Tafrate (2007) present the most comprehensive review of theories and research of anger to date. They look at anger and anger disorders from a variety of psychological perspectives and systematically integrate knowledge of this subject while remaining anchored in a cognitive-behavioral theory of emotions. According to DiGiuseppe and Tafrate:

> Anger is a subjectively experienced emotional state with high sympathetic autonomic arousal. It is initially elicited by a perception of a threat (to one's physical well-being, property, present or future resources, self-image, social status or projected image to one's group, maintenance of social rules that regulate daily life, or comfort), although it may persist even after the threat has passed. Anger is associated with attributional, informational, and evaluative cognitions that emphasize the misdeeds of others and motivate a response of antagonism to thwart, drive off, retaliate against, or attack the source of the perceived threat. Anger is communicated through facial or postural gestures or vocal inflections, aversive verbalizations, and aggressive behavior. One's choice of strategies to communicate anger varies with social roles, learning history, and environmental contingencies. (DiGiuseppe & Tafrate, 2007, p. 21)

This definition is congruent with contemporary understanding of emotion as a multifaceted construct with physiological, phenomenological (subjective feeling), cognitive, and behavioral elements. It synthesizes the knowledge of anger offered by research and it corresponds with the widely accepted model of anger as a two-level phenomenon with rudimentary perceptions of a threat followed by more elaborated cognitions (Berkowitz & Harmon- Jones, 2004). DiGiuseppe and Tafrate's definition encompasses instances of dysfunctional as well as healthy anger because it does not describe anger-related cognitions as distorted. It is specific enough to separate anger from other emotional states, such as anxiety, by using the concept of antagonism as a motivational state which corresponds to the more general concept of "action tendency" used in the psychology of emotions (e. g., Berkowitz, 1993; Berkowitz & Harmon-Jones, 2004). It explains the relation of anger to aggression and it shows the subjectivity of anger not only as a phenomenological experience but also as stemming from the individual's perception of the situation, thus including the possibility of individual differences in angry responses to similar situations. Finally, it acknowledges the role of the environment and culture in development and people's choice of anger expressions. The above-quoted definition pertains to *state anger* (the instance of anger experienced in a specific situation). DiGiuseppe and Tafrate (2007) subsequently define *trait anger* as "the propensity to experience intense states of anger (as defined above) frequently" (pp.21-22).

It is important for clinicians to have a good definition of anger, a definition that helps to understand anger and to differentiate it from other emotions in order to apply proper treatment. For example, anxiety might result in acting out and it is therefore often confused with anger, but cognitions and motivation associated with feeling anxious differ from the cognitions and motivation associated with feeling angry. When perceiving a threat, an anxious person is likely

to focus on a deleterious outcome of the threatening situation, strongly exaggerate the threat and the likelihood of the harm, and respond with the attempt to escape (the flight response). This might demonstrate as screaming and even physical aggression towards others in an attempt to get out of the situation, which is evoking unbearable fear. In contrast, an angry person facing a threatening situation is likely to focus on the injustice of the situation, which now threatens the angry person's well-being or values. Therefore, the angry person is more likely to engage in blaming those believed to contribute to the injustice and focus on retaliation or setting the situation right (the fight response), which also can demonstrate in screaming and possible physical aggression. DiGiuseppe and Tafrate's (2007) definition helps the clinicians to distinguish anger from other emotions by clarifying the cognitions and motivation typical for anger. It does not help, however, to differentiate adaptive from pathological anger.

All aspects of problematic anger cannot be captured in one definition. It seems that a good anger definition is just a first step in helping clinician to diagnose pathological anger. What they need to diagnose the problem when it arises and then determine how to best treat it is not only a matter of anger definition, but also a matter of creating diagnostic categories of disordered anger and outlining criteria that define these categories, as it is done with other disorders listed in the Diagnostic Statistical Manual of Mental Disorders (DSM, most recent version being DSM-IV-TR, American Psychiatric Association, 2000). The issue of anger disorders proposed by scholars (Eckhard & Deffenbacher, 1995; Mc Dermut, Fuller, DiGiuseppe, Chelminski, & Zimmerman, 2009), disorders that are missing from all editions of the DSM published to date will be discussed later in this chapter.

## Measurement of Anger

As a subjective phenomenon, anger is most directly assessed by self-reporting measures.

Even though it is possible to observe signs of anger in others, the discrepancy between feeling angry and acting upon this feeling (Averill, 1983; Spielberger & Reheiser, 2004) renders observational methods limited. When using self-report measures, however, the clinicians and researchers must exercise caution in their interpretation of results and be aware of factors that affect self-reports of anger.

**Threats to Validity of Self-Report Measures of Anger**

**Social desirability bias.** The main threat to the self-report validity is a social desirability bias, which might affect self-reports of acting out anger (e.g. in the direction of underreporting) and anger control (e.g. in the direction of overreporting). Gollwitzer, Eid, and Jurgensen (2005) tested response styles in a large clinical sample that completed State-Trait Anger Expression Inventory (STAXI, Spielberger, 1988), the most commonly used measure of anger. Golwitzer et al.'s (2005) study revealed that the majority of the subjects responded in a manner that indicates relative freedom from response biases. However, a much smaller but substantial minority demonstrated a pattern of responses on scales Anger-out and Anger-in (see discussion of the STAXI below) that is consistent with social desirability bias. Golwitzer et al.'s study indicates the need for more thorough examination of response styles when assessing anger using self-report measures.

**Reactivity bias.** Taylor and Novaco (2005) expand on the idea of social desirability and discuss reactivity bias, which pertains to the person's inferences about and responses to the situation, such as psychological assessment or research participation. This is particularly important in forensic settings where people might feel threatened by the request to disclose their anger. Taylor and Novaco list several sources of reactivity bias, which include people's distrust, a culturally based symbolism associating anger with savage, irrational, and overpowering

emotions, and the idea that anger is a protected part of an individual's identity. Response styles might also affect the results of self-report measures. Acquiescence tendency, or the tendency to avoid or prefer extreme responses on inventories that use the Likert scale, might unintentionally alter the subjects' reports.

**Proximity bias.** Self-reported anger experiences might also be altered by proximity bias (Taylor & Novaco, 2005), which is a person's tendency to report discrete events directly preceding anger episodes as the causes of their anger. Since anger is usually attributed to another person's faulty actions, "people are inclined to attribute the causes of their anger to personal, stable, and controllable aspects of another person's behaviour" (Taylor & Novaco, 2005, p. 70). They usually do not recognize the residual effect of daily stress and/or contextual factors in an anger-provoking situation. The authors suggest that the contextual and temporal aspects of anger be actively explored in interviews that should accompany the self-report measures of anger. Similarly, treatments that explore antecedents and factors contributing to the person's susceptibility to angry reactions address the proximity bias.

**Instruments Commonly Used to Assess Anger**

**State-Trait Anger Expression Inventory (STAXI).** STAXI, created by Spielberger (1988), is the most commonly used inventory of anger and anger expression (Novaco, 1995). The recent version of this inventory, STAXI-2 (Spielberger & Reheiser, 2004) consists of 57 items that constitute 6 scales and 5 subscales. This empirically based test was developed gradually by administration of anger-related statements to students, navy recruits, hypertensive patients, surgical patients, high school students, and other populations (see Spielberger, Reheiser, & Sydeman, 1995 for review). Initially, only two factors, State-Anger and Trait-Anger, were detected and tested. State-Anger was defined as the "psychobiological state or condition,

consisting of subjective feelings that varied in intensity from mild irritation or annoyance to intense fury and rage, with associated activation of the autonomic nervous system" (Spielberger & Reheiser, 2004, p. 76). Trait-Anger was defined as the "individual differences in the frequency that State-Anger was experienced over time" (p. 76). With time, the anger expression scale was added to the existing state and trait related items. The anger expression scale consists of three subscales, Anger-in, Anger-out, and Anger-control. Anger-in refers to the suppression of angry feelings and Anger-out refers to the frequency with which a person expresses angry feelings in a verbally or physically aggressive manner. The Anger-control subscale was developed to identify the individual differences in the ability to control angry feelings and actions. This scale was subsequently divided into Anger Control-Out, which measures the frequency with which a person controls the outward expression of angry feelings, and Anger Control-In, which measures the frequency with which a person attempts to control the internal feeling of anger by calming down. Finally, the State-Anger scale was divided into three factorially derived subscales: Feeling Angry, Feeling Like Expressing Anger Verbally, and Feeling Like Expressing Anger Physically.

The STAXI-2 requires a sixth-grade reading level and may be modified for visually or cognitively impaired patients. The concurrent validity of the STAS (a prototypical version of STAXI-2) was tested by comparison with Buss-Durkee Hostility Inventory (BDHI, Buss & Durkee, 1957), which showed a positive correlation between those two measures ($r = 0.63$). STAXI-2 is reported to have a satisfactory internal consistency (alpha coefficient = 0.87), which is not influenced by gender or pathology (Spielberger & Reheiser, 2004). A normative sample of 1,900 normal adults and hospitalized psychiatric patients completed the STAXI-2. In addition, norms for the STAXI (original version) are reported (Spielberger, 1988).

**Novaco Provocation Inventory (NPI).** This instrument consists of 80 brief descriptions of anger-provoking situations, which fall into one of the following categories: "(1) annoying behavior of others, (2) humiliation/verbal insult, (3) personal injustice, (4) social injustice, (5) frustration, (6) personal clumsiness, and (7) physical assault" (Novaco, 1995, p. 328). The respondents indicate on a five-point scale the degree of anger they would feel if exposed to those situations. The results are presented as a total score, a global index of the person's intensity of anger (Novaco, 1988). Novaco (1995) reports that, based on the research on clinical and nonclinical samples, the mean for nonclinical samples ranges from 230 to 255 with a standard deviation of 45. He also reports that NPI has high internal reliability ($r$ = 0.93) and test-retest reliability that varies from r = .83 for a one-month interval to $r$ = 0.90 for a one-week interval. An abbreviated version of NPI, the PI (Taylor & Novaco, 2005) consists of 25 items and is often used along with the Novaco Anger Scale (NAS). The PI has been tested on hospital patients and male offenders rendering an internal reliability alpha of 0.95 to 0.96 and a test-retest reliability alpha of 0.85 to 0.86.

**Novaco Anger Scale (NAS).** The NAS (Novaco, 2003) is based on the cognitive theory of anger and consists of Cognitive, Arousal, and Behavioral subscales, as well as an Anger Regulation subscale, which was added to the original version of NAS in 2003. The revised NAS consists of 60 items that are rated on a three-point scale. Forty eight items comprise the NAS Total score and 12 items comprise the Anger Regulation scale. The NAS Total validation was conducted on hospital patients and male offenders and rendered an internal reliability alpha = 0.95 and a test-retest reliability alpha = 0.84 - 0 .89.

**Measures of Pathological Anger.** The STAXI can be used to assess pathological anger. According to Spielberger and Reheiser (2004), "Individuals with anger scores above the 75$^{th}$

percentile are likely to experience and/or express angry feelings that interfere with optimal functioning and dispose them to develop psychological or physical disorders" (p. 79). The ability to select pathological levels of angry feelings is discussed by Eckhardt and Deffenbacher (1995), who indicate that having an inventory to measure clinical levels of anger would help to establish anger disorders as distinct from other clinical categories and lead to their inclusion in future editions of DSM. They report work by a team of scholars (Eckhardt, DiGiuseppe, & Tafrate, 1994, as cited in Eckhardt & Deffenbacher, 1995) on construction and validation of a self-report scale and a structured interview to diagnose clinical anger, the Anger Response Scale (ARS). The ARS is a 35-item inventory, which was administered to outpatient adults, college students, male prisoners, and males who engage in domestic violence. The results indicate that the ARS captures the intense anger experience, which is distinct from normative results of STAXI and indicative of a pathological level of angry feelings.

**Issues of Anger Measurement in People with Intellectual Disabilities**

Novaco and Taylor (2004) report high prevalence rates of anger and high predictive validity of self-reported anger on subsequent assault behavior in patients with developmental disabilities. However, anger assessment in people with reading and comprehending difficulties, such as people with intellectual disabilities, creates a challenge for researchers and practitioners, who frequently shy away from self-report methods while assessing this population and resort to third-party reports obtained from family members or staff. Some studies (e.g. Bromley & Emerson, 1995; Dagnan & Cairns, 2005; Tynan & Allen, 2002), however, indicate that staff working directly with people with intellectual disabilities rate the level of frequency and the intensity of the angry feelings of their clients higher than self-reports of the people with intellectual disabilities. This could be a result of social desirability bias or a lack of insight

distorting the results of self-reports of people with intellectual disabilities. Studies by Lindsay, Michie, and Baty (1994) and Stenfert-Kroese, Dagnan, and Loumidis (1997) do not support the social desirability or distortion biases and suggest that people with intellectual disabilities could report their feelings and give account of their internal states quite reliably if appropriate techniques were to be used. The discrepancy between self-reported and staff-reported levels of anger could be explained by the staff and families overreporting the anger experience of people with intellectual disabilities, mostly due to burnout of the caregivers, perceived threat to self, stigmatization of people with intellectual disabilities, and/or as a justification of their restrictive care giving practices (Tynan & Allen, 2002).

Novaco and Taylor (2004; Taylor & Novaco, 2005) modified several instruments to adapt to the abilities and needs of offenders with intellectual disabilities. The adaptations include simplified wording and shorter versions of commonly used self-report measures such as the STAXI, NAS, and NPI. Instruction changes, which require the researcher to read the questionnaire items and record the responses rather than requesting that the participants read and rate the items, were also made. The study by Novaco and Taylor (2004), conducted with 129 male patients on the forensic unit of the Northgate Hospital in England, indicated that those adapted instruments had good internal consistency (consistency coefficients, alphas, were as follows: STAXI, 0.86 - 0.87, NAS Total, 0.92 and NPI 0.92). The test-retest reliability coefficients measured in two- to six-month intervals on a subsample of 44 patients were mostly in a moderate range. The authors also used the Ward Anger Rating Scale (WARS, 1994), which was completed by ward staff members who knew the patients well. There were significant correlations between staff-rated anger and self-reported anger only for the Anger-out subscale of STAXI and NAS Cognitive scale. However, the staff ratings were highly related to the patients'

history of violent offenses, which were known to the staff and could affect their scoring, while the self-reported anger was not related to the history of violent offenses. Novaco and Taylor also report that hierarchical regression analysis revealed the significant predictive value of self-report anger on post-admission assaults. Overall, there is an empirical basis for the use of self-reports to assess anger in people with intellectual disabilities, but more research is needed in this area.

## Anger as We Know It

The above review of the instruments most commonly used to measure anger illustrates the tendency of the scientists to use self-report measures without sufficient corroboration of the results by other-parties reports or measures of physiological arousal associated with angry feelings. This raises a question of the external validity of the results, an issue that affects other areas of psychological research as well (Bornstein, 2003).

Moreover, the predominance of self-report instruments was created using the cognitive-behavioral models of anger and, in turn, research conducted using these instruments contributed to further development of these models. Thus, the current understanding of anger is somewhat driven by measures of this emotion. Psychological knowledge of anger is largely built by converging data (facts as we know them) collected using specific instruments, and theories or models of anger follow. While the empirical basis of anger models is strong, the question remains to what extent the models reflect reality or the human experience of anger, and if some parts of this experience might be missing due to the current scope of the psychological perspectives on anger. For example, the existing instruments do not capture the cognitive aspect of anger (Del Veccio & O'Leary, 2004).

## The Ramifications of Dysfunctional Anger

Excessive anger is associated with a wide range of severe public health problems. These

include: Medical issues such as hypertension and cardiovascular diseases, a general tendency toward violent behavior, tendency toward intimate partner violence, child maltreatment, aggressive driving, and violence in some people with psychiatric diagnoses.

**Anger and Medical Problems**

A relationship between anger and hypertension and heart problems has long been discussed in the literature. The link between coronary heart disease and anger is supported by empirical evidence (see Diamond, 1982; Friedman & Booth-Kewley, 1987; Iribarren et al., 2000; Ouimette, Cronkite, Prins, & Moos, 2004; Smith, Glazer, Ruiz, & Gallo, 2004; Suls & Bunde, 2005 for reviews). Studies indicate that there are also other health risks involved. When compared with people with low anger levels, people with high anger levels are diagnosed with more somatic complaints (Begley, 1994), decreased cellular immunity (Kiekolt-Glasser et al., 1993), unhealthy LDL-HDL cholesterol ratios (Johnson, Collier, Nazzarro, & Gilbert, 1992), and an increase in death incidents (Harburg, Julius, Kaciroti, Glieberman, & Schork, 2003). Moreover, there is decreased pain tolerance reported in chronic pain patients with high levels of anger (Kerns, Rosenberg, Jacobs, 1994). Anger is also related to binge-eating (Penas-Lledo, Dios Fernandez, & Waller, 2004) and substance use (see next section for a detailed discussion), behaviors which impair physical health of people who engage in them.

Despite the common belief that “holding in” angry feelings may lead to health problems and “letting out” the angry feelings protects people from the detrimental results of suppressed anger, empirical evidence of this subject matter is not conclusive. For example, according to DiGiuseppe and Tafrate’s review (2007), people with anger that is frequent, intense, and accompanied by long lasting physiological arousal, develop health problems whether they try to suppress their angry feelings or express them by acting out. On the other hand, in a cohort of

23,522 elderly professional men, moderate levels of expressing anger outwardly (as indicated by scores of 12-16 on the Spielberger Anger-Out Expression Scale) was found to be a protective factor against coronary heart disease and stroke comparing to low level of expressing anger outwardly (as indicated by scores of 8-11 on the Spielberger Anger-Out Expression Scale) (Eng, Fitzmaurice, Kubzansky, Rimm, & Kawachi, 2003). It should be noted that the distribution of the anger expression in this sample was skewed toward lower levels of anger expression. About 49% of this group scored within the low anger expression range (8-11 points), about 43 % scored within the moderate anger expression range (12-16), and only 8% scored within the high anger expression range (17 points and above) of the Spielberger Anger-Out Expression Scale. According to Eng et al.'s study (2003), elderly professional men who sometimes expressed their anger (e.g. by sarcastic remarks, arguments, or slamming doors) fared better than the ones who refrained from these behaviors. One of the limitations of this study is the lack of data pertaining to the levels of anger experienced by the participants, data that would make the interpretation of the study's finding more meaningful. There is a clear need for more research to identify variables that modify the anger-health link and inform treatments that would effectively reduce health risks related to problematic anger experiences.

**Anger and Substance Use Disorders**

There is a high level of anger in substance abusers as reported by many scholars (Grisso, Davis, Vasselinov, Appelbaum, & Monahan, 2000; Reilly & Shopshire, 2000; Tivis, Parsons, & Nixon, 1998). There is also a body of research testing the impact of substance use, particularly alcohol abuse, on aggressive behaviors and feeling of anger after alcohol use (Bushman & Cooper, 1990; Ito, Miller, & Pollock, 1996). However, the causal relationship between anger and substance use is yet to be scientifically established. A number of questions arise: Does anger

lead to substance use or does substance use predispose people to feeling angry – either directly by pharmacologically changing their mood, or less directly as a result of problems and frustrations that substance users face in their lives? Is there an ever-evolving link between these two variables where anger leads to substance use that in turn evokes or disinhibits angry feelings and then this cycle repeats? Finally, is there a third variable underlying both anger and substance abuse, such as impulsivity or feelings of efficacy/power (DiGiuseppe & Tafrate, 2007)?

The existing literature describes multiple ways in which negative affect (usually specified as depressive or angry moods) and substance abuse could be linked. The widely known self-medication hypothesis (Khantzian, 1985, 1997, 1999, Khantzian & Albanese, 2008) posits that people use illicit substances to alleviate painful emotions that they have difficulty tolerating due to failures in ego control (Gottdiener, Murawski, & Kucharski, 2008), and that the choice of substances that people abuse depends on the emotion that they want to self-medicate. Thus, according to the model, people who suffer from intolerable anger tend to abuse opiates because of their calming effects while people who are prone to depression would choose stimulants such as cocaine to alleviate their depression. The self-medication hypothesis, however, is widely accepted, supported by clinical observations and growing empirical evidence (e.g. Khantzian & Albanese, 2008), and it has been incorporated into cognitive-behavioral theories of addictions (e.g. Marlatt, 1985; Marlatt & Gordon, 1980). However, the self-medication literature usually lumps together basic negative emotions, including anger, and reports results of negative affect or displeasure on substance use, thus specific information that relates anger with substance abuse is minimal. Nonetheless, several recent studies examined the association between anger and substance abuse.

Aharonovich, Nguyen, and Nunes (2001) tested the psychopharmacological specificity

aspect of the self-medication hypothesis with opiate, cocaine, and cannabis abusers. As noted above, according to the self-medication hypothesis, people who are prone to anger usually choose opiates because of these substances' calming effect on them, while people who are depressed usually choose stimulants such as cocaine to alleviate their depression. Aharonovich et al. (2001) report elevated levels of both anger and depression in the participants; however, few differences in anger levels were discovered between opiate and cocaine abusers. The cocaine abusers actually scored somewhat higher than opiate abusers on several dimensions of situational anger. The difference in angry predisposition (more pervasive than situational tendency to experience anger) between heroin and cocaine abusers was negligible. However, due to the lack of pretest data in this study, it is still not clear if the heroin users were originally angrier than the cocaine users and then their level of anger was effectively medicated by heroin, or whether the cocaine users were originally angrier than the heroin users. The psychopharmacological specificity hypothesis was not supported by this study, but it was also not invalidated. The study design actually does not permit an effective test of this. A repeated measures design, or, ideally, a prospective longitudinal study and more experimental studies are needed to test the functional relationship between anger and substance use.

Gilbert et al. (1998) conducted a randomized study that employed repeated measures to assess the relation between smoking, smoking cessation, and mood. They compared a group of smokers who quit with the control group of participants who continued to smoke. The participants' anger – as measured by the Profile of Mood States (POMS) – increased after cessation and did not decrease even after 30 days of abstinence, beyond the usually transient irritability due to withdrawal. Gilbert et al. concluded that a long-term predisposition toward experiencing negative affect (which included anger) characterized the smokers and that this

mood predisposed them to smoking and could contribute to relapse. Marlatt and Gordon's (1980, 1985) seminal work on relapse prevention also indicated that anger, more than any other emotion, elicited relapse in alcohol-abstinent subjects.

Path-analysis studies bring inconsistent results, which indicate that the relationship between anger and substance abuse is complex and it is likely to be moderated by other variables. Deffenbacher and Swaim (1999) found that high levels of verbal and physical expressions of anger predict alcohol use in male and female teenagers, and Leibsohn, Oetting, and Deffenbacher (1994) found similar results in male and female college students. On the other hand, Oetting, Swaim, Edwards, and Beauvais (1989) reported that Native American teenagers with higher levels of anger showed higher self-esteem and lower alcohol use than their less-angry peers. The question arises whether the Native American youth with higher levels of anger and self-esteem feel more empowered than their less-angry peers. According to DiGiuseppe and Tafrate (2007), one of the positive aspects of anger is the feeling of self-efficacy and power, which could also be evoked by substance use. It could be hypothesized that the angrier Native American youths feel less compelled to drink than their peers because their anger and high self-esteem give them the feeling of empowerment, so they do not have to use alcohol to superficially evoke that feeling. In this case, anger paired with positive self-esteem would protect against alcohol use. Another explanation of this phenomenon, an explanation coming from the self-medication perspective on substance use, could be that Native American youths with higher levels of self-esteem were able to regulate anger better and therefore they did not have to use alcohol to self-medicate their anger.

An association of anger and alcohol use was also recently tested by Witkiewitz and Villarroel (2009). Using repeated measures, the authors studied mood changes and alcohol use

in 1,726 participants of Project MATCH (Matching Alcoholism Treatments to Client Heterogeneity) over their first year after completing the alcohol treatment program. They found that negative affect (specified as high depression and anger levels as measured by BDI and STAXI) and alcohol use were highly related and that the relationship between these two variables was reciprocal: The periods of drinking predicted a significant increase in negative affect and the negative affect (prior to and concurrent with drinking) was in turn significantly related to increased drinking. This study also showed that non-drinking predicted lower negative affect over time. Interestingly, neither depression nor anger alone affected drinking, but the combination of these two affective states was strongly associated with alcohol use.

Both anger and substance abuse models emphasize the concept of control, which requires good executive functioning abilities (Denson, 2009). The attempt to control angry feelings and substance abuse cravings are crucial components of the majority of the anger and substance abuse treatment models. An angry person with substance abuse problems is expected to control both anger and substance cravings while also fighting the – often present in this match – feeling of depression and possible associated somatic discomfort. However, as demonstrated in numerous studies, executive functioning is a renewable but limited resource (see Baumeister, Muraven, & Tice, 2000, for a review of studies), which leaves a person resisting one urge to be more likely to give into another urge. According to this model, the person who tries to control anger might be more likely to lapse into substance abuse and a person who tries to control substance cravings is more likely to act out on anger because resisting the feeling or craving depletes the executive functioning resource, thus reducing the person's ability to control their actions.

A comprehensive review of the complex relationship between anger and SUDs exceeds

the scope of this work, but it is clear that anger and substance use are linked and need to be addressed simultaneously to improve the effectiveness of treatments that help people overcome their addiction to substances and their problematic anger. The need for treatments that would help people to renew their self-control energy is particularly clear in working with angry substance abusers who have to resist multiple temptations that challenge their ability to control their actions. It seems to be equally important to provide them with treatments that reduce their anger experiences and treatments that teach them how to control their feelings of anger.

**Anger and Violence**

Difficulties controlling angry reactions contribute to interpersonal violence, which affects individuals, families, and societies. Although the literature indicates that only ten percent of angry individuals act aggressively and that most of the time the aggression is verbal rather than physical (Averil, 1983; Van Coillie & Van Mechelen, 2006), the relationship between anger and violence can not be denied. The instances of violent crimes, such as physical or sexual assaults, bring attention to their perpetrators, who are often perceived as angry and aggressive.

The literature of violent crimes makes the distinction between instrumental and hostile aggression. The instrumental aggression refers to violent acts which are carefully planned and seemingly void of any emotions, while the hostile aggression refers to violent acts in which hostility and anger are clearly present. This distinction, however, does not account for mixed motivations (both instrumental and hostile) and falsely assumes that anger has to be impulsive (Bushman & Anderson, 2001; DiGiuseppe & Tafrate, 2007). Recent research focuses on revenge (Stillwell, Baumeister, & Del Priore, 2008; Tripp & Bies, 1997), a motivational state that is fueled by anger and feelings of victimization while leading to actions that are often deliberate and having the attributes of “instrumental aggression.” The revenge seekers can also ruminate

about being wronged and their anger can lead to violent action in response to seemingly small provocation, thus creating an impression of an impulsive act. Revenge is one of the central concepts of a model that links anger and aggression, a model recently proposed DiGiuseppe and Tafrate (2007).

Expanding on Berkowitz's theory of emotions (Berkowitz, 1969, 1990, 1993; Berkowitz & Harmon Jones, 2004), DiGiuseppe and Tafrate (2007) posit that anger evokes the desire to strike and activates one or more of the three motivational states: (1) The need to repel a perceived attack, (2) revenge, and (3) envy, which is related to power and domination. These motives could be associated with healthy anger and lead to adaptive actions, but they could also lead to violent actions when the anger is disturbed. The disturbance of anger could be manifested in the intensity, duration, and frequency of angry feelings, and in distorted cognitions (Deffenbacher, 1999; Frijda, 1986; Kassinove & Sukhodolsky, 1995; Lazarus, 1991). The cognitions typical for people with high levels of anger intensify perceived threat to their well-being or system of values and amplify their feeling of injustice. These, in turn, excite revenge and/or the need to protect the values threatened by the actions of others, who "should not" have done what they did or they "should" behave in a manner preserving the values (see DiGiuseppe & Tafrate, 2007, for clinical examples and a full explanation of their model). The violence fueled by angry feelings and cognitions is often directed at the families of the perpetrators.

**Anger and intimate partner violence.** A substantial body of literature discusses the relation between anger and intimate partner violence. Stith, Smith, Penn, Ward, and Tritt (2004) meta-analyzed 85 studies and found that high levels of anger and hostility were among risk factors moderately related to intimate partner physical abuse and victimization. Another meta-analytic review of 28 independent samples of male-to-female intimate partner violence

(Norlander & Eckhardt, 2005) indicated that the men violent towards their partners evidenced moderately higher levels of anger and hostility then nonviolent men who were also in discordant relationships. Recent individual studies also show the impact of low anger control or angry mood on interpersonal violence by male and female perpetrators (Eckhardt, Samper, & Murphy, 2008; Murphy, Taft, & Eckhardt, 2007; Ward & Muldoon, 2007). Finally, high anger experience contributes to poorer treatment outcomes in court-mandated treatment of physically abusive men and their higher re-arrest rates as compared with men with lower levels of anger experience (Eckhardt, Samper, & Murphy, 2008; Murphy, Taft, & Eckhardt, 2007). These results show that anger treatment should continue to be a vital part of the programs aimed at decreasing intimate partner violence.

**Anger and child maltreatment.** Numerous studies were conducted to assess factors contributing to child maltreatment and many of them indicate the role of anger in parental aggression toward children, thus calling for inclusion of anger management treatment in programs designed to lower the risk of child abuse. A recent meta-analysis, which included 155 studies of risk factors in child physical abuse and neglect (Stith et al., 2009), found that parent anger/hyperactivity was one of the five main risk factors of these two types of child maltreatment. Smith Slep and O'Leary's (2007) analysis of parental aggression using structural equation modeling also found that anger expression (a measure of behavioral expression of anger) was one of the four leading pathways of parental aggression toward preschool children and it moderated more distant risk factors, such as the parent's perceived stress, impulsivity, and childhood history of aggression. Another example of empirical evidence that supports the role of parental anger in child maltreatment comes from Rodriguez and Richardson's (2007) study of factors predicting the risk of parental child maltreatment. The authors of this study hypothesized

that the parent's general preexisting cognitive schemas, such as external locus-of-control, low empathic perspective-taking ability, and low perceived attachment to the child, will be stronger predictors of child maltreatment than the parents' level of stress and anger. The results showed the opposite: The parent's stress and anger were stronger risk factors of parent abuse potential, dysfunctional disciplinary style, and parent-child physical aggression, than the preexisting general cognitive schemas.

**Anger and aggressive driving.** Aggressive driving results in injuries, death, psychological aftermaths of accidents, and costs related to treatment and property damage (Galovski, Blanchard, Malta, & Freidenberg, 2003; Galovski, Malta, Blanchard, 2006; Martinez, 1997). Studies indicate that high anger significantly increases the risk of aggressive driving, which includes verbal aggression towards other drivers, making hostile gestures, and cutting the other drivers off (Deffenbacher, 1999; Deffenbacher, Filetti, Lynch, Dahlen, & Oetting, 2002). Angry drivers are also more likely than the calmer driver to direct their anger toward the vehicle and injure themselves or damage their vehicle by smashing or kicking it. They are more likely to be fined for moving violations and participate in accidents due to erratic driving and speeding over the limit (Deffenbacher et al., 2002). Angry drivers pose a risk to themselves and others around them, but few studies address the effectiveness of interventions to reduce anger while driving.

## Anger as a Predictor of Violence in People with Mental Disorders

Mental illness is often accompanied by highly disturbed affect and cognition, which can contribute to interpersonal violence. In a seminal Epidemiological Catchment Area (ECA) study by Swanson, Holzer, Ganju, and Jono (1990), which included about 10,000 people, the prevalence of violence among people with mental illness was over five times higher than the

prevalence of violence among people without mental illness (11-13% versus 2% respectively). This result was replicated by other studies (e.g. Link, Andrews, & Cullen, 1992; Monahan, 2001). It should be noted, however, that – contrary to the popular beliefs – these studies indicate that the majority of the seriously mentally ill (87-89%) do not pose threats to others. Another counterintuitive finding of these studies is that the presence of the seemingly benign adjustment disorder increases the risk of violent behavior more than the presence of serious mental disorders, such as Schizophrenia, Major Depressive Disorder, or Bipolar Disorder. Moreover, the prevalence of violence among people with Schizophrenia is almost the same as in people with Bipolar Disorder and Major Depressive Disorder and the prevalence of violence among people with adjustment disorders equals that of people with personality disorders, including psychopathy.

The Mac Arthur studies on over one thousand mentally ill patients of three psychiatric facilities (Monahan, 2001; Monahan, Steadman, Silver, & Appelbaum, 2001) found that the main factors associated with violence at post-discharge were violent thoughts and high anger scores, particularly when comorbid with substance abuse. The presence of delusions or hallucinations per se did not predict violent behaviors within one year at post-discharge, but the presence of voices commanding violent acts and suspiciousness, possibly related to the perception of hostility of others, were related to increased violence. A recent study by Swanson et al. (2008), which included 1,445 patients with Schizophrenia, found that – in addition to environmental factors – childhood conduct problems, substance abuse, and a history of being a victim of violence predicted violent behaviors in people with Schizophrenia. Moreover, "negative psychotic symptoms were associated with significantly lower risk of violence" (Swanson et al., 2008, p.40). The authors concluded that factors unrelated to psychosis were

more predictive of violent acts than the psychotic symptoms.

Swanson et al. (2008) and Skeem, Miller, Mulvey, Tiemann, and Monahan (2005) suggest that similar factors predict violence in people with and without mental disorders. Skeem et al. (2005) found in a sample of 769 psychiatric patients that antagonism (an opposite of agreeableness in a five-factor personality model) was moderately related to violence. Neuroticism was weakly related to violence and three other general factors were not associated with violence. Neuroticism and antagonism are correlates of anger (Caprara, Barbaranelli, & Zimbardo, 1996); therefore, Skeem et al.'s (2005) finding supports the role of anger as a predictor of violence in the seriously mentally ill. High levels of self-reported anger are also predictive of violence among people with mental retardation (Taylor & Novaco, 2005).

The studies of people who actually committed violent acts also indicate that mental illness combined with anger might contribute to extreme violence. Blake, Pincus, and Buckner (1995) investigated the presence of psychiatric conditions in convicted murderers and found that impaired impulse control due to neurological dysfunction, serious mental illness, and a history of childhood abuse were common among the murderers. Pincus (2001) hypothesized that shame and resentment related to past abuse, and misinterpretation of the others' behavior due to mental illness, set the stage for the convicts' desire for revenge, resulting in violent acts. In another study analyzing the characteristics of mentally ill murderers, Matejkowski, Cullen, and Solomon (2008) found that intense anger toward an intimate partner or a family member was the most frequent motive of murder. The above studies indicate that high levels of anger predict violence in people with mental illness, but few studies assess the effectiveness of anger treatments in this population.

## The Need for Effective Anger Treatments

The above review of anger ramifications indicates the urgency of developing effective anger treatments to prevent or lower the individual, family, and societal consequences of dysfunctional anger. Dysfunctional anger is a determining factor in subsequent behavior and it has an impact on health and interpersonal functioning of the individual. As noted above, anger is related to violence, which destroys relationships and results in crime and child abuse. Hence, it is critically important to determine which anger treatments work.

## Models of Anger Treatment and Their Effectiveness

As the reader will see, the vast majority of anger management treatments that have been empirically tested and included in the current meta-analysis are cognitive-behavioral therapies. The virtual absence of research on other approaches to directly and exclusively target anger is striking, particularly considering the variety of ideas and treatment models that influence general clinical practice and, in particular, the practitioners' attempts to help clients referred for anger management problems. The few non-CBT treatments that directly target anger and that have been tested include: Process-oriented group counseling (Deffenbacher, McNamara, Stark, & Sabadell, 1990), meditation (Dua & Swinden, 1992; Vannoy, 2005), forgiveness therapy (Lin, Mack, Enright, Krahn, & Baskin, 2004), acceptance and commitment therapy (ACT) (Saavedra, 2007), and the use of humor (Shocket, 1985). These studies will be reviewed at the end of this section, after the more commonly employed behavioral and cognitive-behavioral anger treatment models are described. There are surprisingly no known empirically tested psychodynamic treatments for anger management, despite the lengthy history of discussions of anger, delinquency, antisocial behavior and their treatment in the psychodynamic literature (see Brenner, 1982; Meloy & Yakeley, 2010). The review of the cognitive-behavioral anger

treatments will start with basic behavioral and cognitive strategies of anger reduction and management, on which more complex models are built.

**Behavioral Treatments of Anger**

Behavioral techniques address directly the person's response to angry feelings, a response that could be the person's overt behavior or bodily reaction.

**Learning behavioral skills.** According to Averill (1983), most anger experiences arise in interpersonal situations. Therefore, engaging the client during behavioral therapy in modeling and rehearsing of alternate (not angry) responses to frustrating situations promotes more adaptive behaviors. Implementation of these new skills in real life helps clients to cope more effectively with interpersonal situations that evoke anger (Deffenbacher, 1995; Edmonson & Conger, 1996, DiGiuseppe &Tafrate, 2003). Clients practice taking time out, assertiveness, and social skills that promote the resolution of anger (e.g. reading social cues, improved communication, and negotiation of conflict). The self-monitoring of anger-related behaviors and the implementation of reinforcement systems are also part of behavioral treatments of anger.

**Systematic desensitization.** The systematic desensitization technique, commonly used in treating anxiety, can be used to ameliorate anger by developing more relaxed physiological responses to provocation. This technique is an important element of Novaco's multicomponent anger treatment (see below), but it can be used as a stand-alone treatment. The treatment starts with the identification of individual triggers (situations that provoke anger) and builds a hierarchy of those triggers from the least to the most angering. Simultaneously, the clients are taught relaxation techniques, which are eventually paired with imaginary provocations (desensitization through relaxation counterconditioning). This pairing of relaxed states with anger provoking situations helps the client to lower the arousal component of anger and master

their control over angry reactions, as reported by Evans, Hearn, and Saklofske (1973), O'Donnell and Worell (1973), and Rimm, DeGroot, Boord, Heiman, and Dillow (1971).

**Cognitive Therapy of Anger**

Cognitive treatments target biases in information processing, with a particular focus on appraisal processes and the individual's belief systems (Aaron Beck, 1976; Judith Beck, 1995). The underlying assumption of these interventions is that anger arises as a result of a distorted appraisal of the situation and culturally informed beliefs as to how the person should act under a set of challenging circumstances (Deffenbacher, Oetting, Huff, Cornell, & Dallager, 1996).

As previously discussed, people with difficulty controlling their anger often believe that what happened should not have happened and they tend to perceive the anger-provoking situation as preventable and intentionally caused by someone else. The angry individuals might also hold a belief that in general they should not be exposed to frustrating events and that these events are intolerable; therefore, their angry outbursts are justified. That prevents them from a constructive approach to the anger-provoking situations and resolving them. Cognitive therapy addresses these faulty beliefs by cognitive restructuring, self-instructional training, and promoting problem solving. Although some authors (e.g. Sturmey, 2004) argue that what is often seen as cognitive interventions are actually strictly behavioral techniques, problem solving and self-instructional training will be discussed here as cognitive techniques because they engage predominantly cognitive processes.

**Cognitive restructuring.** This technique helps the clients to identify distortions in their information processing and their irrational beliefs (Aaron Beck, 1976; Judith Beck, 1995). The clients examine and question evidence for the existing beliefs, explore the usefulness of holding certain beliefs, test those beliefs via experiments that the client executes in his/her real life, and

form new, more adaptive beliefs. Techniques such as analysis of the advantages and disadvantages of following certain thoughts, identification and change of anger-provoking thoughts, a review of the consequences of anger-related behaviors vs. calm behaviors, and many others are also used to assist the clients in changing their belief systems (Aaron Beck, 1976; Judith Beck, 1995).

**Self-instruction.** Self-instructional training was developed by Meichenbaum (1972) as a part of his stress inoculation procedure. This technique trains the clients in identifying their anger-related thoughts, stopping them (e.g. by instructing themselves to stop), and replacing them with more calming thoughts. For example, if the client identifies the anger-provoking thought, "This is terrible. I can't stand it," she could replace it with the more adaptive self-talk, "This is unpleasant and upsetting, but I can handle it." Empirical evidence (e.g. Tafrate & Kassinove, 1998; Beck & Fernandez, 1998) confirms the effectiveness of this technique in reducing the intensity of anger and increasing anger control.

**Problem solving.** Problem solving can help clients who struggle with their angry feelings in two ways. First, some of the anger-provoking situations could be resolved or prevented, thus reducing anger stimulation. Second, excessive anger could be looked at as a problem to resolve rather than as an overwhelming, uncontrollable experience. Once defined as a problem to resolve, anger could be approached in a reasonable manner, which promotes the development and implementation of strategies to cope with it.

Deffenbacher (1995) suggests that problem solving is likely to be effective if the client is proficient in basic behavior skills (e.g. social skills), but lacks an ability to assess the situation and select the solutions and skills that are appropriate for the situation. Problem solving could be combined with self-instruction training to help the person follow the steps of identifying and

defining the problem, breaking it down into smaller steps, developing and evaluating solutions for each step, and implementing adaptive changes in behavior (Dahlen & Deffenbacher, 2001).

**Novaco's Multimodal Anger Treatment Model**

In 1977, Novaco applied Meichenbaum's stress inoculation training to teach police officers in training how to manage their own anger (Meichenbaum & Novaco, 1985). Systematic desensitization was used to "desensitize" clients to the provocation that evokes angry responses. Over time, Novaco (1995; Taylor & Novaco, 2005) developed a multimodal anger treatment, the effectiveness of which was validated in studies including a variety of populations (see Taylor & Novaco, 2005, for a review of studies). The multimodal treatment addresses all four basic domains of anger experience: cognitive, affective, physiological, and environmental.

The treatment starts with a preparation phase, during which mechanisms and cost of angry responses are discussed with the client. The clients are also introduced to more adaptive responses and ways of making these responses part of their response repertoire. The actual treatment phase combines systematic desensitization and cognitive treatment elements. Cognitive restructuring helps to change the clients' appraisal of the anger-provoking situations, thus reducing their feelings of anger. Problem solving and negotiation of conflicts are also practiced in an individual or group format. Through trying these new skills in their natural environment and reporting the results back in sessions, the clients work on not only changing their own cognitive, physiological, and behavioral responses, but also on altering their environment to reduce stress levels and prevent future provocations. The treatment is implemented within 8-10 sessions with clients with average intellectual abilities and is extended to 18 sessions for clients with intellectual disabilities (Taylor & Novaco, 2005).

Novaco's model of anger treatment was found to be helpful in decreasing anger

symptoms with probation counselors (Novaco, 1980), adolescent delinquents (Schlichter & Horan, 1981), adults with mental retardation (Benson, Rice, & Miranti, 1986), forensic patients (Stermac, 1986; Taylor & Novaco, 2005), and female offenders with mental retardation (Robertson, 2005).

**Deffenbacher's Cognitive-Behavioral Treatment of Anger**

On the other end of the client spectrum, Deffenbacher and his team conducted multiple studies with college students who reported high levels of anger. Similarly to Novaco, Deffenbacher (1999) utilizes elements of CBT, but he emphasizes that those elements could be used individually or in any combination, depending on the client's anger problem and other variables. He proposes, for example, the use of relaxation techniques with clients who are not willing to talk about anger, because relaxation reduces the client's resistance, which is a frequently encountered client reaction to cognitive strategies. As a matter of fact, some studies (Deffenbacher, Huff, Lynch, Oeting, & Salvatore, 2000; Deffenbacher & Stark, 1992) demonstrate that relaxation alone was as effective in reducing trait anger and dysfunctional angry responses to daily stressors as cognitive therapy and a combination of cognitive and relaxation elements (Deffenbacher , 1988). The effectiveness of relaxation for anger treatment was also confirmed in recent meta-analysis by DiGiuseppe and Tafrate (2003).

Deffennbacher (1999) reports that the relaxation strategies he and his team used in studies include progressive muscle relaxation, relaxing imagery, and planned soothing activities, which all lower the level of physiological and emotional arousal and result in clients feeling calmer and more able to reason about the anger-provoking situations. Results of empirical studies (e.g. Deffenbacher & Stark, 1992; Defenbacher, Huff, Lynch, Oetting, & Salvatore, 2000) confirm the calming effect of relaxation (which targets mostly physiological arousal) on

the other components of anger experience (emotions and cognitions). This supports and expands on Berkowitz's (1993) cognitive-neoassociationistic model of anger. As it was previously discussed, according to Berkowitz, excitation of any element of the "anger syndrome" could lead to developing a full experience of anger. By extension, it could be argued that relaxation of any component should have a calming effect on the other components of the anger experience. Studies that demonstrate the effectiveness of relaxation strategies seem to validate this conclusion. Similarly, studies that demonstrate the effectiveness of addressing solely the cognitive component of anger, e.g. via self-instructional training (see DiGiuseppe & Tafrate, 2003, for review) or cognitive restructuring (Deffenbacher, Story, Stark, Hogg, & Brandon, 1987) support the equivalence of the "anger syndrome" components, as proposed by Berkowitz.

**Other Treatments of Anger**

As previously stated, few studies tested the effectiveness of anger management treatments using other than the above-described behavioral, cognitive, and cognitive-behavioral models. Other treatments include: Process-oriented group counseling (Deffenbacher, McNamara, Stark, & Sabadell, 1990), meditation (Dua & Swinden, 1992; Vannoy, 2005), forgiveness therapy (Lin, Mack, Enright, Krahn, & Baskin, 2004), acceptance and commitment therapy (ACT) (Saavedra, 2007), and the use of humor (Shocket, 1985). Their descriptions follow.

**Process-oriented group counseling of anger.** This treatment was based on Yalom's (1985) group therapy model as adapted by McNamara (Deffenbacher, McNamara, Stark, & Sabadell, 1990) to a short-term (8 sessions) format of anger treatment. Briefly, Yalom's group therapy model emphasizes the importance of interpersonal learning and emotional experience, which occurs in groups. In his view, a group is a social microcosm in which the group members reveal their personalities and behavior patterns and they learn through interaction, sharing their

experiences, and feedback from other group members. Through emotionally charged group participation, the members gain a better understanding of their problems and emotions and develop new interpersonal behaviors. The group leader refrains from interpretations, promotes the members' interactions, and ensures therapeutic milieu of the group.

In Deffenbacher et al.'s study (1990), the group of 16 students discussed instances of angry reactions, which occurred during sessions and outside of the group. The treatment focused on increasing the participant's awareness of angry feelings and other related feelings, such as hurt or anxiety, receiving feedback about how well the participants handled the angering situations, problem-solving, and sharing suggestions about ways of coping with angering situations. This randomized control trial indicated that process oriented counseling was as effective as cognitive-relaxation counseling in anger reduction. The results demonstrated a significant decrease of the treated participants' anger levels (as measured by STAXI) compared to a no-treatment control group. These results could not be generalized to other process-oriented groups due to: (1) small number of the participants (N=16), (2) homogeneous nature of the group (the participants were all students with anger-related problems), (3) the high level of expertise of the treatment provider, a level not typical for an average group leader, and (4) focus of the group exclusively on anger. These characteristics are not typical of other process-oriented groups existing in the community. Deffenbacher et al.'s (1990) study results provide preliminary support for the use of process-oriented counseling to treat angry clients and call for more research of this treatment model.

**Meditation.** Two studies tested the effectiveness of meditation to treat anger (Dua & Swinden, 1992; Vannoy, 2005). Dua and Swinden conducted a study in which 32 students who scored within the upper quartile range on the Spielberger Trait-Anger Scale (STAS-T, an early

version of the STAXI) were randomly assigned to meditation, negative-thought-reduction, placebo, or no-treatment control groups. Each treatment group met for three weeks, six sessions twice a week. The participants listened to prerecorded instructions to imagine anger-provoking situations and either focus on their breathing and ignore all distractions and thoughts (meditation), notice and reduce their negative thoughts as instructed (negative thoughts reduction), or just imagine the anger-provoking situations (placebo). The control group did not meet or receive any training. The results of this experiment indicate that the meditation, negative-thought-reduction, and placebo all significantly reduced the participants' trait- and situational anger, unconstructive coping, and physiological arousal as compared to the control group. The question arises whether this study supports the efficacy of meditation as a technique to reduce anger, since meditation was no more efficacious than the placebo treatment. It could be argued, however, that the design of the placebo treatment in this study confounded the results: The placebo group actually received desensitization training through repeated exposure to anger-provoking images while remaining calm (counterconditioning), a technique that is shown to reduce anger and is a vital element of well-established anger treatment packages (DiGiuseppe & Tafrate, 2007; Novaco, 1995; Taylor & Novaco 2005). Thus, it could be concluded that Dua and Swinden's study showed that meditation was as efficacious as some other existing treatment procedures in reducing anger in students.

Vannoy (2005) tested the effectiveness of meditation as an anger-reducing technique in adult incarcerated men and women, who were randomly assigned to either meditation or wait-list control conditions. There were nine men and fourteen women in the meditation condition and nine men and eight women in the control condition. The treatment consisted of 10 weekly group sessions of silent meditation followed by guided meditation, discussions of the meditative

experience, and discussions of a topic, which the group facilitator introduced. Unfortunately, because Vannoy does not provide any description of the topics discussed, that is he does not inform the reader if the group discussed anger-related or meditation-related topics, it is difficult to assess whether or not the discussions could be linked to some other treatment technique. Vannoy's study found a significant reduction of anger experience through participation in the meditation group in incarcerated women (a significant decrease on seven out of eight measures of anger used), but not in incarcerated men. The above-discussed studies provide preliminary support for the use of meditation in anger reduction, particularly in women. However, due to the small number of participants (31 people participated in some form of meditation and 24 in control groups), more studies are needed to clarify the potential usefulness of meditation in treating anger.

**Forgiveness therapy.** Forgiveness therapy is a recently developed treatment that targets depression, anxiety, and resentment resulting from somebody's severe wrongdoing (see Baskin & Enright, 2004, meta-analysis of forgiveness therapy results with various issues and populations). Forgiveness therapy assists the client to move through the stages of the forgiveness process to reduce negative emotions related to the injustice done to them. These stages include: (1) Identification of anger caused by someone's unjust action, (2) introduction of the idea of forgiveness as a decision to make, (3) differentiation of forgiveness from related concepts such as condoning, excusing, forgetting, or reconciliation, (4) developing empathy for the offender and starting to perceive him or her as a person who also might be vulnerable, (5) finding meaning in the act of forgiveness. Studies testing the results of forgiveness therapy do not typically use the anger measures as a dependent variable. Lin, Mack, Enright, Krahn, and Baskin (2004), however, used the Spielberger State-Trait Anger Expression Inventory (SSTAEI,

one of the versions of the STAXI) to test the impact of forgiveness therapy on anger experience in seven adults with substance dependence problems. Lin et al. (2004) found a significant reduction of the overall anger scores and trait anger (but not state anger) after 12 individual sessions of forgiveness therapy with this sample.

Forgiveness therapy seems to be a promising new way of reducing resentment, an important component of the human anger experience (DiGiuseppe & Tafrate, 2007). This therapy is shown to increase the forgiveness (Baskin & Enright, 2004), but its ability to decrease levels of anger in various populations is yet to be empirically established.

**Acceptance and Commitment Therapy (ACT).** The ACT model is rooted in Buddhist practices, humanistic therapy, and radical behaviorist models (Heyes, Strosahl, & Wilson, 1999; Eifert, McKay, & Forsyth, 2006). Created as an alternative to therapies that attempt to improve human well-being by the reduction of suffering and control of emotions (such as CBT models), the ACT model views human anger as the person's attempt to avoid experiencing vulnerability (being aware of his or her psychological or physical discomfort, such as feelings of shame, sadness, guilt, or weakness). In contrast to models that aim to decrease human emotional pain, the ACT model posits that vulnerability – however painful – is necessary to bond with others, know who we are, and experience happy relationships. Thus, painful awareness of the person's vulnerability is a part of a human condition and avoidance of that vulnerability and pain is what creates suffering and disconnect from the person's real needs and values. The ACT treatment focuses on full participation in the present, challenging the rules of how things should be and judgments about self and others, becoming aware of the values for which the person deeply cares, and expanding the person's repertoire of behaviors in order to actualize these values.

For example, when a teenager coming from an abusive family becomes enraged while his

peers tease him, the rage helps him to avoid painful emotions and vulnerability evoked by his family situation. If he viciously attacks his peers, this behavior, along with rage, protects him from feeling vulnerable. At the same time, however, he acts against the very values that he deeply cares for: Stability, safety, and friendship/love in relationships with others, the values that he lacks in his family. His treatment would include becoming fully aware of the shame related to his abuse while also holding in awareness his need to connect to others, not to attack or scare them. This painful awareness of his vulnerability and real needs would open up the possibility of considering actions other than violence, actions that could increase his chances to build good relationships he is craving. Despite the ACT's claim that this form of therapy is the opposite of the CBT's attempts at anger control, the proponents of the ACT emphasize the need to control anger-related behaviors and to choose actions that help to actualize the person's values.

Saavedra (2007) tested the efficacy of the ACT in a sample of 26 low income minority adults, who received substance abuse recovery services. Fifteen participants, who completed the 8-week ACT group therapy, were compared to 11 wait-list control group participants on measures of problematic behaviors and trait anger. The Anger Consequences Questionnaire (ACQ, Deffenbacher, Oetting, Lynch, & Morris, 1996), modified for this study by removing anger experience items and focusing on action/overt behavior items, was used to assess anger-related problematic behaviors. These behaviors included verbal and physical aggression toward others, aggressive driving, drug use, and withdrawing from contact with others. Trait anger was measured by the Trait-Anger scale of the STAXI-2, which assesses the person's predisposition to experience anger frequently, intensely, and in a variety of situations. This study indicated that the ACT had a positive impact on reducing problematic behaviors related to anger in this group of participants. The level of trait anger was not reduced as a result of the ACT and it did not

moderate the impact of the ACT on reduction of anger-related behaviors. The author concluded that these results are consistent with the ACT model: The treatment that does not focus on anger control lowers the behaviors related to problematic anger without lowering the level of anger experience (trait anger in this case). The study also tested the acceptance levels as another potential moderating variable and it failed to show that acceptance levels, which increase as a result of the ACT, moderate anger-related behaviors. Thus, the study did not provide an explanation of mechanisms that moderate the impact of the ACT on anger-related behaviors. This might be due to a small sample size (N= 26) and related low power of this study.

**The use of humor in anger treatment.** Therapeutic use of humor to reduce negative mood yielded inconsistent results when it comes to anxiety, but studies show more consistently a positive impact of humor on depressive and angry mood (see Szabo, 2007, for a review). Non-hostile humor is reported to reduce angry mood (Baron, 1978), reduce angry responses to a provoking situation (Baron, 1974), and humorous laughter is reported to be followed by reduced physiological arousal (Scheff, 1979). It should be noted that most of the existing studies use a single episode of humor (e.g. humorous video tape). Shocket's study (1985) is an exception from this trend. Shocket compared anger reduction in angry drivers who participated in three sessions (one preparatory and two treatment sessions) of the systematic desensitization or humorous imagery, or a no-treatment control group. This study did not find significant differences between the control and treatment groups on self-reported anger and skin conductance measures.

More recent studies tested the temporal aspect of the use of humor to reduce anger. Szabo (2007) compared the physiological and psychological impact of exercise and watching a humorous tape and found that both humor and exercise reduce negative mood, including anger,

but the impact of humor on anger reduction was limited to up to 30 minutes post treatment. Cann, Calhoun, and Nance (2000) manipulated the timing of the humor use to prevent or to reduce angry mood. A humorous videotape was presented either before or after the participants watched an unpleasant, negative mood-evoking videotape. Cann et al.'s (2000) results show that anger is reduced by using humor as a preventative intervention (before) as well as a treatment intervention (after angry mood is evoked).

Overall, the use of humor to treat anger has yet to be determined. As previously mentioned, most of the existing studies apply a single episode of humor and none of the studies I was able to find use humor to the extent that other treatment techniques are being used, that is, over a number of weekly sessions. Moreover, only one study (Shocket, 1985) focused exclusively on anger management treatment, but its results found no support for humor as the sole intervention for anger management.

**Beyond anger control?** The studies presented in this section attempt to extend the effort to develop efficacious anger treatments beyond the commonly tested and typical CBT approach, and their proponents claim uniqueness of these treatments as different from the omnipresent CBT approach (Hayes, Strosahl, & Wilson, 1999; Eifert, McKay, & Forsyth, 2006). Meditation, forgiveness, and the ACT are attempts to deal with anger-related problems without trying to focus on anger or control it. These alternate approaches aim to reduce anger by letting it go (forgiveness) or letting it be (meditation and ACT). The question remains, how much do these treatments really differ from the CBT model and what mechanisms lead to anger reduction in these treatments? It could be argued that forgiveness therapy employs decision-making techniques used in cognitive therapy, and that meditation and ACT treatments include elements of exposure to angry feelings, a behavioral technique. Similarly, the use of humor seems to

employ mechanisms known to the CBT practitioners and researchers, namely distraction, counterconditioning, and physiological tension release. The previously described CBT models include distraction (humorous distraction being one possible option) as a coping strategy to reduce anger, and they include relaxation as a coping strategy to reduce physiological tension related to anger. The use of humor when exposed to anger-provoking stimuli also follows a typical counterconditioning model, where anger-provoking stimuli are paired with neutral or positive mood states. Thus, the use of humor could be classified as a component already existing within the CBT treatments, not a unique treatment model. If employed as a stand-alone treatment, the use of humor differs from the broadly defined CBT models only in its very narrow scope of this therapeutic technique. The question then arises: Are all the existing treatment models of anger similar? Certainly not, but those that have been tested seemed to be.

## Results of Meta-Analytic Studies of Anger Treatments

Although the technique of meta-analysis has been known since Smith and Glass published their first synthesis of psychotherapy outcome studies (1977), meta-analysis has been only recently applied to anger treatment outcome studies. This is mostly due to the scarcity of meta-analyzable studies. To give the readers some sense of the low rate of empirical research that has been conducted on anger management treatments, DiGiuseppe and Tafrate (2007) report that anger treatment had been mentioned in 185 studies published between 1971 and 2005, while 6,356 studies published within that period of time mentioned treatment of depression and 2,516 studies mentioned treatment of anxiety. Despite the relatively low historical interest in research of anger treatments, the number of anger treatment outcome studies is growing, and six meta-analyses have been published so far synthesizing these studies.

The first meta-analysis by Tafrate (1995) included 17 studies of adults being treated for

anger control issues. This meta-analysis found anger treatments to be highly effective, with an overall mean effect size close to $d = 1.0$. However, six of the 17 original studies were conducted by Deffenbacher and his team with analog samples (undergraduate students, who scored high on the STAXI and/or other self-report measures), and only three clinical samples were included in the meta-analysis, which raises the question of the ecological validity of this meta-analysis. Moreover, the effect sizes of the original studies were not weighted and no tests of homogeneity or significance of the findings were conducted. Thus, the statistical methods now commonly used in meta-analytical studies (Borenstein, Hedges, Higgins, & Rothstein, 2009; Cooper, 1998; Cooper, Hedges, & Valentine, 2009; Lipsey & Wilson, 2001) were not applied in Tafrate's analysis. Tafrate also limited his presentation to post-test results and did not include data on follow-up studies.

The next meta-analysis of anger treatment was published by Edmondson and Conger in 1996 and included 10 studies. These authors adopted Berkowitz's definition and model of anger, which includes anger expression (anger-related behavior). Thus, they were able to include studies using assertiveness or aggression as dependent measures. Edmonson and Conger excluded studies conducted with participants with developmental disabilities, studies that did not report non-significant results, studies that combined several treatment modalities, and studies with adolescent samples. They focused on studies that were designed to decrease anger regulation problems in adults.

To compare the effectiveness of various anger treatments, Edmondson and Conger (1996) grouped treatment studies into five categories: cognitive, relaxation, cognitive-relaxation, social skills, and others. Results show that different treatments are effective for different aspects of anger-related problems and that the effect sizes differ among various measures of the same

aspect of anger. For example, relaxation was highly effective for reduction of physiological arousal as measured by self-reports (effect size $d$ = 1.21), but much less effective for reduction of physiological arousal as measured by observation (effect size $d$ = 0.30). Overall, relaxation and social skills training yielded large effect sizes ($d$ = 0.82 and 0.80 respectively) while cognitive and cognitive-relaxation treatments yielded medium-to-large effect sizes ($d$ = 0.64 and 0.76 respectively). It should be noted that clinical populations, such as people with mental retardation, forensic samples, or spouse abusers were not included in this analysis. Seventy percent of the studies included were conducted by the same research team (lead by Deffenbacher) and focused on predominantly student samples.

Beck and Fernandez (1998) conducted a meta-analysis of cognitive-behavioral therapy and its effectiveness in the treatment of anger with adults and children. These authors used less stringent exclusion criteria and included published and unpublished studies of anger treatment for adults and children. This broad inclusion basis resulted in the selection of 50 studies and increased the diversity of samples. Twenty-seven of the included studies were conducted with clinical samples such as spouse abusers, offenders, juvenile delinquents, and individuals seeking treatment for anger problems. One study of individuals with mental retardation was also included. The remaining 23 studies represented mainly school children and college students. However, they excluded purely cognitive and purely behavioral treatments as well as studies that used relaxation as a main treatment modality. Forty of the studies used a between-groups design and 10 used a pretest-posttest single group design. Beck and Fernandez combined effect sizes for within-group and between-group studies and came up with a mean weighted effect size of $d$ = 0.70 (range –0.32 to 1.57, SD = 0.43). The authors also conducted the fail-safe $N$ analysis, which indicated that the findings of the study were robust. A test of heterogeneity revealed that the

variance across studies was homogeneous. Because of the homogeneity of the results, they did not search for moderator variables.

DiGiuseppe and Tafrate (2003) included a large sample of 57 studies in their meta-analysis and looked at a variety of treatments of anger, including self-instruction training, cognitive restructuring, problem solving, relaxation, systematic desensitization, exposure, behavioral skills, humor, biofeedback, and combined treatments. They analyzed the relationship between treatment modality and a range of dependent measures such as anger, aggression, positive behaviors, other emotions, physiological reactions, attitudes/cognitions, Type A personality, self-esteem, and relationships. DiGiuseppe and Tafrate (2003) also compared individual versus group treatment results and separately analyzed effect sizes for within-group and between-group studies. Their analysis revealed an average effect size of $d = 0.71$. The authors also calculated a follow-up average size effect, which was $d = 0.59$ that did not depend on the length of the follow-up or the measure used to assess treatment effectiveness.

An analysis of the homogeneity of variance revealed that results were influenced by moderator variables. DiGiuseppe and Tafrate (2003) showed that dependent measures which were directly related to anger (e.g. self-reported or observed anger, aggression, or hostility) yielded significantly higher effects than less directly related measures such as self-esteem and relationships. Individual rather than group treatments were also associated with higher effect sizes. Moreover, manualized treatments and fidelity checks were associated with better treatment results on measures of aggression, but not on any other outcome measure. The analysis did not reveal significant differences between various treatment types, number of treatment sessions, participants' type or gender, or publication status. It did reveal that the within-group design produced a higher average effect size ($d = 0.99$) than the between-group

design ($d$ = 0.73) at post-treatment. The magnitude of the difference discovered by DiGiuseppe and Tafrate (2003) indicated that calculating the results coming from those two types of study designs together would camouflage the differences between them and alter the overall effect size. DiGiuseppe and Tafrate's (2003) meta-analysis was the first to reveal the influence of moderator variables on the effectiveness of anger treatment.

Two meta-analyses of anger treatments were published in 2004. Sukhodolsky, Kassinove, and Gorman (2004) presented their study of CBT for anger in children and adolescents, which complements previously discussed meta-analysis of CBT for anger in adults (Beck & Fernandez, 1998). Del Vecchio and O'Leary (2004) published their analysis of the effectiveness of anger treatments for specific problems in adults.

Sukhodolsky et al.'s (2004) meta-analysis, which included 40 studies of CBT for anger in children, yielded a mean weighted effect size of $d$ = 0.67. Skills development, affective education, problem solving, and multimodal (eclectic) treatments were evaluated. This analysis revealed that multimodal treatment and skills training are effective in reducing aggression and improving social skills, while problem solving was more effective in lowering subjective angry feelings. Modeling, feedback, and homework assignments were positively correlated with the overall effect size. The authors examined potential mediating variables, such as treatment duration, treatment modality (individual versus group), therapist's experience, and treatment setting, and concluded that these variables did not affect the results of treatment in a significant manner. Age, gender, and severity of the presenting problem were examined as moderating variables. There was no significant relationship between the age of the participants and the overall effect size. However, the authors indicate that there was a trend in results that suggested an increase in the magnitude of effect sizes for the oldest quartile versus the youngest quartile of

children ($d$ = 0.74 versus $d$ = 0.54). Gender affected results of treatments only as measured by anger experience measures with a higher proportion of boys in groups negatively correlated with effect sizes related to anger experience. There was no significant correlation between the severity of the problem and the effectiveness of treatment; however, there was a trend indicating that the greatest effect sizes were observed in a group of children with moderately severe anger issues.

Del Vecchio and O'Leary (2004) included 23 studies of outpatient adult samples in their analysis. They excluded studies that did not use standardized measures of anger and limited their analysis to studies that used a random assignment of subjects to the treatment and control groups. Del Vecchio and O'Leary categorized anger treatments into cognitive, cognitive-behavioral, relaxation, and other groups. This meta-analysis supported the effectiveness of anger treatment and yielded mean weighted effect sizes ranging from $d$ = 0.61 to $d$ = 0.90. Longer treatments yielded larger effect sizes and publication status (published or not) did not affect the effect sizes. The authors looked at various anger problems, e.g. driving anger, trait anger, anger control, and concluded that CBT was consistently effective (medium-to-large effect sizes) for problems related to driving anger, anger control, anger expression, and trait anger. However, the differences between various types of treatments were generally not significant. These results are limited by the small numbers of studies using treatment approaches other than CBT. The issue of ecological validity is also apparent because only three of the studies were conducted with clinical samples, 17 included non-clinical student participants, and over 50 % of the original studies were conducted by the same research team.

In summary, all the existing meta-analyses found moderate-to-large effect sizes of interventions aimed at decreasing various aspects of anger. Two of the previously conducted

meta-analyses (Del Vecchio& O'Leary, 2004; DiGiuseppe & Tafrate, 2003) concluded that the existing anger treatment models yield similar results and that there are no significant differences between various anger treatment types. Several moderating variables were detected by previous meta-analyses. DiGiuseppe and Tafrate (2003) established that dependent measures related directly to anger, such as anger frequency or intensity, yielded higher effect sizes than less directly related measures, such as self-esteem. They also found that individual treatment was more effective than group treatment and that manualized treatments and fidelity checks increased treatment efficacy. Del Veccio and O'Leary (2004) found that longer treatments were more effective than short ones. Contrarily, Sukhodolsky et al. (1995) concluded that, in children and adolescents, treatment duration and treatment modality (individual versus group) did not affect the results of treatment in a significant manner. However, with regard to groups consisting of boys and girls, the higher percentage of boys was related to lower treatment results as measured by anger experience measures. No meta-analysis to date has examined the relationship between the effectiveness of treatment and the population being treated with anger-management interventions.

## Towards Improvement of Anger Treatments

The state of knowledge of anger and the psychologists' ability to help angry clients are far from satisfying. Several strategies could help to improve efficacy of anger treatments. These include establishing diagnostic criteria for anger disorders, expanding treatment outcome research to include treatment models that have not be sufficiently (or at all) tested, developing new treatment directions, and more efficient use of the existing empirical evidence.

### Establishing Criteria for Anger Disorders

The absence of anger disorders in the Diagnostic and Statistical Manual of Mental

Disorders (DSM, most recent version being DSM-IV-TR, American Psychiatric Association, 2000) is perceived as a critical omission by many scholars and practitioners, particularly in light of the high individual, familial and social ramifications of dysfunctional anger (Eckhard & Deffenbacher, 1995; McDermut, Fuller, DiGiuseppe, Chelminski, & Zimmerman, 2009). The lack of formal diagnostic criteria of maladaptive anger often forces clinicians to diagnose their angry client with Intermittent Explosive Disorder, or consider other diagnoses that are associated with increased levels of anger such as Bipolar Disorder, Borderline Personality Disorder, or Mood Disorder. The category of Impulse Control Disorder is also occasionally used (and misused) to diagnose clients who act out their angry impulses. None of these diagnostic categories really fits the problems and symptoms experienced by clients with difficulties of anger regulation or expression, clients who might not have concurrent behavioral, mood, personality, or impulse control issues. For example, the criteria for Intermittent Explosive Disorder will be met by violent clients, but not by resentful clients who express their anger in bitter or cynical remarks and never resort to assault or property destruction. Moreover, the clients who might experience frequent, intense, and long lasting anger, but have a strong ability to control it (the overcontrolled subtype, DiGiuseppe & Tafrate, 2007), will not meet criteria for any of the above-mentioned diagnostic categories, unless they experience other co-occurring symptoms. Their overcontrolled anger might contribute to medical issues, such as cardiovascular disease, hypertension, or immune system depletion, but they will go undiagnosed and untreated because of the omission of anger syndrome from the DSM-IV-TR (APA, 2000).

The lack of diagnostic criteria for anger disorders leaves anger as an undifferentiated emotion, which – if dysfunctional – could be treated with a “one-size-fits-all” anger management approach. There is also lack of clarity as to what constitutes dysfunctional anger and when it

should or should not be treated. These diagnostic issues hinder the development of more effective treatments, treatments that ideally would be developed to alleviate problems related to specific anger disorders. There is no shortage of proposed criteria to assess dysfunctional anger and diagnostic categories of anger. Leading scholars of anger recommend that anger disorders be included in the future DSM renditions (DiGiuseppe & Tafrate, 2007; Eckhard & Deffenbacher, 1995; Novaco, 1995; McDermut, Fuller, DiGiuseppe, Chelminski, & Zimmerman, 2009). Establishing diagnostic criteria for proposed Anger Regulation-Expression Disorder (ARED) and its subtypes (DiGiuseppe & Tafrate, 2007) would stimulate the development of anger treatments that could address more specifically and effectively individual manifestations of dysfunctional anger.

**Testing More Models of Anger Treatment**

Not all of the existing treatment models have been rigorously tested. One of the major psychological orientations, psychodynamic therapy, is missing from the reviews that synthesize knowledge of anger treatments. Despite the growing empirical evidence of the efficacy of psychodynamic treatments (see Shedler, 2010, for a review), psychodynamic therapy research typically does not focus on anger outcomes. Therefore, the evidence supporting the use of psychodynamic therapy to treat anger is largely anecdotal or inferential, that is, it is possible to either quote clinicians' reports that angry clients improve when treated with psychodynamic therapy, or we can infer that this treatment model is effective with angry clients since the research shows its effectiveness in reduction of, for example, symptoms of Borderline Personality Disorder, one of the disorders that is characterized by frequent angry reactions and which treatment with psychodynamic therapy was tested (Leichsenring & Leibing, 2003; Leichsenring & Rabung, 2008). However, this inferential conclusion could be highly misleading,

because not all people who struggle with problematic anger have Borderline Personality Disorder and because people with Borderline Personality Disorder display symptoms other than problematic anger. There is a clear need for studies using anger outcome measures to assess the impact of psychodynamic treatment on the regulation and expression of pathological anger.

Within the CBT spectrum, Dialectic-Behavioral Therapy (DBT, Linnehan, 1993) addresses working with angry feelings and anger-related behavior. DBT targets anger as one of outcome variables, but it is provided as a treatment for Borderline Personality Disorder, which means that it targets a broad range of other personality factors as well. The effects of the anger treatment component of DBT could result from the synergy that might exist with the other components of the treatment: The parts of DBT that target other variables might also have indirect effect on anger management that might be impossible to parse out. Similar problems arise when testing the efficacy of Transference Focused Psychotherapy (TFP, Caligor, Kernberg, & Clarkin, 2007; Kernberg, 2010) or Mentalization-Based Therapy (MBT, Fonagy, Target, & Bateman, 2010) with clients referred for anger management treatment.

**Exploring New Treatment Possibilities**

New dimensions relevant to anger treatment should also be explored. Some of the ideas that anger treatments could expand on are: Facial feedback, priming of calm responses, addressing selective perception phenomenon, and building on positive aspects of anger.

**Facial feedback.** The facial feedback hypothesis (James, 1884; Tomkins, 1962) posits that facial expressions are the source of subjective feelings. This hypothesis has inspired a number of studies that confirm that facial expressions either evoke or emphasize mood corresponding to the facial expression (Duclos et al., 1989; Laird, 1974, 1984; Leventhal & Tomarken, 1986; Lewis & Bowler, 2009; Mauss, Levenson, McCarter, Wilhelm, & Gross,

2005). Laird's initial study (1974) showed that the participants who assumed a frowned facial expression reported increased aggressive feelings in response to pictures of children playing or of Klansmen. Recent studies showed that techniques which stop frowning, such as botox injection, reduce negative mood (Lewis & Bowler, 2009); however, their effect on anger reduction has yet to be tested.

One example of a treatment technique using the facial feedback hypothesis is the half-smile exercise introduced by Dialectical-Behavioral Therapy (DBT, Linnehan, 1993), a technique in which the person maintains the half-smile to induce positive mood and reduce negative emotions, including anger. DBT is known to be effective with clients who are diagnosed with Borderline Personality Disorder and who report difficulty regulating their anger; however, I failed to find a study that assessed specifically the impact of the half-smile exercise on anger reduction. Similarly, few studies to date tested the impact of assuming angry postures versus relaxed postures on the levels of anger (see Berkowitz & Harmon-Jones, 2004). Inferential evidence could be drawn from studies that show that relaxation techniques reduce anger; however, as previously discussed, the mechanism of this effect has not been fully explained. The efficacy of working on facial expressions and postures that would promote positive affect and reduce negative affect should be further investigated.

**The use of calming primes.** The experiments on mood priming (e.g. Abela & Brozina, 2004; Bargh, 1997; Bushman & Baumeister, 1998; Storbeck & Clore, 2008; Verona & Curtin, 2006) have provided a solid knowledge base of this phenomenon, a knowledge that could inspire and expand the scope of anger and anger treatment research. Priming refers to an implicit (beyond awareness) impact of stimuli on the person's mood, cognitions, or behavior that follows an exposure to the implicit stimuli. In the studies quoted above, a change in mood is evoked by

mood-congruent music, images (e.g. sad music or pictures when sad mood is being primed), or action (e.g. insulting behavior when angry mood is being primed). The primed mood affects the person's emotions, cognitions, and behavior beyond their awareness. For example, participants who were asked to write an essay on punishment (Berkowitz & Heimer, 1989) or to construct sentences using aggressive words (Carver, Ganellen, Froming & Chambers, 1983) reported feeling annoyed and were prone to administer punishments rather than rewards or stronger punishment in a subsequent, ostensibly unrelated task of evaluating somebody else's performance. Thus, mere exposure to anger-related cues increased the participant's likelihood of acting more aggressively. According to Berkowitz' model of anger (Berkowitz, 1993; Berkowitz & Harmon-Jones, 2004), angry primes could activate the net of physiological sensations, affective states, memories (cognitions), and behavioral scripts associated with anger. The primes could stimulate directly the affective component of the net, e.g. through mood-inducing music, or they could stimulate directly the semantic memory, e.g. through exposure to words that evoke emotions.

Contemporary American culture is satiated with images of anger-driven solutions to problems and of power equated with aggressive action. Unbounded anger expression is omnipresent in popular video games, movies, song lyrics, sport events, and the behavior of some celebrities. This affects Americans not only because of explicit modeling of aggressive behaviors but also through implicit messages (primes) evoking angry mood. On the other hand, various relaxation strategies, e.g. the use of yoga and meditation, enjoy growing popularity. As previously discussed, there is empirical evidence that these strategies decrease stress and anger.

The questions still remains, how do the relaxation techniques work? Berkowitz' model provides an explanation by positing that any element of the anger-net can affect the remaining

elements of the net. Thus, physiological sensations associated with calmness could evoke relaxed mood and cognitions. Still, many questions remain unanswered: Is it a purely physiological tension decrease which then spreads through the associated net affecting mood and related cognitions, or is it that people are being primed with implicit semantic messages, e.g. by listening to the progressive muscle relaxation instructions, where the word relax repeats numerous times? Does the calm tone of voice of these instructions have priming impact as well? What other calming primes exist and which of them could be incorporated in anger treatments? Future research could test the impact of angry primes versus calming primes on dysfunctional anger and investigate the therapeutic effects of priming.

**Addressing the phenomenon of selective perception.** DiGiuseppe and Tafrate (2003, 2007) call for more work on cognitive mediation of anger. Once thoroughly examined, the cognitive mechanisms that mediate anger could be addressed in psychotherapy. Anger treatment research could focus, for example, on addressing the phenomenon of selective perception and related cognitions. The selective perception – a facilitation of attention in a direction congruent with the person's mood – is a mechanism known to result from, but also to contribute to, depression (Bisson, & Sears, 2007; Leung, Lee, Yip, Li, & Wong, 2009) and anger (Berkowitz, 1993; Vansteeland & Van Mechelen, 2006). Thus, people who are in an angry mood demonstrate a predilection to pay more attention to anger-related cues, which strengthens their angry cognitions. The selective perception contributes to interpreting the ambiguous behavior of others as hostile and leads to an increase of anger and aggression (Dodge & Coie, 1987; Kogut, Langley, & O'Neil, 1992). Future research could test the impact of the angry participant's ability to overcome the selective perception. For example, the participants could be trained in considering multiple dimensions of the ambiguous or explicitly anger-provoking situations,

including the ambiguous or explicitly anger-provoking behavior of others. If this type of training were effective and the participants developed a habit of seeing situations and people as complex rather than one-dimensional, thus overcoming the selective perception, the impact of anger-provoking cues on their anger levels should decrease.

**The use of anger as a positive emotion.** A positive role of anger could be also explored and used in therapy because anger is the only basic emotion with both positive and negative valance. Studies of transforming the energizing aspect of anger into positive action, such as Zackariasson's (2009) analysis of the role of anger in engaging in social justice movement, might expand our understanding of mechanism of anger and contribute to the improvement of anger treatments. DiGiuseppe and Tafrate (2003) found that anger management interventions increase positive behaviors in their participants, but the mechanisms of this increase in positive actions requires further investigation. Finally, drawing on the idea of the use of positive emotions in psychotherapy (Stalikas & Fitzpatrick, 2008), it would be interesting to see how engaging angry clients in activities that evoke their positive emotions affects their problematic anger.

**More Efficient Use of Existing Findings**

The knowledge gathered by the individual treatment outcome studies could be utilized more efficiently by synthesizing these studies' results. The method of meta-analysis permits to combine the results of existing individual studies by applying common metrics – an effect size – to compare their results (see Chapter II for a detailed description of this method). Meta-analysis is used not only to assess with more accuracy the efficacy of existing anger management treatments, but also to test variables that moderate anger management treatments. The knowledge of factors that affect treatment efficacy/effectiveness could be used to create more

refined anger management treatments. Although six meta-analyses of anger treatment outcomes have been completed to date, only three of them tested variables that moderate anger treatment effectiveness. More individual studies and more meta-analyses are needed to expand our knowledge base of anger treatment effectiveness, mechanisms that lead to better anger regulation and factors that affect the treatment success.

## The Need for a New Meta-Analysis of the Efficacy of Anger Treatments

Despite the considerable amount of information that previous research and meta-analyses have provided, there remain some gaps in the base of knowledge about the efficacy of anger treatments. This meta-analysis aims to synthesize new studies and more studies with clinical samples in addition to testing the following potential moderators: Study design, participants' category (populations from which the participants were recruited), cognitive level, gender, and their pretreatment anger severity level, treatment modality, and publication status of the studies. These moderating variables were chosen for the reasons discussed below.

### Potential Moderating Variables

**Study design.** DiGiuseppe and Tafrate (2003) argue that the single group pretest-posttest studies should not be combined with the between-group studies. In their meta-analysis, the within-group design produced higher average effect size ($d$ = 0.99) than the between-group design ($d$ = 0.73) at post-treatment. This had led to their statement that calculating the results coming from those two types of study designs together might camouflage the differences between them and alter the overall effect size. On the other hand, Borenstein, Hedges, Higgins, and Rothstein (2009) and Cooper, Hedges, and Valentine (2009) argue that since the effect size is a common metric, there is no statistical reason not to combine studies of different designs. In the current meta-analysis, the study design (randomized controlled trials, non-equivalent control

group studies, and pretest-posttest single-group studies) was coded with the idea of looking at it as a variable that could mediate the magnitude of the effect sizes of anger treatments.

**Population from which participants were recruited.** Only one study to date tested the impact of participant category on anger treatment outcomes (DiGiuseppe & Tafrate, 2003). DiGiuseppe and Tafrate looked at subject type as a moderator variable and they did not find this variable to significantly moderate effect sizes on any of the anger measures used. However, their report does not describe or define the subject type; therefore, it is not clear if the authors tested differences between participants with different levels of anger experience (e.g. intensity, frequency, duration), different types of anger problems (e.g. people with high physiological arousal versus people with poor social skills), or participants coming from different environments and populations (e.g. students versus substance abusers). Since the individual studies I uncovered indicated that the existing treatment models were applied (often with no or little modification) to populations as different as students, people with mental retardation, inmates, substance abusers, caregivers, people with psychiatric problems, people with medical problems, angry drivers, and veterans, I was interested to see if the results of treatments were moderated by the population from which the participants were recruited. These samples of participants were likely to differ, for example, in readiness and motivation to decrease their anger, personal and environmental strengths or resources with which they could face anger-provoking situations, and types of these provocations or challenges (anger triggers). Therefore, I expected the type of treated population to be a variable that moderates anger treatment outcomes.

**Cognitive level of the participants.** In addition to testing the variability of relations between treatment and treated population, the current meta-analysis aimed to compare two particular populations, people with intellectual disabilities (mental retardation to borderline

intelligence) and students, to look at the possible relation between the presumed general cognitive level of the participants and anger treatment results. Studies in children indicate that there is a possible link between cognitive developmental level and response to CBT. Durlak, Fuhrman, and Lampman (1991) synthesized these studies and their meta-analysis found that the cognitive-developmental level related to age was a significant moderator of CBT results in children and adolescents. Sukhodolsky, Kassinove, and Gorman's (2004) meta-analytical study, however, reports no significant difference in response to CBT anger treatment between 15 – 17-year-olds and 7 – 10-year-olds, two groups representing presumably different cognitive developmental levels. To my knowledge, no study comparing anger treatment with people with intellectual disabilities and with a regular population was conducted to date.

The participant's cognitive level was expected to moderate treatment results because of the nature of the predominant, CBT, treatment model. The cognitive component of this model requires that the participants have the ability to notice and observe their own thoughts and emotions, which might be more difficult for people with limited cognitive abilities, such as people with mental retardation, than for people who were pre-selected based on their good cognitive abilities, such as students. Moreover, some materials used in CBT (e.g. dysfunctional thought records or self-monitoring forms), even if adapted to the needs of people with disabilities, seemed to require a cognitive, reading, and writing levels higher than these of people with mental retardation. I assumed that these treatment techniques could be used with greater ease with students, thus facilitating the treatment process and contributing to better treatment results. Finally, people with developmental disabilities experience difficulties learning, thus I assumed that the process of learning and generalization of the acquired coping strategies will be less efficient in this population than in people with more advanced learning skills, such as a

population of students.

**Gender.** The participant's gender as a moderator variable was chosen because, while DiGiuseppe and Tafrate's meta-analysis (2003) did not find that gender moderates treatment results in adults, Sukhodolsky et al.'s (2004) meta-analysis indicated that anger treatment results are worse in all-boy groups than in mixed-gender groups. This was consistent with results of meta-analyses that showed higher effect sizes of psychotherapy with children treated for a variety of problems when the proportion of girls was greater than the proportion of boys (Casey & Berman, 1985; Weisz, Weiss, Han, Granger, & Morton, 1995). Moreover, Vannoy (2005) found that participation in a meditation group decreased anger levels in incarcerated women, but not in incarcerated men. Finally, Edmondson and Conger (1996) suggested based on their meta-analysis that gender be examined as a potential moderator of anger treatment. Therefore, participant's gender was chosen to be tested as a potential moderator variable.

**Anger severity.** The pretreatment anger severity of the participants was expected to moderate the treatment results. No meta-analysis to date examined this moderator variable in adults and only one meta-analysis examined it in children. Sukhodolsky et al. (2004) did not find a significant relationship between the treated children's anger severity and treatment outcomes, but they found a trend that indicated that the largest effect sizes are found in children with moderate anger severity. The effect sizes in groups of children with severe or mild anger levels were somewhat smaller. It could be predicted that severe anger problems are more difficult to treat than the moderate ones, thus high pretreatment anger levels could contribute to smaller effect sizes of the treatment outcomes. On the other hand, people with mild anger problems do not require much improvement in their ability to regulate anger, so it is possible that even with an effective treatment less improvement in this group will be detected resulting also in smaller

effect sizes of their treatment outcomes. The moderate anger severity would be thus likely to be associated with larger effect sizes than the high or low anger severity. The current meta-analysis aimed to examine anger severity as a potential moderator variable of anger treatment in adults.

**Treatment modality.** Two previous meta-analyses, which tested the mediating effect of the treatment modality on treatment outcomes, yielded inconsistent results. DiGiuseppe and Tafrate (2003) found that, in adults, individual treatments resulted in larger effect sizes and group treatments resulted in lower effect sizes. However, Sukhodolsky et al. (2004) found no moderating effects of the treatment modality on treatment results in children. Since there is no certainty that this discrepancy is due solely to the age factor, the current meta-analysis aimed to increase understanding of this issue by testing treatment modality as a potential moderator of anger treatment results.

**Publication status.** The publication status of the included reports was also examined to confirm the previous findings of no relationship between publication status and the reported treatment outcome results (DiGiuseppe & Tafrate, 2003; Sukhodolsky et al., 2004). DiGiuseppe and Tafrate's meta-analysis included 33% of unpublished studies and Sukhodolsky et al.'s meta-analysis included 47.5% of unpublished studies. This study included 31% of unpublished reports, a proportion sufficient to compare the effect sizes yielded by the published and unpublished studies.

## Hypotheses

The following hypotheses were tested:

1. The study design was expected to be related to the magnitude of effect sizes. More specifically, it was expected that the pretest-posttest single group design studies will yield greater effect sizes than the between-group designs (experimental or quasi-experimental).

2. Psychosocial interventions for anger-related problems were predicted to be more effective than no treatment. More specifically, effect sizes in the moderate-to-large range of $g$ = 0.60 to 0.90 were expected.
3. The variance of effect sizes was expected to be heterogeneous across studies that included participants representing different groups treated with anger reducing interventions, and the group membership was expected to moderate the magnitude of the anger treatment effect sizes.

    3a. The population from which the participants were recruited (for example being a substance abuser, a veteran, a student, or a psychiatric patient) was expected to moderate the magnitude of the anger treatment effect sizes.

    3b. The participants' cognitive level was expected to moderate the magnitude of the anger treatment effect sizes. It was expected that anger treatments would produce larger effect sizes in participants with higher cognitive abilities, such as students, as compared with participants with lower cognitive abilities, such as people with intellectual disabilities.

    3c. The participants' gender was expected to moderate the magnitude of the anger treatment effect sizes.

    3d. The severity of the participants' pre-treatment anger levels was expected to moderate the magnitude of the anger treatment effect sizes.

4. Individual anger treatments were expected to yield greater magnitude of effect sizes than group anger treatments.
5. Publication status of the reports was not expected to be associated with the magnitude of the effect sizes.

## Summary

Anger is commonly experienced, signalizes the person's dissatisfaction with something or someone, and could lead to corrective action thus helping to restore the person's well-being. However, when frequently experienced, easily evoked, intense, and long lasting, anger could have detrimental results to the person who experiences it and others. Studies show connection between poorly regulated anger and medical problems, substance abuse, and interpersonal violence, which includes child and intimate partner abuse.

Despite its potentially harmful societal and individual ramifications, anger is largely understudied when compared to anxiety or depression. The limited knowledge of mechanism and factors that affect anger and anger treatment calls for more research to support psychological practice and policies. Diagnostic criteria for anger disorders should be established to assure the proper diagnosis of pathological anger and promote effective treatment, which should be tailored to the specific anger problem and to the characteristics of the person experiencing it. In addition to the existing cognitive-behavioral models, other approaches to anger treatment and variables affecting these treatment results should be examined and new anger treatment directions should be explored. More meta-analytic studies are also needed to utilize the existing data efficiently and to discover factors that affect anger experience and regulation.

Six meta-analyses have been completed to date to synthesize anger treatment outcome studies and all of them show that participation in anger treatment is associated with reduction of anger symptoms. Little is still known, however, about variables that moderate anger treatment results, a gap in knowledge that needs to be filled to promote development of more effective anger management treatments. This meta-analysis aims to include new individual studies, thus enlarging the pool of synthesized reports and to test moderating effects of four participants'

characteristics (the population from which the participants were recruited, their cognitive level, their gender, and their pre-treatment anger severity level) and three study characteristics (the study design, treatment modality, and the study publication status) on anger treatment results.

# CHAPTER II

# METHOD

*In and of themselves, the findings of any single research are meaningless – they might have occurred simply by chance (Taveggia, 1974)*

Science, including the science of psychology, strives to understand reality. Scientific methods are being developed to capture the picture of what is likely to be occurring in the population. Along with that effort, however, misunderstandings and myths flourish, often under the disguise of science. One of them is the myth of a perfect study (Schmidt & Hunter, 2003), a study free of methodological flaws and therefore believed to be an error-proof window into reality. However, while methodologically flawed studies clearly provide misleading results, even the best study design does not guarantee that the results can be trusted. This is, among others, due to sampling error, measurement error, threats to construct validity, and issues of statistical conclusion validity, such as the traditional reliance on significance testing in the interpretation of findings. Meta-analytical procedures help to eliminate some of these problems and provide solutions to others. This chapter first outlines several general concepts pertaining to the meta-analytical methodology and next describes the methods used in this study.

## Problems with Single Research

No individual study findings are error-proof. First, no single study, particularly a study testing psychosocial treatment effects, has a large enough sample to avoid a sampling error that could call the results in question, even if random sampling procedures are carefully observed. Second, all psychological measurement instruments have an imbedded measurement error, but researchers tend to treat instruments with established reliability as almost free of measurement error, thus inflating confidence in the measurement results. The measure's construct validity

could be also problematic: It could be deficient, leaving out the construct features that should be included, or contaminated, including features of other constructs that should not be included. Third, threats to the independent variable construct validity, such as the variation in treatment operationalization and delivery (e.g. therapists, timing, setting, etc.), affect the results.

**Significance testing: The illusion of error-proof conclusions.** An additional serious source of error in interpreting research findings is an excessive reliance on significance testing, which does not account for Type II errors. Traditionally, researchers applying inferential statistics focused on establishing high significance level, such as alpha of 0.05, to minimize erroneous conclusions. If the findings were statistically significant, the conclusion would be that the null hypothesis of no relationship was not supported and if the findings were statistically not significant, the conclusion would be that the null hypothesis of no relationship could not be rejected. This careful statistical language has been often enthusiastically translated into stronger statements, such as that the relationship exists (if statistically significant) or that there is no relationship (if not significant). Moreover, some researchers believed and still believe that the alpha of 0.05 meant that there was only 5% chance that their conclusions were erroneous. In fact, the 0.05 alpha means only that there was 5% chance to erroneously conclude that the relationship existed when it did not exist in reality (Type I error).

The Type II error, missing from this line of reasoning, is related to the study's power to detect the relationship that does exist in reality. If the study's power is low, the existing relationship would not be detected and the conclusion based on statistical significance testing would be that the relationship does not exist, even if it does exist in reality. The Type II errors could have high rates. For example, if the study's power is 0.80, the Type II error would be 1 minus 0.80, which equals an error of 0.20. So, even in a very carefully designed study, where the

researcher uses power analysis to establish a sample size that results in that high level of power, there is a 20% chance of failing to detect relationship when it exists. It should be noted that in many treatment outcome studies, power is about 0.50 (Schmidt & Hunter, 2003), so the Type II error rate could reach level of 0.50. Thus, a single study has a close to 50% chance ability to detect existing relationships, such as a relationship between treatment and its results. A half or more (if adding the Type I and Type II errors) of the studies that show no significant effects of treatment could be erroneous.

## Synthesis of Results

Considering the previously discussed study artifacts that could affect findings and the error rate in statistical interpretations of these findings, it is clear that no single research is a reliable basis for conclusions about reality and only their synthesis leads to more accurate results. The question is how the synthesis is done. Traditionally, the results of individual studies were analyzed and combined in a process of qualitative literature review. The more effective and accurate meta-analytical syntheses are recently conducted to combine individual studies results.

### Qualitative Reviews

The scientists who conduct qualitative reviews attempt to reach valid conclusions by looking at multiple studies and what their results show. Unfortunately, this method relies on significance testing and a related procedure known as vote counting (counting studies that reported statistically significant results thus supporting the existence of a relationship and the ones that did not). The conclusions of such reviews, which are still commonly used, are highly subjective. The reviewer decides quite arbitrarily which studies to include and how much emphasis should be placed on individual research results. Even if the utmost attention is paid to the objectivity of the process, it is only human to omit some studies and focus on the literature

that represents the researcher's theoretical perspective.

Conducting research based on a selected theory of the subject matter is highly recommended and researchers often choose a psychological theory or perspective to guide their research. What follows, however, is that studies supporting the researcher's understanding of the issue are quoted in their literature review more frequently than the ones that are alien to their theoretical perspective; research supporting a different theoretical perspective is often neglected, and the resulting literature review is limited in its scope and ability to explain reality. The result is that qualitative reviews often lead to conflicting conclusions, conclusions which could be less puzzling if a thorough literature search was conducted, a larger body of literature was reviewed, and a systemic way of looking at the research results was applied. Meta-analytical methods provide tools to do just that.

**Meta-Analysis and Its Advantages over Qualitative Reviews**

There are several advantages of meta-analysis over qualitative reviews, advantages discussed in all major publications about the method of meta-analysis (e.g. Borenstein, Hedges, Higgins, Rothstein, 2009; Cooper, Hedges, & Valentine, 2009; Cooper, 1998; Hunter & Schmidt, 1990; Lipsey & Wilson, 2001; Schmidt & Hunter, 2003; Rosenthal & DiMatteo, 2001). These advantages include the ability of the meta-analyst to: (1) include more studies in the synthesis than any qualitative reviewer could include by coding and systematically categorizing data, the process of which improves the meta-analyst's clarity of what is going on in the data and his or her ability to synthesize it, (2) detect relationships and find patterns that are either too fine-grained to be visible in a single study or could be detected only if multiple studies (each bringing a new aspect to the picture) are included in the synthesis, (3) resolve conflicting findings of individual studies by systematically and simultaneously looking at a large number of factors

(independent and moderating variables) that could have affected results, (4) show to the scientific community how the synthesis is done, thus increasing the objectivity of the synthesis process and opening it for peer review. The main advantage of meta-analysis over qualitative review, however, is the use of statistical procedures to synthesize the coded data, procedures that go beyond significance testing and enable the meta-analyst to use the data included in all studies, studies that report significant as well as non-significant findings, as long as the effect size could be calculated from the provided data. Meta-analysis combines the thoughtful selection and review of the studies with the power of meta-analytical procedures, which makes the synthesis organized and objective.

## The Method of Meta-Analysis

**The effect size.** Meta-analysis uses the common metrics of the effect size statistics to synthesize the multiple findings. Cohen (1988) defines the effect size as "the *degree* to which the phenomenon is present in the population," which also makes it "the degree to which the null hypothesis is false" (p. 9). This definition creates a very interesting shift in assessing the accuracy of the null hypothesis; the matter is not the probability of the hypothesis of no relationship being false (a very crude approach used in significance testing) but the degree to which it is false. The larger the effect size, the stronger the evidence against the null hypothesis. Interestingly, even the small but positive effect sizes indicate the existence of the relationship, the existence that would be denied if just significance testing was used.

Effect sizes indicate not only the strength but also the direction of the relationship. A positive effect size means that there is a positive relationship between the independent and dependent variables. A zero effect size means that no relationship was detected. A negative effect size indicates that the independent variable and the dependent variable are negatively

related. For example, if an anger treatment study shows a negative effect size, that means that – assuming linearity of this relationship – the more treatment was applied, the worse the participants would fare on anger measures. Overall, effect sizes provide more information than the significance testing as to the existence, magnitude, and direction of the relationship between the independent and dependent variables. The effect size interpretation depends on a model that is being used to conceptualize individual studies' effect sizes as well as the summary effect size.

**Fixed-effects model versus random-effects model.** The fixed-effects model assumes that there is one common true effect size underlying all individual research results. The summary effect size is an estimate of this true effect size and all variability in individual studies effect sizes is believed to be due to sampling error. In contrast, the random-effects model assumes that there might be multiple but related true effect sizes, which might depend, for example, on various characteristics of the participants or the treatment. The effect sizes yielded by individual studies included in the meta-analysis represent a random sample of these true effect sizes and the summary effect size is an estimation of the *mean* of a distribution of these effects. In the random-effects model, there are two sources of variance: the within-study error and the variation of true effect sizes across studies that aim to estimate these true effects (Borenstein, Hedges, Higgins, & Rothstein, 2009; Cooper, Hedges, & Valentine, 2009).

Under the fixed-effects model, all studies' results approximate the same true effect. Therefore, the results of smaller studies are given much less weight then the results of the large studies in the computation of the summary effect size. This is because it is assumed that due to the larger sampling error of small studies, the small studies are simply less accurate than the large studies are and their results could be discounted. In contrast, under the random-effects model, each study could represent a different true effect; therefore, no study results should be

discounted. The small size studies are still assigned smaller weights in the calculation of the overall effect size than the large studies are, but the weights assigned to studies of different sample sizes under the random-effects model are more balanced than under the fixed-effects model.

**The effect size calculation.** In studies that look at the treatment effects, the effect size is typically calculated as the standardized mean difference, which is a difference between treatment and control groups on the chosen measures of the dependent variable divided by the groups' pooled standard deviation. The commonly used sample estimate of this parameter is Cohen's *d*. Since Cohen's *d* overestimates effect sizes in small samples (such as the samples of many treatment outcome trials), a correction should be applied to Cohen's *d* by multiplying it by the correction factor, *J*, which is roughly calculated as $1 - (3/4df - 1)$.

The *J* values range from zero to one. The *J* is very close to 1 in large samples and decreases as the sample size decreases. Thus, in small samples, multiplying Cohen's *d* by *J* yields a markedly smaller effect size, while in large samples the correction makes a negligible difference. The corrected effect size is referred to as Hedges' *g*. Cohen's *d* and Hedges' *g* represent the same category of effect sizes, the standardized mean difference effect size.

**The process of meta-analysis.** Meta-analysis is conducted through a series of steps that include a thorough literature search, retrieval and evaluation of individual studies, coding, calculation of the individual effect sizes and their variance, calculation of the summary effect size and its variance, assessment of homogeneity of the results, and (if not homogeneous), analysis of heterogeneity, which includes a search for and identification of moderating variables. These steps will be described below as applied to this study.

## Methods of the Current Study

To reiterate, the main purpose of this study was to assess the efficacy of anger management treatments and to test the aforementioned hypotheses. A meta-analysis was conducted to accomplish this aim.

### Operationalization of Anger and Anger Treatment

Following DiGiuseppe and Tafrate (2007), anger was defined as "a subjectively experienced emotional state with high sympathetic autonomic arousal" (p. 21, see Chapter I for a full definition). As noted above, anger differs from aggression (one of the behaviors that could communicate anger, but could also occur without anger) and hostility (an antagonistic attitude). Anger intensity, frequency, and duration are the aspects of anger that vary across people and situations. These aspects of anger are measured by instruments such as STAXI and its derivatives, Novaco Anger Scale (NAS), Novaco Provocation Inventory (NPI), Anger Inventory, and widely used anger logs (see Chapter I for the review of anger measures). These well-established self-report measures were used as the only or as the primary instruments to assess anger in the studies included in this meta-analysis. Few studies used collateral reports in addition to these self-report measures. Hence, only the self-report anger measures were used to compute results of this study. Measures of aggression or hostility were excluded from this study. In sum, for the purpose of this study anger (or more precisely anger level) is operationalized as the participants' score on the instruments that measure self-reported anger.

Psychological treatments of anger were broadly defined as any treatment where one or more therapists work toward helping one or more patients to reduce their problematic anger. All treatment modalities were considered, including individual, group, and family/couples treatments in addition to treatments from any theoretical perspective, as long as the treatment identified

anger reduction as a primary goal. Some deviations from strictly defined anger reduction treatments were permitted. For example, if the treatment was defined as a therapy for Type A personality, with anger reduction as a main goal of treatment, the treatment would meet the working definition of anger treatment since anger reduction was the priority. On the other hand, if the study aimed to reduce depressive mood and anger treatment would be a part of depression reduction, this treatment would not meet the working definition of anger treatment because anger reduction was not its priority.

**Literature Search**

Studies were identified by: (1) searching electronic databases, (2) obtaining references of those found in acquired reports, (3) incidental browsing of libraries and bookstores, and, (4) searching citation indexes.

Electronic databases searched included PsycInfo, Cumulative Index to Nursing and Allied Health Literature (CINHAL), Conference Papers Index, Dissertation Abstracts, Educational Resources Information Center (ERIC), PubMed/MEDLINE, Mental Health Abstracts, The National Criminal Justice Reference Service Abstracts Database (NCJRS), Sociological Abstracts, and Social Services Abstracts. Each database was searched in its entirety.

Articles were retrieved by cross-referencing of the terms *anger* with the terms *manage** and *treat**. The asterisk in the search broadens the search process compared with a key word search and retrieves all documents with the stem preceding the asterisk. A preliminary search using these criteria resulted in total of 1, 254 relevant reports. From this initial search, 177 published reports and unpublished doctoral dissertations were pre-selected for further analysis; other search methods yielded additional an 14 studies, which resulted in 191 potential studies.

**Inclusion/Exclusion Criteria and Resulting Studies Pool**

The current study considered for inclusion any outcome study that (1) tested results of anger (not hostility or aggression) treatment; (2) included participants who were at least 18 years old; (3) used measures of anger experience commonly utilized in anger research; (4) provided data in a format for which an effect size was calculable; (5) was reported in English; (6) did not use another anger treatment procedure as a control/comparison group (studies with no-treatment, treatment as usual, or placebo control groups were included, but studies comparing two or more different anger treatment models were excluded). Single-case studies were also excluded.

The inclusion criteria were specific enough to exclude studies that focused on related constructs, such as aggression or hostility, and studies that did not use well-established anger measures (studies that used idiosyncratic measures that did not have known validity and reliability). If a study included both well-established and idiosyncratic measures, only the results of well-established measures were coded. This was done to increase the construct validity of this study and reduce measurement error. If a study reported results of no-treatment and other-anger - treatment control groups, only the no-treatment control group comparison was included in the study. This was done to increase the clarity of the results at the exploratory stage of studying the effectiveness of anger treatments. As previously mentioned, the dismantling procedures, procedures which compare various elements or forms of anger treatment, were excluded from the current study.

The inclusion criteria were broad enough to include laboratory, community, and clinical samples, thus increasing the diversity of the populations from which the study samples were drawn. Moreover, studies of different designs – randomized control trials, nonequivalent control group studies, and single group pretest-posttest studies – were included. The original idea was to

conduct separate meta-analyses of these three study design groups, but combining of all studies into one meta-analysis was also considered to assess for the moderating effect of study design.

Of the 191 potential reports reviewed, 80 met the inclusion criteria. Of the 80, 77 independent studies were identified (i.e., 3 follow-up studies were combined with the basic studies). In addition, a posteriori decision was made to exclude two studies that reported the results of extremely long treatments: One implemented anger treatment that lasted four and a half years (De Leon, Powell, & Kaplan, 1991) and the second one implemented anger treatment over a total of 154 individual and group sessions (Evershed et al., 2003). The remaining 75 studies tested anger treatment that lasted 1- 40 sessions with an average of nine sessions and standard deviation of five. Thus, the typical (within two standard deviations from the mean) range of sessions' number was 1 – 19 and studies beyond this range were considered outliers. One such outlier was identified and removed from the sample (Lindsay et al., 2004, 40 sessions).This resulted in a final sample of 74 independent studies with number of sessions ranging from 1 – 18.

**The Quality of the Included Studies**

Meta-analysis is a method of individual research synthesis, and the quality of its results is related to the quality of the included studies. As previously discussed, study artifacts such as poor construct validity, inadequate study design or poor quality of measures used to assess the dependent variable, could invalidate the study. There are also other potential threats to a study's validity; for example, the experimenter's bias, the participants' desirability effect, poor quality of the treatment provided, and many others. The solutions proposed to resolve these threats to the validity of meta-analysis vary from inclusion of only the highest quality studies to inclusion of all available studies, regardless of their quality. In the last case, the study quality features should be included in coding and their impact on the results should be tested for a possible moderating

effect.

This synthesis aimed to find a middle ground between these two extreme positions. As previously discussed, a careful selection of studies was conducted to exclude results that could decrease validity of this synthesis. Three basic elements of the studies' quality were assessed during the selection process: Anger construct validity, independent variable construct validity, and dependent variable construct validity. Even though the selection process was only a rough estimate of the studies' validity, it helped to strengthen this synthesis' results by including only the studies that: (1) Defined anger as an emotion (anger construct validity), which had led to excluding results pertaining to aggression, hostility, and other related concepts, (2) implemented treatments that aimed to reduce anger and only anger (independent variable construct validity), (3) used established measures of anger levels (dependent variable construct validity). If the study provided results pertaining to other constructs along with anger level results, only the results pertaining to anger levels were coded and synthesized. By combining only studies in which the independent and dependent variables were conceptually similar, as advised by Lipsey and Wilson (2001), the most serious threat the synthesis validity – mixing research findings that should not be mixed (the "apples and oranges" problem") – was reduced.

One of the typical threats to the study validity is a small sample size. Large sample sizes, however, are difficult to achieve in psychotherapy outcome studies due to multiple obstacles in finding a proper sample and due to attrition rates. In conducting meta-analysis, small sample sizes are less of a problem than when it comes to the findings of a single study, because of the statistical procedures used to combine the findings. These statistical procedures were applied in this meta-analysis to include small as well as large samples. First, a conservative Hedges' *g* formula was used to calculate individual effect sizes and correct for a small sample size bias in

calculation of these effect sizes. Second, before the individual research findings were summed into an overall mean effect size, each study's effect size was weighted by the inverse of its variance. Since variance is usually greater when the sample size is small, the studies with larger sample sizes contributed more weight to the overall mean effect size and studies with smaller sample sizes contributed less to the overall mean effect size, but could be still included. Therefore, studies of all sample sizes (except for single case studies) were considered for this meta-analysis.

Another issue related to the study quality is its design. There is an ongoing debate among meta-analysts regarding including different study designs in one meta-analytical study. Some researchers of anger treatment outcome believe that studies of different designs, particularly the between-groups and within-group comparison studies, should be analyzed separately (e.g. DiGiuseppe &Tafrate, 2003; Sukhodolsky et al., 2004); some believe that only randomized experimental studies should be included for review because such studies are believed to be of better quality than are quasi-experimental studies (e.g. Del Vecchio & O'Leary, 2004); and some researchers decide to combine experimental and quasi-experimental as well as between-groups and within-group comparison studies (e.g. Beck & Fernandez, 1998).

The growing consensus in the field of psychotherapy is that after new treatments are experimentally tested, they should be tested outside of laboratories where randomization is often not possible. For example, Shadish et al. (1997; 2000) argue the value of all studies that "vary along the continuum of clinical representativeness" (2000, p. 513), thus enabling the researcher to study the relation between treatment effectiveness established in a laboratory setting and the one achieved in clinical practice. These authors included both experimental and quasi-experimental studies in their meta-analysis of psychotherapies representing various levels of

clinical representativeness – from those conducted in experimental settings through those conducted in clinics – and showed that effect sizes from experimental studies were similar to effect sizes from quasi-experimental studies.

When looking at different study designs, the question arises if indeed the quality of the experimental studies is always higher than the quality of the quasi-experimental studies. The presumed inherent value of randomization is questioned by some authorities. For example, Shadish, Cook, and Campbell (2001) argue that non-random assignment does not necessarily decrease the internal validity of the study. Worthman (1994) discusses the attrition effects as a serious issue undermining the findings of controlled experimental trials. It should be also noted that, if still in doubt as to the comparability of experimental and quasi-experimental studies, the effects of randomization on effect sizes can be examined at the stage of moderator analysis (Gottdiener & Haslam, 2002), which was done in the current meta-analysis.

I considered three study designs for inclusion: Randomized controlled trials, non-equivalent group studies, and pretest-posttest single group studies. These three categories of studies were coded and analyzed separately, but eventually all the studies were combined in one synthesis. This was done because it is feasible to do so statistically (Borenstein, Hedges, Higgins, & Rothstein, 2009; Cooper, Hedges, & Valentine, 2009; Shadish, Matt, Navarro, & Phillips, 2000) and because it was particularly feasible to do so in this meta-analysis, providing minimal differences in the findings of these three categories of studies (see the review of analytical procedures below and Chapter III for details).

In sum, the current meta-analysis ensured quality of the studies included by incorporating only the studies that focused on anger as an emotion, implemented treatments developed to reduce problematic anger, and used well-established measures to assess changes in anger levels.

Moreover, the study design (and related study quality) was treated as a potential moderator variable.

**Management and Evaluation of the Meta-Analysis Database**

A database was created using EndNote, a bibliographic citation and database software. The meta-analysis database enables the researcher to maintain records of retrieved reports and records of the reports that had to be still retrieved. Reports not available via an on-line search of full text documents were retrieved from local libraries, and their hard copies were scanned and stored electronically. Reports not available at the local libraries were retrieved through inter-library loan.

The database also enabled the researcher to determine whether or not reports are independent or dependent (i.e., multiple reports from one study). Multiple reports from the same study were kept together and treated as one study. The reports were stored electronically in three designated files (randomized controlled trials, non-equivalent control group studies, and pretest-posttest single group studies). Each file was alphabetized by the first author's last name.

It is well known that retrieval of all studies that have ever been completed is not feasible (Borenstein, Hedges, Higgins, Rothstein, 2009; Cooper, 1998; Cooper, Hedges, & Valentine, 2009; Lipsey & Wilson, 2001; Rosenthal & DiMatteo, 2001). It is also well known that an incomplete literature search could distort the result of meta-analysis. If the studies included in the meta-analysis are systematically different from the ones that would have been included but have not been retrieved, the retrieval of studies is biased and the resulting overall effect size could be artificially inflated. This is often due to a publication bias. Studies that report larger effect sizes or significant findings have a greater chance to be published than studies reporting smaller effect sizes or non-significant findings (Borenstein et al., 2009). The published studies

are easier to retrieve and have a greater chance to be included in qualitative or quantitative reviews, which is a serious threat to the validity of the synthesis results.

The threat of retrieval bias was addressed in this study through: (1) literature search and attempts to identify and include as many as possible unpublished reports, such as unpublished doctoral dissertations and conference presentations, (2) funnel plot analysis, (3) application of Rosenthal's *File-Safe N* statistics, to assess the robustness of the results. The *File-Safe N* indicates how many unretrieved studies with zero effect sizes would be needed to invalidate the mean meta-analysis effect sizes.

**Coding Procedures and Coding Reliability**

A coding manual and forms were developed and continuously revised as needed. All reports were coded by an author of this meta-analysis and 17 randomly selected reports (24%) were coded by a 5$^{th}$-year Ph.D. student, who had previous experience in conducting meta-analysis. During the training phase, practice meetings were held to resolve coding questions and refine coding forms, and three studies were coded during this phase. These three studies were not included in calculations of the interrater reliability since any disagreements were resolved. Following the training phase, the first and second coders independently coded 14 randomly selected studies. Twelve of these studies were included in the current meta-analysis. Two types of data were tested for interrater reliability across the 12 studies: (1) continuous data pertaining to effect sizes and, (2) categorical data, which included a category of the participants (population from which they were recruited and gender), their anger severity, treatment modality, the report publication status, and the study design.

The intraclass correlation coefficient, $r_1$ (Orwin & Vevea, 2009), was computed to assess the interrater reliability in coding continuous data (group means, standard deviations, and sample

sizes at post-treatment), data which was used to calculate effect sizes. The $r_1$ chosen to assess the interrater reliability of this study is based on a two-way random effects model ANOVA, which permits the researcher to include the between-coder's variance in the error term. Thus the $r_1$ accounts for both agreement and disagreement between coders. A strong interclass correlation coefficient was found of $r_1 = 0.96$, which indicates high interrater reliability in coding continuous data of this study (see Appendix B for calculations).

Cohen's *Kappa* (*K*) statistic computation was attempted to determine the level of interrater reliability on each categorical variable separately. There was a 100% agreement on rating of almost all categorical variables (e.g. study design, population treated, and treatment modality), with the exception of anger severity. The *K* cannot be calculated for 100% agreements; therefore, the only variable for which the *K* was actually calculated was anger severity (see Appendix B for calculations). The *K* ranges from -1 to 1. The *K* for anger severity ratings in this study was 0.361 with a perfect agreement on seven out of twelve coded studies and a modest disagreement (a difference of 1 point on 1-3 scale) on five out of twelve studies. The *K* of .0361 is interpreted as fair level of interrater agreement (Fleiss, 1981). Overall, there was a high level of agreement between coders, which suggests an adequate coding reliability of this study.

**Calculation of Effect Sizes**

The previously discussed methods for effect size calculation were employed to assess the effectiveness of anger treatment in studies that used independent groups (Borenstein, Hedges, Higgins, & Rothstein, 2009; Cooper, 1998; Cooper, Hedges, & Valentine, 2009; Hedges & Olkin, 1985; Lipsey & Wilson, 2001). Effect size calculations and data analysis was performed with a meta-analytic and effect size software package, Comprehensive Meta-Analysis (CMA)

2.0. The main effect size was the standardized mean difference of the mean of the treatment group minus the mean of the control group divided by the pooled within-groups standard deviation. This statistic was then corrected for small sample sizes bias by multiplying the standardized mean difference by the correction factor, *J*, which resulted in an effect size known as Hedges' *g* (Borenstein, Hedges, Higgins, & Rothstein, 2009; Borenstein, 2009; Lipsey & Wilson, 2001).

The standardized mean gain score was used to calculate effect sizes from studies that used pretest-posttest designs (Borenstein, Hedges, Higgins, & Rothstein, 2009; Borenstein, 2009). The mean difference score (difference between pretest and posttest scores) was divided by the pooled standard deviation within-groups. The within-groups standard deviation was calculated as the standard deviation of the differences divided by the square root of 2 $(1 - r)$, where $r$ is the correlation between pairs of observations. Thus, the correlation of the pretest and posttest scores of the same group was accounted for and included in the effect size calculations to avoid their artificial inflation. If the correlation between pretest and posttest scores was high, the resulting effect size would be affected (decreased) more than if the correlation was low. The resulting effect size was also corrected for small sample sizes bias by multiplying the standardized mean gain score by the correction factor, *J*, which procedure again yielded Hedges' *g* effect size for each study.

If the mean scores, standard deviations, or correlations necessary for the calculations of effect sizes were not available, the effect sizes were derived from statistics such as *F*, *t*, or *p*. The CMA software used in this study enables the researcher to calculate an effect size (*d* or *g*) and variance from each study by taking into account the study design.

Once the effect sizes were calculated, they were weighted by the inverse of their variance

and summed, and an overall mean effect size was computed. The process of calculating the overall mean effect size also controls for sampling error (Borenstein, Hedges, Higgins, & Rothstein, 2009; Cooper, Hedges, & Valentine, 2009; Hedges & Olkin, 1985; Lipsey & Wilson, 2001).

## Data Analytic Procedures

The researcher faces numerous choices while calculating the summary effect size and while conducting data analysis. In the current study, first, the decision had to be made whether the fixed-effects model or the random-effects model should be used to calculate the summary effect size. Second, the heterogeneity of the data had to be assessed and, since the data was heterogeneous, the decision had to be made whether or not the predetermined (based on theory and previous research) moderator variables explained the heterogeneity. Third, the decision had to be made what the most appropriate statistic was to test the impact of the moderator variables on the summary effect size. Fourth, the decision had to be made whether the studies of different designs should be analyzed separately or included in one analysis.

**The use of the random-effects and mixed-effects models.** The decision regarding which model to use in data synthesis and analysis is based on the researcher's assumption as to the nature of the true effects and the nature of research providing data for the summary. The random-effects model was chosen as a basic model for this meta-analysis because the individual research incorporated in it was done independently, included a variety of participants, implemented treatments that – although similar – were by no means identical, and used a range of measures to assess the treatment results. Thus, the assumption that individual studies estimated multiple true effects (true for their particular research team and setting, participants' category, treatment, and measures used), not one true effect, seemed to be justified and the

random-effects model was chosen to calculate the effect sizes of individual studies and the summary effect size.

If the results of this meta-analysis were heterogenous, the search for moderator variables was planned using a subgroup analysis. At this stage of analysis, when studies are categorized into subgroups along the dimensions of the potential moderator variables, a mixed-effects model is utilized. The mixed-effects model partitions the source of data variability into (1) within group variation, where the random-effects model is assumed, and (2) between-groups variation, where the fixed-effects model is assumed. Thus, like random effects model, the mixed-effects model assumes that there exists multiple true effect sizes within each subgroup of analysis and that the individual research results are a random selection of these true effect sizes (a random-effects part of the model). However, the mixed-effects model treats the moderator variable values (categories) as fixed, each value (category) defining a group of studies. This grouping is fixed in a sense that the group membership cannot be randomly selected (e.g. the study done with substance abusers is grouped with other studies done with the same type of participants, not others). Thus, by grouping studies along the values of the moderator variable, the systematic characteristics of the studies and the between-group variability are emphasized.

The statistical model affects the inferences that could be made based on the meta-analysis results. In mixed models, due to the random-effects part of the model, the inferences could be made to a population of studies from which the included studies were sampled, not just to the group of studies included, which expands the generalizability of the results.

**Homogeneity assessment and search for moderator variables.** Previous meta-analyses showed that there is a well-established association between anger treatments and decreased anger levels. The next step undertaken in this study was to assess if this association is equally strong

across populations treated with anger reducing interventions. A series of more specific questions followed: Are anger treatment results uniform in all studies or do the studies' results vary beyond what could be explained by random error? If they do vary, is there any pattern in this variability that could be identified? Could the excessive variance of results (variance that could not be accounted for by random error) be explained by interactions of the results with factors that could influence the treatment (moderator variables)? What proportion of the observed variance could be considered real (indicative of variability in true effects) and what proportion is likely to be spurious?

***The homogeneity test.*** To address the above-listed questions, first the homogeneity of the result was assessed using the *Q* statistics. This statistic has a chi-squared distribution with $k - 1$ degrees of freedom where *k* is the number of studies in the meta-analysis. The *Q* is computed as a weighted sum of squares and it reflects the dispersion of observed effect sizes from the mean effect size. If all the studies shared a common true effect size (and no moderator variables existed), then all the effect sizes should be similar and all the variability of results could be explained by the within-studies sampling error. In this case, the computed Q would not be significantly different from the expected value of *Q* (which is a critical value of chi-square distribution at $k - 1$ degrees of freedom). On the other hand, if a computed *Q* exceeded the expected value of *Q*, this excess of variability would indicate a variation in effect sizes that cannot be explained by the sampling error alone, and which would call for moderator analysis. Moderating variables are then tested to see if the overall variability of the results decreases as the moderating variables are introduced (Borenstein, Hedges, Higgins, & Rothstein, 2009; Cooper, Hedges, & Valentine, 2009; Hedges & Olkin, 1985; Schmidt & Hunter, 2003). This study's results (see Chapter III) indicated that there was significant variability across the included

studies, variability that could not be accounted for only by sampling error. These results indicated heterogeneity of the underlying true effects of anger treatment.

***Moderator variables.*** The variables predetermined to be potential moderators of anger treatment effects were those that have theoretical, methodological, or clinical importance (Hedges & Olkin, 1985; Hunter & Schmidt, 1990), and separate analyses were conducted on each of them. As previously discussed (Chapter I), the study design, the participants' type (population treated and gender), their cognitive level, their pretreatment anger severity, the treatment modality (individual versus group), and the report publication status were considered to be potentially related to the effect sizes of anger treatments.

The first potential moderator variable was study design. As reported by DiGiuseppe and Tafrate (2003), the within-group effect sizes are larger than the between-group effect sizes; therefore, a single-group repeated measures design studies should be analyzed separately from the between-groups design studies. The studies of this analysis were grouped according to their design (randomized controlled trials, nonequivalent control group studies, and one group pretest-posttest studies) and these three groups were compared for between-group differences in effect size magnitudes. The assessment of the potential moderating effects of the study design was crucial for the planning of this meta-analysis. If effect sizes yielded by different study designs were radically different, three separate small meta-analyses were to be conducted, one for each type of design. If the differences were negligible, studies of different designs could be combined in one meta-analysis. This would increase the statistical power of this study and increase the likelihood of detecting moderating variables.

I decided to combine studies that used different designs in one analysis. This decision was based, first, on the theoretical meaning of the effect size as a standardized measure of

treatment effectiveness. Borenstein, Hedges, Higgins, and Rothstein (2009) posit that "from a statistical perspective the effect size (*d* or *g*) has the same meaning regardless of the study design. Therefore, we can compute the effect size and variance from each study using the appropriate formula, and then include all studies in the same analysis" (p. 30). Cooper, Hedges, and Valentine (2009) also support this line of reasoning. Second, the differences among the effect sizes yielded by different study designs of research included in this meta-analysis were negligible (See Chapter III); therefore, studies using different designs were combined to calculate one summary effect size in all subsequent analyses.

The second potential moderator variable to consider in this study was the population from which the participants were recruited, such as caregivers, students, inmates, veterans, psychiatric patients, etc. If the participants represented two such categories, e.g. veterans who abused substances, they were arbitrarily categorized on the basis of a main descriptor used in the individual study. That is, the veterans who abused substances were categorized as veterans if the studies' focus was veterans' anger management treatment and the category of substance abusers was reserved for the participants of the studies that focused on treatment of anger for substance abusers. There were ten different categories (populations) found in the studies included in this meta-analysis. The population treated with anger interventions is a categorical variable, and the ten empirically derived groups represent levels of this variable that was tested for its moderating effect (interaction) with anger treatment effect sizes. It was hypothesized that the effect sizes of the commonly used anger treatments will vary across these populations.

The third potential moderator variable was the subjects' cognitive level. With the exception of studies that focused on anger treatment with people with intellectual disabilities, the existing studies did not report specific data on the participants' intelligence. To approximate the

impact of the cognitive level on the anger treatment results, studies that included two types of participants were compared: College students and people with intellectual disabilities. The comparison of treatment effect sizes between these two populations, populations with presumably different cognitive levels, was deemed the only possible way of assessing this moderator variable based on the existing data.

The fourth potential moderator variable was the subject's gender. Few studies that included both men and women reported anger treatment results separately for men and women. Some other studies were conducted with either men or women. Data coming from the combination of these studies was tested for the potential relation of gender and anger treatment effects.

The fifth potential moderator variable was the subjects' anger severity. One difficulty that the researchers face is to validly and reliably operationalize anger severity. In this study the subjects' anger was conceptualized as severe, moderate, or low, depending on the anger testing results and/or the impact of the anger-related issues on the subjects' lives. The anger was considered to be severe if the subjects tested in the upper quartile of the standardized anger tests (high anger testing results), or if their anger resulted in an arrest for aggressive behavior, child abuse, or domestic violence. The moderate anger severity level was operationalized as the subject's reports of the anger-related vocational, domestic, driving, health, and other issues that have not resulted in an arrest and were not paired with high anger testing results. Low severity of anger was operationalized as self-reported anger that has not resulted in the above-mentioned problems.

The sixth potential moderator variable was treatment modality (individual versus group). Individual anger treatments were found to be associated with greater effect sizes than group

anger treatments in previous meta-analysis by DiGiuseppe and Taftrate (2003). No family or couples therapy of anger was studied in the retrieved individual reports; therefore, only individual or group therapy outcome studies were included in this meta-analysis.

The seventh potential moderator variable was the report's publication status. Published and unpublished reports were separated in two groups and the between-group difference was tested with the *Q*-test (see below) to assess its significance.

**Subgroup Analysis and the ANOVA Analog *Q*-test.** Subgroup analysis and meta-regression are the two most commonly used strategies to test the moderator variables in a meta-analysis (Viswesvaran & Sanchez, 1998). Similarly to the original ANOVA, the subgroup analysis (and the analog ANOVA) is predominantly used to respond to the question whether or not there exists an interaction between independent and moderator variables, which modifies the association between treatment and treatment results. In subgroup analysis one independent variable is tested at a time. Similarly to multiple regression, meta-regression is predominantly used to predict the impact of multiple independent or moderator variables on the dependent variable and to quantify that impact by calculating beta weights, which indicate the increment of the independent variable change when the dependent variable changes by one unit. This is related to another difference between subgroup analysis and meta-regression: Like ANOVA, the subgroup analysis is predominantly used with categorical variables, while meta-regression, like multiple regression, is predominantly used with continuous variables. Konstantopuolos and Hedges (2009) suggest the use of subgroup analysis with categorical independent variables and the use of meta-regression with discrete or continuous independent variables when conducting meta-analysis.

This meta-analysis used subgroup analysis and employed the ANOVA analog *Q*-test to

assess the predetermined moderator variables. The statistical method used to analyze data should depend on the research purpose and question asked by the researcher (Cooper, Hedges, & Valentine, 2009). The purpose of this study was to empirically determine the existence of the proposed variables moderating anger treatment results, one at the time, and to assess their ability to explain variability in effect sizes. One of the main questions of interest was: Is the association between anger treatment and its results similar in all the populations treated or is it different in various populations treated? The null hypothesis tested here was that there was no difference between the subgroup mean effect sizes. Shadish and Haddock (2009) state, "for that omnibus hypothesis, *Q* is the most powerful unbiased test possible (p. 263)" and they recommend the use of the *Q* test along with the *I-squared* statistic (see next section) to assess the heterogeneity of results.

The nature of the data synthesized here also called for subgroup analysis rather than meta-regression. The participant's category (population treated or gender), study design, treatment modality, and publication status, are all categorical variables, which are most appropriately analyzed with subgroup analysis and the ANOVA analog *Q*-test (Konstanopoulos & Hedges, 2009). The two remaining proposed moderator variables, the participants' pre-treatment anger levels and their cognitive levels, even though possibly continuous by nature, were operationalized as categorical variables in this study. The definition of the participants' anger levels in this study included practical consequences of the angry persons' actions, not just their anger tests results, thus a categorical variable with three levels of anger (severe, moderate, and low) was created. Similarly, because the individual studies included in this meta-analysis generally did not report the participant's intelligence levels (with the exception of studies using participants with intellectual disabilities), I decided to contrast two categories of participants

(students and people with intellectual disabilities) with ostensibly different intelligence levels to assess the potential connection between cognitive level and anger treatment results. Thus, a categorical variable was created with two levels: High cognitive ability represented by students and low cognitive ability represented by people with intellectual disabilities. Overall, since all proposed moderator variables were categorical, the use of subgroup analysis was warranted.

For each moderator variable, separate subgroup-analyses were conducted to test the impact of the moderator variables on the treatment results. After the variable of interest was selected and its values were established by grouping studies into subgroups, the analysis of variance (ANOVA) analog *Q*-test was used to assess the variability of the between-group and within-group effect sizes and the significance of this variability (Borenstein, Hedges, Higgins, & Rothstein, 2009; Konstantopoulos & Hedges, 2009; Viswesvaran & Sanchez, 1998). As previously discussed, the *Q* test breaks down the variance of effect sizes into within-group and between-group variances. If the between-group variance is significantly greater than it would be expected by chance, the potential moderator variable being tested with the *Q* test is concluded to interact with anger treatment (independent variable) and moderate the treatment results.

**Consistency of findings: The $I^2$ statistic.** The $I^2$ is a descriptive statistic that specifies the proportion of variation across studies that is due to real heterogeneity, not to chance (Higgins, Thompson, Deeks, & Altman, 2003; Shadish & Haddock, 2009). The $I^2$ ranges from 0% to 100%. The higher $I^2$, the greater the inconsistency of findings (heterogeneity) is. A small within-subgroup $I^2$ indicates that the subgroup effect sizes are consistent (homogeneous), which along with a high between-group $I^2$ strengthens the conclusion that the variable used to create subgroups indeed moderates the treatment results. Higgins et al. (2003) propose guidelines to interpret the $I^2$ as follows: $I^2$ = 25% is considered to be a small heterogeneity, $I^2$ = 50% is

considered to be medium heterogeneity, and $I^2$ = 75% is considered to be large heterogeneity. It should be noted that these are arbitrarily, not empirically, derived interpretative guidelines.

The research of variables moderating anger treatment is still in exploratory stages: It remains unclear what combination of variables moderates the treatment. Once the field of anger treatment research advances and the existence of more moderating variables is determined, meta-regression could be used to test models explaining how the combination of these moderating variables affects the treatment results. Since current knowledge of the variables that moderate anger treatment is not sufficient to build such a theoretically and clinically meaningful model, meta-regression was not attempted here. The $Q$ test and the $I^2$ statistic were used instead to analyze the data.

# CHAPTER III

# RESULTS

As previously noted, this study was conducted to assess the effectiveness of interventions that intend to reduce anger and to find factors that moderate anger treatment effectiveness.

## Descriptive Statistics

One hundred ninety one relevant reports were examined and 80 studies that met the inclusion criteria were identified. Three of these studies were follow-up reports, which were therefore coded as one report with the basic studies that they referred to. This resulted in 77 independent studies. Two more studies were removed from final analyses because they reported results of unusually long treatments. These were studies done by Evershed et al. (2003) presenting results of 77 weeks of treatment (approximately 154 sessions), and De Leon, Powell, and Kaplan (1991) reporting results of 232 weeks (4 ½ years) of treatment (approximately 54 sessions). The remaining 75 studies had 9 sessions on average with standard deviation of 5; therefore 1 to 19 sessions was considered a typical range of session numbers (mean +/- two standard deviations) and studies outside of this range were considered outliers. Only one study was identified as such an outlier (Lindsay et al., 2004, 40 sessions). Seventy four studies reported number of sessions ranging from 1 to 18, within two standard deviations of the mean. Thus, the final sample consisted of 74 reports (see Table 1, Table 3, and Appendix A for a list of included reports).

The number of participants across all the included studies was 3, 259. An average study included 44 participants (SD = 37), who were 40% female (SD = 37), 58 % Caucasian (SD = 32), and 34 years old (SD = 10). It should be noted that 43 studies (58%) did not report the race of the participants (see Table 1 for details).

Table 1

*Description of Individual Studies Included in Meta-Analysis of Anger Treatment Effectiveness in Adults*

| Study | Participants | N | % Female | % Cauc. | Age | Modality | Ses. # | Treatment | Control | Public. | F-up |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Acton & During (1992) | Caregivers | 29 | 69 | -- | -- | G | 13 | CBT | None | Yes | No |
| Alvarez (1997) | Subst. abus. | 53 | 86 | -- | 34 | G | 3 | CBT | NoTx | No | No |
| Bennett et al. (1991) | Medical pts | 29 | 0 | -- | 46 | G | 8 | Multicomp. | NoTx | Yes | Yes |
| Briscoe (2001) | Subst. abus. | 27 | 100 | 52 | -- | G | 8 | CBT | TAU | No | No |
| Cary & Dua (1999) | Caregivers | 27 | 81 | -- | 40 | G | 10 | SD, SI | Wait | Yes | Yes |
| Chan et al. (2003) | Psych. outp. | 78 | 46 | -- | 35 | G | 10 | Multicomp | TAU | Yes | Yes |
| Chetomb et al. (1997) | Veterans | 15 | 0 | 54 | 47 | I | 12 | Multicomp | TAU | Yes | No |
| Coon et al. (2003) | Caregivers | 85 | 100 | 90 | 64 | G | 10 | Multicomp | Wait | Yes | No |
| Dahlen & Deffenbacher (2000) | Students | 86 | 77 | -- | 19 | G | 8 | CBT, CR | Wait | Yes | Yes |
| Deffenbacher et al. (2000a) | Students | 69 | 64 | -- | 19 | G | 9 | CBT | NoTx | Yes | Yes |
| Deffenbacher et al. (2002) | Drivers | 55 | 49 | -- | 19 | G | 8 | CBT, Relax | NoTx | Yes | Yes |
| Deffenbacher et al. (2000b) | Drivers | 57 | 47 | -- | 19 | G | 8 | CBT, Relax | NoTx | Yes | Yes |
| Deffenbacher et al. (1990a) | Students | 29 | 50 | -- | 19 | G | 8 | CBT, Other | NoTx | Yes | Yes |
| Deffenbacher et al. (1990b) | Students | 48 | 46 | -- | -- | G | 8 | CBT | NoTx | Yes | Yes |
| Deffenbacher et al. (1996) | Students | 78 | 45 | 93 | -- | G | 8 | CBT, SS | NoTx | Yes | Yes |
| Deffenbacher & Stark (1992) | Students | 55 | 50 | -- | -- | G | 8 | CBT, Relax | NoTx | Yes | Yes |
| Deffenbacher et al. (1987) | Students | 49 | 50 | -- | -- | G | 8 | CBT | NoTx | Yes | Yes |
| Deffenbacher et al. (1994) | Students | 180 | 52 | 93 | 19 | G | 8 | CBT, SS | NoTx | Yes | Yes |
| Dua & Swinden (1992) | Students | 29 | 83 | -- | 19 | G | 6 | CR, Exp., Meditat | NoTx | Yes | Yes |
| Dyer (2000) | Psych. outp. | 23 | 9 | 100 | 38 | G | 6 | Multicomp. | None | Yes | Yes |
| Eamon et al. (2001) | Inmates | 33 | 100 | 35 | 31 | G | 12 | CBT | NoTx | Yes | No |

Table 1 (continued)

*Description of Individual Studies Included in Meta-Analysis of Anger Treatment Effectiveness in Adults*

| Study | Participants | N | % Female | % Cauc. | Age | Modality | Ses. # | Treatment | Control | Public. | F-up |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Eastridge (1983) | Students | 48 | 100 | -- | -- | G | 5 | CBT, Exp., SS | TAU | No | No |
| Gaertner (1983) | Inmates | 36 | 0 | 50 | -- | I | 6 | CR, SD, Exp., Ed. | NoTx | No | Yes |
| Galovski et al. (2006) | Drivers | 27 | -- | -- | -- | G | 4 | CBT | None | Yes | No |
| Gerlock (1994) | Veterans | 38 | 0 | -- | -- | G | 8 | CBT | None | Yes | No |
| Gerzina & Drummond (2000) | Community | 24 | 4 | -- | 39 | G | 6 | CBT | NoTx | Yes | Yes |
| Gorenstein et al. (2007) | Community | 34 | 68 | 56 | 30 | I | 12 | CBT | None | Yes | No |
| Grodnitzky & Tafrate (2000) | Community | 6 | 17 | 100 | 34 | G | 10 | Exp. | None | Yes | Yes |
| Haaga et al. (1994) | Community | 32 | 0 | 100 | -- | G | 7 | Relax | NoTx | Yes | No |
| Hagiliassis et al. (2005) | People w. IDs | 29 | 45 | -- | 44 | G | 12 | Multicomp. | Wait | Yes | Yes |
| Hazaleus & Deffenbacher (1986) | Students | 61 | 43 | -- | -- | G | 6 | CR, SD | NoTx | Yes | Yes |
| Hiebert & Malcolm (1988) | People w. IDs | 10 | 50 | -- | 27 | G | 8 | CBT | None | Yes | No |
| Howells et al. (2005) | Inmates | 260 | 0 | 65 | 29 | G | 10 | Multicomp. | Wait | Yes | No |
| Hughes (1996) | Inmates | 25 | 0 | -- | 36 | G | 12 | CBT | None | Yes | No |
| Ireland (2004) | Inmates | 87 | 0 | -- | 19 | G | 12 | CBT | NoTx | Yes | No |
| Johansen (2005) | Community | 23 | 0 | 30 | 38 | G | 10 | AM | None | No | No |
| King et al. (1999) | People w. IDs | 11 | 36 | -- | 30 | G | 15 | CBT | None | Yes | Yes |
| Keyes & Dean (1988) | Caregivers | 50 | 71 | -- | 31 | G | 1 | CBT | Atten. | Yes | No |
| Larkin & Zayfert (1996) | Medical pts. | 22 | 50 | 100 | 39 | I | 6 | Multicomp. | NoTx | Yes | No |
| Lin et al. (2004) | Subst. abus. | 14 | 50 | 93 | 37 | I | 12 | Forgive | TAU | Yes | Yes |
| Linkh & Sonnek (2003) | Community | 46 | 25 | -- | 28 | G | 4 | CBT | None | Yes | No |
| Macpherson (1986) | Inmates | 42 | 0 | -- | -- | I | 8 | Multicomp. | Wait | No | No |

Table 1 (continued)

*Description of Individual Studies Included in Meta-Analysis of Anger Treatment Effectiveness in Adults*

| Study | Participants | N | % Female | % Cauc. | Age | Modality | Ses. # | Treatment | Control | Public. | F-up |
|---|---|---|---|---|---|---|---|---|---|---|---|
| McCloskey et al. (2008) | Psych. outp | 41 | 33 | 73 | 37 | M | 12 | CBT | NoTx | Yes | No |
| McLoughlin (2000) | Subst. abus. | 30 | 0 | 20 | 68 | G | 12 | CBT | Wait | No | Yes |
| Medd & Tate (2000) | Medical pts. | 16 | 13 | -- | 35 | G | 7 | Multicomp. | Wait | Yes | No |
| Moon & Eisler (1983) | Students | 40 | 0 | -- | -- | G | 5 | SD, PS, SS | Min.att | Yes | No |
| Mooney (1990) | Medical pts. | 38 | 0 | -- | 30 | I | 6 | Multicomp. | NoTx | No | No |
| Napolitano (1991) | Inmates | 40 | 0 | 47 | 37 | G | 12 | Multicomp. | Wait | No | No |
| Pake (2005) | Community | 45 | 0 | 13 | 42 | G | 10 | AM | None | No | No |
| Rokach (1987) | Inmates | 95 | 0 | -- | -- | G | 16 | CBT | NoTx | Yes | No |
| Rose et al. (2005) | People w. IDs | 86 | 17 | -- | 37 | G | 16 | CBT | TAU | Yes | No |
| Saavedra (2007) | Subst. abus. | 26 | 33 | 0 | 46 | G | 8 | ACT | Wait | No | No |
| Shocket (1985) | Drivers | 24 | -- | -- | -- | G | 2 | SD, Humor | NoTx | No | No |
| Skidmore (1989) | Caregivers | 18 | 78 | 79 | 33 | G | 8 | Multicomp. | Wait | No | Yes |
| Smith & Beckner (1993) | Inmates | 18 | 0 | 44 | 35 | G | 3 | CBT | None | Yes | No |
| Smith et al. (1994) | Inmates | 11 | 100 | 64 | 35 | G | 3 | CBT | None | Yes | No |
| Stillman (2005) | Medical pts. | 46 | 96 | -- | 50 | G | 4 | CBT | Wait | No | No |
| Taylor et al. (2005) | People w. IDs | 36 | 0 | -- | 30 | I | 18 | Multicomp. | Wait | Yes | Yes |
| Taylor et al. (2002) | People w. IDs | 19 | 0 | -- | 29 | I | 18 | Multicomp. | TAU | Yes | No |
| Taylor et al. (2004) | People w. IDs | 17 | 0 | -- | 29 | I | 18 | Multicomp. | TAU | Yes | No |
| Terracciano (2000) | Community | 26 | 0 | 89 | 41 | G | 12 | Exp., SI | Wait | No | No |
| Thomas (2003) | Veterans | 16 | 0 | 50 | 52 | G | 10 | CBT | None | No | No |
| Thurman (1985) | Community | 34 | 23 | -- | 47 | G | 8 | CBT, SS | NoTx | Yes | Yes |
| Timmons (1997) | Veterans | 48 | 0 | -- | -- | M | 6 | Multicomp. | Wait | Yes | No |

Table 1 (continued)

*Description of Individual Studies Included in Meta-Analysis of Anger Treatment Effectiveness in Adults*

| Study | Participants | N | % Female | % Cauc. | Age | Modality | Ses. # | Treatment | Control | Public. | F-up |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Vannoy (2005) | Inmates | 52 | 50 | 81 | 35 | G | 10 | CBT, Meditat. | NoTx | No | Yes |
| Walley (2002) | Students | 38 | 82 | -- | 24 | I | 6 | Exp. | NoTx | No | Yes |
| Watt & Howells (1998) | Inmates | 57 | 0 | -- | 27 | G | 10 | CBT | NoTx, Wait | Yes | No |
| Webb (1993) | Caregivers | 43 | 100 | 0 | 34 | I | 8 | Relax | NoTx | No | No |
| Webb et al. (2006) | Medical pts. | 33 | 100 | 0 | 44 | G | 6 | CR, Relax | Wait | Yes | No |
| Whiteman et al. (1987) | Caregivers | 94 | 91 | 22 | 33 | I | 6 | CBT, CR, PS, Relax | TAU, NoTx | Yes | No |
| Willner et al. (2002) | People w. IDs | 14 | 36 | -- | 31 | G | 9 | Multicomp. | Wait | Yes | No |
| Wilson (2001) | Students | 27 | 100 | 56 | 22 | G | 8 | CBT | Wait | No | No |
| Wlazelek (1990) | Caregivers | 40 | 100 | -- | 39 | G | 8 | Multicomp., Relax | Wait | Yes | No |
| Workman (1994) | Students | 32 | 61 | 56 | 32 | G | 8 | Relax | NoTx | No | No |

*Note.* **Participants**: Medical pts = Medical patients, People w. IDs = People with Intellectual Disabilities, Psych. outp. = Psychiatric out-patients, Subst. abus. = Substance abusers; **N =** number of participants in treatment and control groups combined; **% Female =** % of women in treatment and control groups; **% Cauc. =** % of Caucasians in treatment and control groups ; **Age**: average age of treatment and control groups combined; **Modality:** G = group, I = individual, M = mixed group and individual; **Ses. # =** number of sessions; **Treatment:** AM = anger management, no description of treatment provided, CBT = any treatment combining cognitive and behavioral techniques, not otherwise specified, CR = cognitive restructuring, Ed. = education, Exp. = exposure therapy, Forgive = Forgiveness training, Meditat. = meditation, Multicomp. = multicomponent treatment developed by Novaco, PS = problem solving, Relax = relaxation, SD = systematic desensitization, SI = self-instruction training, SS = social skills training; **Control** (group types): Min.att. = minimum attention, NoTx = no treatment expected, TAU = treatment as usual, Wait = wait list; **Public.** = Was the study published?; **F-up** = Were the results tested at follow-up?

As summarized in Table 1, 59 studies (80%) reported results of group anger treatment, 13 studies (17%) reported results on individual anger treatment, and two studies (3%) reported results of mixed (combined group and individual) treatment. The treatment was predominantly focused on various components of CBT combined (37 studies) or on the multicomponent anger treatment model developed by Novaco (19 studies), which also combines multiple CBT techniques, but was coded and presented separately because of its unique nature. Some studies focused on just one CBT component. These were: Relaxation (9 studies), exposure (6 studies), cognitive restructuring (5 studies), social skills (5 studies), systematic desensitization (5 studies), problem solving (2 studies), self-instruction training (2 studies), and education (1 study). Six studies used techniques other than CBT: Two studies tested the effects of meditation, one tested the effects of forgiveness, one tested the use of humor, one tested the effects of the acceptance and commitment therapy (ACT), and one tested the effects of the process group (Yalom's model) on anger levels. Finally, two studies did not provide a description of the treatment but defined it generically as "anger management."

There were four types of control groups: No treatment expected (29 studies), wait list (20 studies), treatment as usual (9 studies), and attention (2 studies). Fifteen studies did not have control groups built into their design (the single group pretest-posttest studies).

Fifty-one studies (69%) included in this meta-analysis were published and 23 (31%) were not published. There were 22 unpublished doctoral dissertations and one conference presentation among the unpublished studies.

Twenty-eight studies (38%) reported follow-up results. The length of the follow-up period ranged from 3 to 65 weeks after the treatment completion. Sixteen studies reported a 3-10 weeks follow-up; 22 studies reported an 11-20 weeks follow-up; 1 study reported a 26 weeks

follow-up; no studies reported a 31-50 weeks follow-up; 4 studies reported a 51-60 weeks follow-up, and 3 studies reported a 61-65 weeks follow-up. It should be noted that some studies reported results of more than one follow-up, thus the number of follow-up results differs from the cumulative number of studies reporting them.

As summarized in Table 3, fifty-nine studies utilized control groups and 15 utilized single-group, pretest-posttest designs (SGPPs). Of the studies that utilized control groups, 47 were randomized control trials (RCTs), 11 were nonequivalent control group studies (NCGs), and one was a mixed design (randomized/nonequivalent group) study.

**Retrieval Bias Assessment**

The threat of retrieval bias was addressed in this study through: (1) attempts to identify and include as many as possible unpublished reports, such as unpublished doctoral dissertations and conference presentations, (2) funnel plot analysis, and (3) application of Rosenthal's *File-Safe N* statistics.

Fifty one studies (69%) included in this meta-analysis were published and 23 (31%) were not published. The proportion of unpublished studies included in this synthesis is comparable to other meta-analyses of anger treatments with adults. DiGiuseppe and Tafrate's (2003) meta-analysis included 33% unpublished studies, Beck and Fernandez' (1998) meta-analysis included 30% unpublished studies, Del Veccio and O'Leary's (2004) meta-analysis included 26% unpublished studies, and Edmondson and Conger (1996) included only published studies in their meta-analysis.

Second, the funnel plot of standard error by Hedges' *g* (see Appendix C) shows a quite symmetrical distribution of the included studies. There is a relatively small asymmetry to the bottom left of the mean standard error, where the small effect size studies would have been, had

they been located. This funnel plot is typical of relatively unbiased studies inclusion, with studies reporting both large and small effect sizes well represented in this meta-analysis.

Finally, estimation of the potential literature retrieval bias with the *File-Safe N* revealed that it would take 4,602 missing studies to bring the significance level of the overall mean effect size below 0.05 (see Appendix C for details). Based on the literature search and a number of retrieved studies, it is clear that the number of missing studies cannot be that large. Thus, this meta-analysis is presumed to be relatively free of the retrieval bias.

## Hypotheses Testing Results

### Hypothesis 1

The study design was expected to be related to the magnitude of effect sizes. More specifically, it was expected that the pretest-posttest single group design studies would yield larger effect sizes than the between-group designs (experimental or quasi-experimental).

Table 2
*Mean Effect Sizes and Heterogeneity Analysis for Anger Treatment Effects by Study Design (Mixed Effects Subgroup Analysis)*

| | | | 95% CI | | | Within-Group Heterogeneity | | |
|---|---|---|---|---|---|---|---|---|
| Design | *k* | ***Hedges' g*** | LL | UL | *P* (2-Tail) | *Q* | *P* | *I-squared* |
| RCT | 46 | **0.591** | 0.459 | 0.722 | 0.000 | 69.305 | 0.011 | 35.070 |
| NCG | 12 | **0.574** | 0.289 | 0.860 | 0.000 | 36.051 | 0.000 | 69.488 |
| SGPP | 15 | **0.613** | 0.403 | 0.823 | 0.000 | 44.316 | 0.000 | 68.409 |
| | $Q_{between}$ = 0.052, df($Q$) = 2, $p$ = 0.974 | | | | | | | |

*Note.* [1] *k* = number of studies; [2] A study of mixed design (Vannoy, 2005) was excluded from this analysis.

The results did not support Hypothesis 1. The effect sizes were $g$ = 0.613 for pretest-posttest single group studies, $g$ = 0.591 for randomized control trials, and $g$ = 0.574 for nonequivalent control group studies. The differences among these effect sizes were not

significant ($Q_{between}$ = 0.052, $P$ = 0.974) (Table 2). Therefore, the studies using different designs were combined in one meta-analysis and all subsequent computations were done using all 74 studies.

**Hypothesis 2**

Psychosocial interventions for anger-related problems were predicted to be more effective than no treatment. More specifically, effect sizes in the moderate-to-large range of $g$ = 0.60 to 0.90 were expected based on the results of previously conducted meta-analyses of anger management treatment outcomes.

In this study, the overall mean effect size using a random effects model, combining post-treatment and follow-up results, is $g$ = 0.584, 95% CI [0.480, 0.687] (see Table 3). The mean effect size at posttest is $g$ = 0.576, 95% CI [0.475, 0.677] and at follow-up it increases to $g$ = 0.727, 95% CI [0.526, 0.928]. The results support the hypothesis that anger treatment is more effective than no treatment. The overall mean effect size is in the moderate range and indicates that about 72% of participants receiving anger management treatment fare better than the participants not receiving treatment. Although the overall mean effect size of the current meta-analysis is slightly below the effect sizes reported in previous meta-analyses of anger treatment, it is within similar range of statistical and clinical significance.

**Hypothesis 3**

The variance of effect sizes was expected to be heterogeneous across studies that included participants representing different groups treated with anger reducing interventions and the group membership was expected to moderate the magnitude of the anger treatment effect sizes.

The results were significantly heterogeneous at posttest ($Q$ = 148.732, $P$ = 0.00,

Table 3

*Summary of Studies Included in Meta-Analysis of Anger Treatment Effectiveness in Adults (Random Effect Analysis, Posttest and Follow-up Data Combined)*

| Study | Outcome measured by | Design | *n* | Hedges' *g* | 95% CI LL | 95% CI U L |
|---|---|---|---|---|---|---|
| Acton & During (1992) | STAS | SGPP | 29 | 0.933 | 0.505 | 1.360 |
| Alvarez (1997) | STAXI | RCT | 53 | 0.083 | -0.450 | 0.616 |
| Bennett et al. (1991) | AX | RCT | 29 | -0.132 | -0.847 | 0.583 |
| Briscoe (2001) | STAXI-2, AL | NCG | 27 | 0.399 | -0.351 | 1.148 |
| Cary & Dua (1999) | STAXI | RCT | 27 | 0.158 | -0.730 | 1.047 |
| Chan et al. (2003) | STAXI | NCG | 78 | 0.602 | 0.149 | 1.054 |
| Chetomb et al. (1997) | STAS, AX, NAS | RCT | 15 | 0.674 | -0.330 | 1.678 |
| Coon et al. (2003) | STAXI | RCT | 85 | 1.585 | 1.101 | 2.070 |
| Dahlen & Deffenbacher (2000) | TAS, NAS, ASR, AX, AL | RCT | 86 | 0.630 | 0.095 | 1.164 |
| Deffenbacher et al. (2000a) | TAS, AI, ASR, AL | RCT | 69 | 0.903 | 0.389 | 1.417 |
| Deffenbacher et al. (2002) | TAS, DAS, DAX, DAL | RCT | 55 | 0.742 | 0.091 | 1.394 |
| Deffenbacher et al. (2000b) | TAS, AL, STAXI | RCT | 57 | 0.276 | -0.345 | 0.898 |
| Deffenbacher et al. (1990a) | TAS, AX, AL | RCT | 29 | 0.492 | -0.230 | 1.213 |
| Deffenbacher et al. (1990b) | TAS, AX, AL | RCT | 48 | 0.669 | -0.026 | 1.363 |
| Deffenbacher et al. (1996) | TAS, AX, AL, AI | RCT | 78 | 0.772 | 0.211 | 1.334 |
| Deffenbacher & Stark (1992) | TAS, SAS, AX, AL, AI | RCT | 55 | 1.279 | 0.565 | 1.993 |
| Deffenbacher et al. (1987) | STAS, AI, AX, AL | RCT | 49 | 0.870 | 0.152 | 1.587 |

Table 3 continuation

*Summary of Studies Included in Meta-Analysis of Anger Treatment Effectiveness in Adults (Random Effect Analysis, Posttest and Follow-up Data Combined)*

| Study | Outcome measured by | Design | *n* | Hedges' *g* | 95% CI LL | 95% CI U L |
|---|---|---|---|---|---|---|
| Deffenbacher et al. (1994) | TAS, AR, AI, AL, AX | RCT | 180 | 0.693 | 0.258 | 1.129 |
| Dua & Swinden (1992) | STAS, AI | RCT | 29 | 0.382 | -0.601 | 1.364 |
| Dyer (2000) | NAS | SGPP | 23 | 1.547 | 0.884 | 2.211 |
| Eamon et al. (2001) | NAS | NCG | 33 | 0.494 | -0.194 | 1.182 |
| Eastridge (1983) | AI, AL | RCT | 48 | 1.042 | 0.208 | 1.876 |
| Gaertner (1983) | AI | RCT | 36 | 0.223 | -0.148 | 1.703 |
| Galovski et al. (2006) | DAS, AL, STAXI | SGPP | 27 | 0.282 | -0.096 | 0.660 |
| Gerlock (1994) | STAS | SGPP | 38 | 0.653 | 0.308 | 0.999 |
| Gerzina & Drummond (2000) | TAS, AX, AL | RCT | 24 | 0.836 | 0.033 | 1.638 |
| Gorenstein et al. (2007) | ASR | SGPP | 34 | 0.656 | 0.283 | 1.029 |
| Grodnitzky & Tafrate (2000) | STAXI, ASR | SGPP | 6 | 0.822 | -0.096 | 1.739 |
| Haaga et al. (1994) | AX, AR | RCT | 32 | 0.382 | -0.311 | 1.074 |
| Hagiliassis et al. (2005) | NAS | RCT | 29 | 0.841 | 0.100 | 1.581 |
| Hazaleus & Deffenbacher (1986) | STAS, AI, AR | RCT | 61 | 0.701 | 0.070 | 1.331 |
| Hiebert & Malcolm (1988) | AR | SGPP | 10 | 0.668 | 0.006 | 1.330 |
| Howells et al. (2005) | STAXI, NAS | NCG | 260 | -0.104 | -0.395 | 0.188 |

Table 3 continuation

*Summary of Studies Included in Meta-Analysis of Anger Treatment Effectiveness in Adults (Random Effect Analysis, Posttest and Follow-up Data Combined)*

| Study | Outcome measured by | Design | *n* | Hedges' *g* | 95% CI LL | 95% CI U L |
|---|---|---|---|---|---|---|
| Hughes (1996) | AI, AR | SGPP | 25 | 0.782 | 0.348 | 1.216 |
| Ireland (2004) | AMA | NCG | 87 | 0.545 | 0.116 | 0.974 |
| Johansen (2005) | STAXI-2 | SGPP | 23 | 0.150 | -0.247 | 0.547 |
| King et al. (1999) | AI | SGPP | 11 | 1.162 | 0.422 | 1.902 |
| Keyes & Dean (1988) | AI | NCG | 100 | 0.905 | 0.499 | 1.352 |
| Larkin & Zayfert (1996) | AR | NCG | 22 | 0.584 | -0.257 | 1.425 |
| Lin et al. (2004) | STAS | RCT | 14 | 1.332 | 0.218 | 2.446 |
| Linkh & Sonnek (2003) | STAXI | SGPP | 46 | 0.537 | 0.231 | 0.843 |
| Macpherson (1986) | AR | RCT | 42 | 0.172 | -0.647 | 0.992 |
| McCloskey et al. (2008) | STAXI-2 | RCT | 41 | 1.016 | 0.230 | 1.803 |
| McLoughlin (2000) | STAXI | RCT | 30 | 1.503 | 0.681 | 2.326 |
| Medd & Tate (2000) | STAXI | RCT | 16 | 0.340 | -0.599 | 1.280 |
| Moon & Eisler (1983) | AI, AR | RCT | 40 | 1.192 | 0.251 | 2.133 |
| Mooney (1990) | STAS | RCT | 38 | 0.136 | -0.502 | 0.773 |
| Napolitano (1991) | NPI, OPSAM | RCT | 40 | 0.469 | -0.171 | 1.109 |
| Pake (2005) | STAXI - 2 | SGPP | 45 | 0.138 | -0.151 | 0.428 |

Table 3 continuation

*Summary of Studies Included in Meta-Analysis of Anger Treatment Effectiveness in Adults (Random Effect Analysis, Posttest and Follow-up Data Combined)*

| Study | Outcome measured by | Design | *n* | Hedges' *g* | 95% CI LL | 95% CI U L |
|---|---|---|---|---|---|---|
| Rokach (1987) | NAS | NCG | 95 | 0.295 | -0.107 | 0.697 |
| Rose et al. (2005) | AI | NCG | 86 | 0.738 | 0.299 | 1.177 |
| Saavedra (2007) | STAXI – 2 | RCT | 26 | 0.299 | -0.459 | 1.057 |
| Shocket (1985) | AR | RCT | 24 | 0.495 | -0.449 | 1.439 |
| Skidmore (1989) | STPI- Anger scales | RCT | 18 | -0.345 | -1.312 | 0.632 |
| Smith & Beckner (1993) | NAS | SGPP | 18 | 0.824 | 0.307 | 1.341 |
| Smith et al. (1994) | NAS | SGPP | 11 | 1.222 | 0.475 | 1.969 |
| Stillman (2005) | STAXI – 2 | RCT | 46 | -0.379 | -0.955 | 0.197 |
| Taylor et al. (2005) | NAS | RCT | 36 | 0.319 | -0.329 | 0.967 |
| Taylor et al. (2002) | NPI | NCG | 19 | 2.087 | 1.000 | 3.173 |
| Taylor et al. (2004) | NPI | NCG | 17 | 1.573 | 0.503 | 2.643 |
| Terracciano (2000) | STAXI | RCT | 26 | 1.456 | 0.450 | 2.462 |
| Thomas (2003) | STAXI – 2 | SGPP | 16 | -0.177 | -0.652 | 0.298 |
| Thurman (1985) | STAS | RCT | 34 | 0.266 | -0.542 | 1.075 |
| Timmons (1997) | STAXI | RCT | 48 | 0.292 | -0.391 | 0.974 |
| Vannoy (2005) | STAXI – 2 | Mixed RTC/NCG | 52 | 0.168 | -0.488 | 0.824 |
| Walley (2002) | STAXI | RCT | 38 | 0.439 | -0.198 | 1.076 |

Table 3 continuation

*Summary of Studies Included in Meta-Analysis of Anger Treatment Effectiveness in Adults (Random Effect Analysis, Posttest and Follow-up Data Combined)*

| Study | Outcome measured by | Design | *n* | Hedges' *g* | 95% CI LL | 95% CI U L |
|---|---|---|---|---|---|---|
| Watt & Howells (1998) | NAS, STAXI | NCG | 57 | -0.068 | -0.918 | 0.782 |
| Webb (1993) | STAXI | RCT | 43 | 0.547 | -0.052 | 1.147 |
| Webb et al. (2006) | STAXI – 2 | RCT | 33 | 0.422 | -0.407 | 0.998 |
| Whiteman et al. (1987) | NPI modified | RCT | 94 | 0.794 | -0.119 | 1.706 |
| Willner et al. (2002) | AI, NPI | RCT | 14 | 1.072 | 0.012 | 2.133 |
| Wilson (2001) | STAXI | RCT | 27 | 0.515 | -0.232 | 1.261 |
| Wlazelek (1990) | STAXI, NPI | RCT | 40 | 0.509 | -0.233 | 1.252 |
| Workman (1994) | STAXI | RCT | 32 | 0.319 | -0.376 | 1.014 |
| | | **Total:** | **3,259** | **0.584** | **0.480** | **0.687** |

*Note*. **Instruments**: AI = Anger Inventory, AL = Anger Log, AMA = Anger Management Assessment Questionnaire, AR = Anger Rating, ASR = Anger Situation Rating, DAL = Driving Anger Log, DAS = Driving Anger Scale, DAX = Driving Anger Expression, NPI = Novaco Provocation Inventory, OPSAM = Orlinapi Prison Situational Anger Measure, STAXI = State Trait Anger Expression Inventory, STAS = State Trait Anger Scale, STPI = State Trait Personality Inventory, TAS = Trait Anger Scale. **Design**: NCG = Nonequivalent Control Group, SGPP = Single-Group Pretest-Posttest, RCT = Randomized Controlled Trial.

*I-squared* = 50.918), at follow-up (*Q* = 59.814, *P* = 0.000, *I-squared* = 54.860), and when posttest and follow-up results were combined (*Q* = 153.583, *P* = 0.000, *I-squared* = 52.469). These significant *Qs* suggested that the obtained mean effect sizes did not represent the true effects of anger treatment and that there was a significant dispersion of the results. Moreover, approximately 50-55% of the observed variability of results, as indicated by *I-squared* values, were due to real variation of the effect sizes in the population. These results called for a moderator analysis (Borenstein, Hedges, Higgins, & Rothstein, 2009; Cooper, Hedges, & Valentine, 2009; Del Vecchio & O'Leary, 2004). All moderator analyses in the current study were conducted using posttest data and not the follow-up data.

**Hypothesis 3a.** The population from which the participants were recruited (population treated with interventions aimed to increase anger management) was expected to moderate the magnitude of the anger treatment effect sizes.

Ten such populations were identified in existing studies (see Table 4). The results of grouping by population treated with interventions aimed to increase anger management indicated that the treatment effects differed as a function of subgroup membership ($Q_{between}$= 24.496, df(*Q*) = 9, *P* = 0.004). Six out of ten subgroup results were homogeneous (within-group *Q*s of these categories were not significant, see Table 4), which suggests that the effect sizes described their grouping adequately. These findings, however, should be taken with caution considering the small number of studies in some categories: Fewer than 5 studies with drivers, psychiatric outpatients, and veterans were included in this analysis. Moreover, four categories were heterogeneous (caregivers, inmates, substance abusers, and veterans), which suggests that the mean effect sizes of these categories do not describe adequately the true effect of anger treatment in corresponding populations and that factors other than the subgroup membership might affect

Table 4

*Mean Effect Sizes and Heterogeneity for Various Treated Populations (Mixed Effects Subgroup Analysis at Posttest)*

| | | | 95% CI | | | Within-Group Heterogeneity | | |
|---|---|---|---|---|---|---|---|---|
| Population | *k* | **Hedges' *g*** | LL | UL | *P* (2-Tail) | *Q* | *P* | *I-squared* |
| Caregivers | 8 | **0.747** | 0.391 | 1.102 | 0.000 | 18.645 | 0.009 | 62.456 |
| Community Sample | 9 | **0.475** | 0.243 | 0.707 | 0.000 | 15.025 | 0.059 | 46.755 |
| Drivers | 4 | **0.350** | 0.074 | 0.626 | 0.013 | 1.789 | 0.617 | 0.000 |
| Inmates | 12 | **0.447** | 0.203 | 0.690 | 0.000 | 25.432 | 0.008 | 56.748 |
| Medical Patients | 6 | **0.125** | -0.170 | 0.420 | 0.407 | 4.837 | 0.436 | 0.000 |
| People with IDs | 8 | **0.863** | 0.546 | 1.180 | 0.000 | 10.533 | 0.160 | 33.544 |
| Psychiatric Outpatients | 3 | **0.969** | 0.607 | 1.330 | 0.000 | 2.457 | 0.293 | 18.593 |
| Students | 15 | **0.682** | 0.518 | 0.845 | 0.000 | 8.965 | 0.833 | 0.000 |
| Substance Abusers | 5 | **0.636** | 0.093 | 1.180 | 0.022 | 10.226 | 0.037 | 60.883 |
| Veterans | 4 | **0.332** | -0.132 | 0.797 | 0.161 | 8.084 | 0.044 | 62.891 |

$Q_{between}$ = 24.496, df($Q$) = 9, $P$ = 0.004

*Note*. $k$ = number of studies

treatment results. The additional analyses section of this chapter (see below) describes attempts to identify some of these factors in inmates and caregivers. These categories included 12 and 8 studies respectively, a number of studies which suggested that more detailed analyses of these categories were feasible.

The findings of the subgroup differences seem to be particularly robust when it comes to community samples, medical patients, people with intellectual disabilities, and students. The results are homogeneous in each of these subgroups and there are more than five studies in each subgroup. In practical terms, findings of this moderator analysis suggest that anger treatment effect sizes are large in people with intellectual disabilities and psychiatric outpatients; medium-large in caregivers, students, and substance abusers; medium in community samples and inmates; and small in medical patients, drivers, and veterans (benchmarks proposed by Cohen, 1988, and empirically supported by Lipsey, 1990).

**Hypothesis 3b.** The participants' cognitive level was expected to moderate the magnitude of the anger treatment effect sizes. It was expected that anger treatments would be associated with larger effect sizes in participants with higher cognitive abilities, such as students, as compared with participants with lower cognitive abilities such as people with intellectual disabilities. This was because of the demands of CBT (predominant orientation of the tested anger management treatments), which involves meta-cognition and learning processes that were presumed to exceed the level of people with disabilities.

Few individual studies included in this meta-analysis reported the intelligence quotients of their participants. Therefore, to approximate the relationship between the participants' cognitive level and anger treatment results, the effect sizes of treatment with students and people with intellectual disabilities were compared. People with intellectual disabilities, who were

diagnosed with borderline intelligence or mental retardation, were presumed to represent lower cognitive levels, while students were presumed to represent higher cognitive levels.

Table 5
*Mean Effect Sizes and Heterogeneity Analysis of Anger Treatment : Students versus People with Intellectual Disabilities Comparison (Mixed Effects Subgroup Analysis)*

| | | | 95% CI | | | Within-Group Heterogeneity | | |
|---|---|---|---|---|---|---|---|---|
| Population Treated | *k* | ***Hedges' g*** | LL | UL | *P* (2-Tail) | *Q* | *P* | *I-squared* |
| People with IDs | 8 | **0.863** | 0.546 | 1.180 | 0.000 | 10.533 | 0.160 | 33.544 |
| Students | 15 | **0.682** | 0.518 | 0.845 | 0.000 | 8.965 | 0.833 | 0.000 |
| | $Q_{between}$ = 0.988, df($Q$) = 1, $p$ = 0.320 | | | | | | | |

*Note.*[1] *k* = number of studies, [2] People with IDs = People with intellectual disabilities.

Contrary to the expectations, however, people with intellectual disabilities in this meta-analysis were as responsive to anger treatment as students were, as indicated by $g$ = 0.863 in people with intellectual disabilities and $g$ = 0.682 in students ($Q_{between}$= 0.988, $P$ = 0.320) (see Table 5). Both subgroups are homogeneous, but the confidence interval of anger treatment results with people who are diagnosed with intellectual disabilities is much wider (the results are more variable) than the confidence interval of anger treatment results in students (see Table 5) and these confidence intervals largely overlap. This distribution of scores indicates that they come from the same population of treatment effects.

**Hypothesis 3c.** The participants' gender was expected to moderate the magnitude of the anger treatment effect sizes. Based on previous data indicating larger anger treatment effect sizes in groups of children with larger proportion of girls than boys (Sukhodolsky, Kassinove, & Gorman, 2004) and Edmondson and Conger's (1996) call to examine the impact of gender on anger management treatment, gender was tested as a potential moderator variable.

To test this hypothesis, anger treatment results reported for men and women separately

were compared using subgroup analysis. Twenty four studies reported anger treatment with exclusively male participants, nine studies reported anger treatment with exclusively female participants, and two studies included both genders, but reported separate results for male and female participants. For this analysis, a subgroup (gender) was treated as the unit of analysis, rather than the study as is usually done. Using gender as the unit of analysis resulted in 37 independent effect sizes (Table 6). The mean effect size was $g = 0.824$ for female participants and $g = 0.451$ for male participants. The difference was statistically significant as indicated by $Q_{between} = 5.152$ and $P = 0.023$ and showed that gender moderated anger treatment effect sizes: Being female was associated with significantly larger effect sizes than being male.

Table 6
*Mean Effect Sizes and Heterogeneity Analysis of Anger Treatment by Gender (Mixed Effects Subgroup Analysis)*

| | | | 95% CI | | | Within-Group Heterogeneity | | |
|---|---|---|---|---|---|---|---|---|
| Gender | *k* | ***Hedges' g*** | LL | UL | *P* (2-Tail) | *Q* | *P* | *I-squared* |
| Female | 11 | **0.824** | 0.559 | 1.088 | 0.000 | 16.425 | 0.088 | 39.117 |
| Male | 26 | **0.451** | 0.267 | 0.635 | 0.000 | 64.241 | 0.000 | 61.084 |
| | $Q_{between} = 5.152$, df($Q$) = 1, $p = 0.023$ | | | | | | | |

*Note.* $k$ = number of male and female subgroups.

It should be noted, however, that while the above-described results for women are homogeneous, as indicated by the $Q_{within} = 16.425$, $P = 0.088$, the results for men are heterogeneous, as indicated by the $Q_{within} = 64.241$, $P = 0.000$ (Table 6). This indicates that additional factors moderate the efficacy of anger treatment in men. A search for such moderators will be described in the Post-Hoc Analyses section of this chapter (see below).

**Hypothesis 3d.** The severity of the participants' pre-treatment anger levels was expected to moderate the magnitude of the anger treatment effect sizes.

In this study, anger severity level was operationalized as a categorical variable, with three levels defined by the anger testing results and the reported manifestation of anger in the participant's lives. The participants' pre-testing anger level was classified as severe when the participants' demonstrated high anger testing results and reported serious consequences of their angry behavior, such as arrests, domestic violence, child abuse, etc. The anger levels were classified as moderate if the reported vocational, domestic, driving, health, and other anger-related issues have not resulted in an arrest and were not paired with high-anger testing results. Low severity of anger was operationalized as self-reported anger that has not resulted in the above-mentioned problems and was not paired with high-anger testing results (see Chapter II for a more detailed discussion of the anger level operationalization).

Table 7
*Mean Effect Sizes and Heterogeneity Analysis of Anger Treatment Effects by Subjects' Pre-treatment Anger Level (Mixed Effects Subgroup Analysis)*

| | | | 95% CI | | | Within-Group Heterogeneity | | |
|---|---|---|---|---|---|---|---|---|
| Anger Level | *k* | ***Hedges' g*** | LL | UL | *P* (2-Tail) | *Q* | *P* | *I-squared* |
| Severe | 45 | **0.574** | 0.452 | 0.696 | 0.000 | 77.074 | 0.002 | 42.912 |
| Medium | 16 | **0.724** | 0.487 | 0.962 | 0.000 | 32.015 | 0.006 | 53.147 |
| Low | 6 | **0.628** | 0.362 | 0.895 | 0.000 | 3.963 | 0.555 | 0.009 |
| | $Q_{between}$ = 1.237, df($Q$) = 2, $P$ = 0.539 | | | | | | | |

*Note.*[1] *k* = number of studies. [2]Seven studies did not provide enough data to assess anger level.

The study results indicated that overall treatment effects did not depend on the pre-treatment levels of the subjects' anger as indicated by $g$ = 0.574 for subjects with severe pre-treatment anger level, $g$ = 0.724 for subjects with moderate pre-treatment anger level, and $g$ = 0.628 for subjects with low pre-treatment anger level. The between-subgroups differences are non-significant ($Q_{between}$ = 1.237, $P$ = 0.539) (Table 7).

**Hypothesis 4**

Individual anger treatments were expected to yield greater magnitude of effect sizes than group anger treatments.

Table 8
*Mean Effect Sizes and Heterogeneity Analysis of Anger Treatment Effects by Treatment Modality (Mixed Effects Subgroup Analysis)*

| | | | 95% CI | | | Within-Group Heterogeneity | | |
|---|---|---|---|---|---|---|---|---|
| Modality | *k* | ***Hedges' g*** | LL | UL | *P* (2-Tail) | *Q* | *P* | *I-squared* |
| Individual | 13 | **0.677** | 0.414 | 0.939 | 0.000 | 18.863 | 0.092 | 36.383 |
| Group | 60 | **0.553** | 0.443 | 0.663 | 0.000 | 127.306 | 0.000 | 53.655 |
| | $Q_{between}$ =0.723, df($Q$) = 1, $p$ = 0.395 | | | | | | | |

*Note. k* = number of studies. One study (McCloskey et al., 2008) was excluded from this analysis because it combined both modalities.

The results indicated that modality of treatment (individual versus group treatment) did not affect the overall effect size of anger treatment as indicated by $g$ = 0.677 for individual treatments and $g$ = 0.553 for group treatments ($Q_{between}$= 0.723, $P$ = 0.395) (Table 8). There was a significant heterogeneity within the group treatment category as indicated by $Q_{within}$= 127.306, $P$ = 0.000. The individual treatment category was homogeneous as indicated by $Q_{within}$= 18.863, $P$ = 0.092. This suggests that group treatment results are affected by additional moderating variables. A search for these variables will be described in the Post-Hoc Analyses section of this chapter.

**Hypothesis 5**

Publication status of the reports was not expected to be associated with the magnitude of the effect sizes.

The unpublished studies included in this analysis reported a lower average effect size of anger treatment ($g$ = 0.317) then the published studies ($g$ = 0.674) and this difference was

significant ($Q_{between}$= 12.528 $P$ = 0.00) (Table 9). There was a significant heterogeneity among both published and not published studies. The effect sizes in published studies ranged from $g$ = -0.132 to $g$ = 2.087 and the effect sizes in studies which were not published ranged from $g$ = -0.379 to $g$ = 1.503.

Table 9
*Mean Effect Sizes and Heterogeneity Analysis of Anger Treatment by Publication Status (Mixed Effects Subgroup Analysis)*

| | | | 95% CI | | | Within-Group Heterogeneity | | |
|---|---|---|---|---|---|---|---|---|
| Publication Status | *k* | ***Hedges' g*** | LL | UL | *P* (2-Tail) | *Q* | *P* | *I-squared* |
| Published | 51 | **0.674** | 0.560 | 0.788 | 0.000 | 93.970 | 0.000 | 46.792 |
| Unpublished | 23 | **0.317** | 0.155 | 0.478 | 0.000 | 32.164 | 0.075 | 31.600 |
| | $Q_{between}$ =12.528, df($Q$) = 1, $p$ = 0.000 | | | | | | | |

*Note.* $k$ = number of studies

**Summary of the Hypotheses Testing Results**

This study's results indicate that there are no statistically significant differences among effect sizes yielded by individual studies of different designs, such as randomized controlled trials, non-equivalent control group studies, and single-group pretest-posttest studies. Therefore, all 74 studies with these three designs are combined in one analysis. The overall mean effect size of anger treatments, combining post-treatment and follow-up results, is $g$ = 0.584, 95% CI [0.480, 0.687]. The mean effect size at posttest is $g$ = 0.576, 95% CI [0.475, 0.677] and at follow-up it increases to $g$ = 0.727, 95% CI [0.526, 0.928]. The results confirmed that anger management treatment is more effective than no treatment.

The results are heterogeneous. The magnitude of the effect sizes is moderated by the participants' membership in a population from which they were recruited (some populations fare better when in anger treatment than the others), the participants' gender (women fare better than

men), and by the publication status of the study reporting the effect size (published studies report higher effect sizes than the studies that were not published). The magnitude of the effect sizes is not moderated by the participant's cognitive level, the participants' pre-treatment anger severity, treatment modality (individual versus group), and, as previously mentioned, study design.

The above-mentioned moderating variables do not fully explain the heterogeneity of the results. There is a considerable inconsistency in some subgroups and as the analyses were conducted, the questions arose as to the source of this within-subgroup dispersion of the results. Therefore, post-hoc analyses were conducted when feasible and the search for variables which moderate anger treatment effectiveness continued.

## Post-Hoc Analyses

Meta-analysis is an iterative process and a number of issues and question arise as the synthesis progresses. The purpose of this study was not only to determine if people who are treated with anger reducing interventions have their anger levels significantly reduced, but more importantly, to search for sources of heterogeneity in the data and to find variables which moderate anger treatment effects. As noted above, three moderator variables found by this study are: Population from which the participants were recruited (population treated), the participants' gender, and the publication status of the report. These variables significantly decrease the heterogeneity of the database, but do not explain it fully. There is still a great deal of dispersion of the individual studies' results, which called for additional analyses. For example, the grouping of studies into subgroups by population treated with interventions aiming to improve anger management shows that some subgroups are still heterogeneous. Similarly, while gender is found to moderate anger treatment results and the results for women are consistent, there is a great deal of inconsistency of the results in the male subgroup. Moreover, while individual treatments result

in a similar level of effect sizes (the results are homogeneous), group treatments show heterogeneous results. An attempt to find out what might explain this heterogeneity was undertaken after the hypotheses testing was completed. The description of this process follows.

**The Search for Additional Variables Moderating Anger Treatment Results in Inmates**

This study shows that there is a link between populations treated with anger reducing interventions and the results of this treatment (see Hypothesis 3a testing results). While six out of ten subgroups representing treated populations show homogeneous results, there is considerable heterogeneity within each of the remaining four subgroups. These subgroups are: inmates (12 studies), caregivers (8 studies), substance abusers (5 studies), and veterans (4 studies). According to Del Veccio and O'Leary (2004), "a minimum of five studies in each cell is necessary to (…) compute the *Q* statistic, a measure of variance accounted for by the analysis (p. 21)". It follows that a minimum of ten studies is necessary to test a potential moderator variable with two values, such as gender. Therefore, no additional analyses were attempted with caregivers, substance abusers, and veterans.

**Does gender moderate anger treatment results in inmates?** First, gender was tested as possible moderator within this category. This study showed that gender moderates anger treatment results across various types of participants. Will gender differences explain the heterogeneity of results in studies with inmate participants? Table 10 shows that treatment effect size with female inmates was $g = 0.827$ and treatment effect size with male inmates was $g = 0.348$. This discrepancy in effect sizes is greater than when a similar primary analysis was conducted on all studies reporting results by gender, where $g = 0.824$ for women and $g = 0.451$ for men were found (see Hypothesis 3c testing results). However, only three individual studies reported results of anger management treatment with female participants.

Table 10
*Mean Effect Sizes and Heterogeneity Analysis of Anger Treatment with Inmates by Gender (Mixed Effects Subgroup Analysis)*

| | | | 95% CI | | | Within-Group Heterogeneity | | |
|---|---|---|---|---|---|---|---|---|
| Gender | *k* | ***Hedges' g*** | LL | UL | *P* (2-Tail) | *Q* | *P* | *I-squared* |
| Female | 3 | **0.827** | 0.389 | 1.264 | 0.000 | 1.972 | 0.373 | 0.000 |
| Male | 10 | **0.348** | 0.068 | 0.629 | 0.015 | 23.678 | 0.005 | 61.990 |
| | | $Q_{between}$ = 3.252, df($Q$) = 1, $p$ = 0.071 | | | | | | |

*Note.* $k$ = number of male and female inmate subgroups.

Despite the marked difference between the effect sizes of anger treatment with female and male inmate participants, the subgroup analysis shows that this difference did not reach a level of statistical significance, as indicated by $Q_{between}$= 3.252, $P$ = 0.071. This might be because only 10 male and 3 female subgroups could be compared: Nine studies were done with exclusively male inmate participants, two with exclusively female inmate participants, and one with both genders, but this study reported separate results for male and female participants. It is possible that the gender difference in the inmates' response to anger treatment would be found significant if more studies were available with this population, particularly with female inmates, thus increasing the power of this analysis. It should be also noted that the results for the male inmate participants are heterogeneous, as indicated by $Q_{within}$ = 23.678, $P$ = 0.005. This indicates that – in male inmates – some other factors moderate the treatment results. It was hypothesized that treatment modality could be one of these factors.

**Does treatment modality moderate anger treatment results in inmates?** The possible link between treatment modality and the inmate participants' response to treatment was examined first with both genders combined. There was no significant impact of treatment modality on treatment effects among inmate participants (Table 11) and the effect sizes were

similar as indicated by $g = 0.486$ for individual and $g = 0.443$ for group treatments ($Q_{between} = 0.013$, $P = 0.909$).

Table 11
*Mean Effect Sizes and Heterogeneity Analysis for Anger Treatment Effects with Inmates by Treatment Modality (Mixed Effects Subgroup Analysis)*

| | | | 95% CI | | | Within-Group Heterogeneity | | |
|---|---|---|---|---|---|---|---|---|
| Modality | *k* | ***Hedges' g*** | LL | UL | *P* (2-Tail) | *Q* | *P* | *I-squared* |
| Individual | 2 | **0.486** | -0.186 | 1.157 | 0.157 | 1.209 | 0.272 | 17.257 |
| Group | 10 | **0.443** | 0.176 | 0.711 | 0.001 | 24.089 | 0.004 | 62.639 |
| | | $Q_{between} = 0.013$, df($Q$) = 1, $p = 0.909$ | | | | | | |

*Note.* $k$ = number of studies

Second, the treatment modality was tested as a possible moderator variable in male inmates (female inmates' results were removed from this analysis). As detailed in Table 12, individual treatments yielded a greater effect size ($g = 0.486$) than the group treatment ($g = 0.324$), but this difference was not significant ($Q_{between} = 0.182$, $P = 0.670$).

Table 12
*Mean Effect Sizes and Heterogeneity Analysis for Anger Treatment Effects with Male Inmates by Treatment Modality (Mixed Effects Subgroup Analysis)*

| | | | 95% CI | | | Within-Group Heterogeneity | | |
|---|---|---|---|---|---|---|---|---|
| Modality | *k* | ***Hedges' g*** | LL | UL | *P* (2-Tail) | *Q* | *P* | *I-squared* |
| Individual | 2 | **0.486** | -0.186 | 1.157 | 0.157 | 1.209 | 0.272 | 17.257 |
| Group | 8 | **0.324** | 0.011 | 0.638 | 0.043 | 22.149 | 0.002 | 68.396 |
| | | $Q_{between} = 0.182$, df($Q$) = 1, $p = 0.670$ | | | | | | |

*Note.* $k$ = number of studies

Overall, the attempted analyses of heterogeneous results of anger treatment in inmates did not reveal moderating variables that could explain the heterogeneity. The analyses revealed

that anger management treatment with female inmates produced larger effect sizes than anger treatment with male inmates and that individual treatment with male inmates produced larger effect sizes than the group treatment with male inmates; however, these differences were not significant.

**The Search for Additional Variables Moderating Results of Anger Treatment with Men**

When gender was tested as a moderator of anger treatment effects, a significant heterogeneity was discovered among studies reporting results of treatment with male (but not with female) participants. Treatment modality was tested as a potential moderator variable. The analysis of population from which the male participants were recruited as a potential moderator variable was also attempted.

**Does treatment modality moderate treatment effects in men?** The results detailed in Table 13 show a mean effect size of $g = 0.726$ in men treated individually and a mean effect size of $g = 0.389$ in men treated in groups. Despite this marked discrepancy in effect sizes, the difference in men's response to individual versus group anger treatment is not significant ($Q_{between} = 1.482$, $P = 0.223$).

Table 13
*Mean Effect Sizes and Heterogeneity Analysis of Anger Treatment with Men by Treatment Modality (Mixed Effects Subgroup Analysis)*

| | | | 95% CI | | | Within-Group Heterogeneity | | |
|---|---|---|---|---|---|---|---|---|
| Modality | *k* | ***Hedges's g*** | LL | UL | *P* (2-Tail) | *Q* | *P* | *I-squared* |
| Individual | 7 | **0.726** | 0.219 | 1.232 | 0.005 | 14.810 | 0.039 | 52.734 |
| Group | 19 | **0.389** | 0.194 | 0.584 | 0.000 | 41.714 | 0.000 | 61.644 |
| | | $Q_{between} = 1.482$, df($Q$) = 1, $p = 0.223$ | | | | | | |

*Note.* $k$ = number of male subgroups

**Does representing a specific population moderate treatment effects in men?** An analysis of male samples using population as a potential moderator variable was also attempted to test for a source of heterogeneity. The results cannot be considered meaningful due to very small numbers of studies in most of the categories (see Table 14). These results were not significant.

Table 14
*Mean Effect Sizes and Heterogeneity Analysis of Anger Treatment with Men by Population Treated (Mixed Effects Subgroup Analysis)*

| | | | 95% CI | | | Within-Group Heterogeneity | | |
|---|---|---|---|---|---|---|---|---|
| Population | *k* | ***Hedges's g*** | LL | UL | *P* (2-Tail) | *Q* | *P* | *I-squared* |
| Caregivers | 1 | **0.662** | -0.066 | 1.390 | 0.075 | 0.000 | 1.000 | 0.000 |
| Community | 4 | **0.322** | -0.057 | 0.702 | 0.096 | 7.267 | 0.122 | 44.959 |
| Inmates | 10 | **0.348** | 0.068 | 0.629 | 0.015 | 19.469 | 0.013 | 58.910 |
| Med. Patients | 2 | **0.169** | -0.306 | 0.643 | 0.486 | 0.023 | 0.879 | 0.000 |
| Men with IDs | 3 | **1.243** | 0.062 | 2.423 | 0.039 | 9.786 | 0.007 | 79.562 |
| Students | 1 | **1.192** | 0.251 | 2.133 | 0.013 | 0.000 | 1.000 | 0.000 |
| SA | 1 | **1.190** | 0.427 | 1.952 | 0.002 | 0.000 | 1.000 | 0.000 |
| Veterans | 4 | **0.332** | -0.132 | 0.797 | 0.161 | 8.084 | 0.044 | 62.891 |
| | | $Q_{between}$ = 10.440, df($Q$) = 6, $p$ =0.107 | | | | | | |

*Note.* $k$ = number of male subgroups, Med. Patients = medical patients, Men with IDs = men with intellectual

Overall, variables that moderate anger treatment results in men are yet to be established and they were not found here. One such variable could be treatment modality since individual treatment with men yielded larger effect sizes than group treatment with men. This discrepancy, however, was not significant.

**The Search for Additional Variables Moderating Results of Group Anger Management Treatment**

In this study individual anger treatments yielded homogeneous results while group treatments yielded heterogeneous results (see Hypothesis 4 testing results). Gender was tested as a potential moderator variable of group treatment results. There was a large and statistically significant difference between results of group anger treatment with women and men, as indicated by g = 0.854 for women and g = 0.389 for men ($Q_{between}$= 6.977, P = 0.008) (Table 15). The group treatment yielded homogeneous results for women but heterogeneous results for men. The results of this analysis show that gender is a strong moderator of group treatment results and that women fare better in anger treatment groups than do men.

Table 15
*Mean Effect Sizes and Heterogeneity Analysis of Group Treatment by Gender (Mixed Effects Subgroup Analysis)*

| | | | 95% CI | | | Within-Group Heterogeneity | | |
|---|---|---|---|---|---|---|---|---|
| Gender | *k* | ***Hedges's g*** | LL | UL | *P* (2-Tail) | *Q* | *P* | *I-squared* |
| Female | 10 | **0.854** | 0.569 | 1.139 | 0.000 | 15.171 | 0.086 | 40.675 |
| Male | 19 | **0.389** | 0.194 | 0.584 | 0.000 | 46.937 | 0.000 | 61.651 |
| | $Q_{between}$ = 6.977, df(*Q*) = 1, *p* = 0.008 | | | | | | | |

*Note. k* = number of male and female subgroups.

Only two of the studies included in this analysis (Keyes & Dean, 1988; Vannoy, 2005) reported separate results for men and women when both genders were included in the same groups. Twenty five studies included in this analysis were conducted with single-gender groups, all male or all female. For the clarity of the interpretation, Keyes and Dean's (1988) and Vannoy's (2005) studies were removed from the next analysis and the effect sizes of the all-female and all-male anger treatment groups were compared (see Table 16). There was still a

large difference of the mean subgroup effect sizes, but the difference did not reach the level of statistical significance.

Table 16
*Mean Effect Sizes and Heterogeneity Analysis of Group Treatment by Gender in Single-Gender Groups (Mixed Effects Subgroup Analysis)*

| | | | 95% CI | | | Within-Group Heterogeneity | | |
|---|---|---|---|---|---|---|---|---|
| Gender | *k* | ***Hedges's g*** | LL | UL | *P* (2-Tail) | *Q* | *P* | *I-squared* |
| Female | 8 | **0.811** | 0.443 | 1.180 | 0.000 | 14.932 | 0.036 | 40.675 |
| Male | 17 | **0.408** | 0.210 | 0.607 | 0.000 | 42.052 | 0.000 | 61.952 |
| | $Q_{between}$ = 3.563, df($Q$) = 1, $p$ = 0.059 | | | | | | | |

*Note.* $k$ = number of studies all-male and all-female groups.

**Summary of the Post-Hock Analyses**

The post-hoc analyses were conducted in an attempt to further explain heterogeneity of the anger treatment results. Therefore, the subgroups of studies that had been found heterogeneous (after the primary moderator variables were put into operation) were tested with potential moderator variables applied just to these heterogeneous subgroups. This was often not feasible because many of the heterogeneous subgroups consisted of few studies: As the bulk of all included studies was broken down into subgroups, the numbers of studies in the subgroups decreased rapidly.

Several additional analyses were attempted with the subgroups that seemed to have enough studies to allow such operations. However, almost all post-hoc analyses yielded non-significant results. The only exception was the result of testing the impact of gender on group anger treatments, which showed that anger treatment with female group participants yielded significantly larger effect size ($g$ = 0.854) than anger treatment with male group participants ($g$ = 0.389), This result was statistically significant, as indicated by $Q_{between}$ = 6.977, $P$ = 0.008.

Two other interesting findings, which were not significant, but showed a trend worth further investigation, were: Larger effect sizes of anger treatment with female inmates (g = 0.827) than male inmates (g = 0.348), and larger effect sizes of individual anger treatment (g = 0.726) than group anger treatment (g = 0.389) in men. Despite the apparent differences of the mean effect sizes in the above-mentioned post-hoc analyses, the results were not statistically significant. This might be due to low power of these analyses.

## Summary of the Results

This study was undertaken to determine the effectiveness of anger management treatments and find variables that moderate their efficacy across a range of populations. Since there was practically no difference in effect sizes yielded by studies of different designs (randomized controlled trials, nonequivalent control group studies, and single group pretest-posttest studies), the results of all 74 included studies were combined in one meta-analysis. This meta-analysis, using a random effects model and combining post-treatment and follow-up results, yielded an overall mean effect size $g$ = 0.584, 95% CI [0.480, 0.687]. The mean effect size at posttest was $g$ = 0.576, 95% CI [0.475, 0.677] and at follow-up increased to $g$ = 0.727, 95% CI [0.526, 0.928].

The results were significantly heterogeneous at posttest ($Q$ = 148.732, $P$ = 0.00, *I-squared* = 50.918), at follow-up ($Q$ = 59.814, $P$ = 0.000, *I-squared* = 54.860), and when posttest and follow-up results were combined ($Q$ = 153.583, $P$ = 0.000, *I-squared* = 52.469). This means that there was a dispersion of anger treatment results that could not be explained by sampling error and that the results were moderated by the participants' or the studies' characteristics (moderating variables). Only 38% of the included studies reported follow-up results. Therefore, all the moderator analyses were conducted using post-test results.

It is likely that a number of variables moderate anger treatment results. This study focused on testing the moderating impact of four participants' characteristics (the population from which the participants were recruited, their cognitive level, their gender, and their pre-treatment anger severity level) and three study characteristics (the study design, treatment modality, and the study publication status).

The analysis using the population from which the participants were recruited as a potential moderator variable revealed that anger treatment effect sizes are: (1) large in people with intellectual disabilities and psychiatric outpatients, (2) medium-large in caregivers, students, and substance abusers, (3) medium in community samples and inmates, and (4) small in medical patients, drivers, and veterans. There was a statistically significant dispersion of these effect sizes, which confirmed that the population from which the participants were recruited moderated anger treatment results.

The participants' gender also moderated anger treatment results. Effect sizes were significantly larger in women than in men. More detailed analysis revealed that women participating in anger treatment groups also fared significantly better than men participating in anger treatment groups. A similar trend was found in inmate population where studies with incarcerated women yielded markedly larger effect sizes than studies with incarcerated men, but this finding did not reach statistical significance at alpha = 0.05. Another gender-related finding was the discrepancy between individual and group treatments with male participants. Individual treatments yielded markedly larger effect sizes in men than group treatments, but this finding did not reach statistical significance at alpha = 0.05.

The participant's cognitive level and their pre-treatment anger severity level did not moderate treatment effects. There were no moderating effects of study design or treatment

modality (when both genders were included) either. Publication status of the studies reporting anger treatment results moderated treatment effect sizes with published studies reporting significantly larger effect sizes than the unpublished studies.

# CHAPTER IV

# DISCUSSION

The current study aimed to assess the mean magnitude of the anger management treatment effect sizes in adults as measured by their self-reported anger levels and to find variables that moderate the anger treatments. Former meta-analyses indicated that that participation in anger treatment is associated with reduction of anger symptoms. Two of the previously conducted meta-analyses (Del Vecchio & O'Leary, 2004; DiGiuseppe & Tafrate, 2003) concluded that the empirically tested anger treatment models yield similar results. Several moderating variables were detected by previous meta-analyses. DiGiuseppe and Tafrate (2003) established that dependent measures related directly to anger, such as anger frequency or intensity, yielded higher effect sizes than less directly related measures, such as self-esteem. They also found that for several dependent measures related to anger individual treatment was more effective than group treatment and that manualized treatments and fidelity checks increased treatment efficacy. Del Veccio and O'Leary (2004) found that longer treatments were more efficacious than short ones. Contrarily, Sukhodolsky et al. (1995) concluded that, in children and adolescents, treatment duration and treatment modality (individual versus group) did not affect the results of treatment in a significant manner. However, gender affected results of treatments, but only as determined by anger experience measures.

The current study aims to expand the knowledge base of factors affecting anger treatments and resolve some of the inconsistencies in findings of the previous meta-analyses. To this end, new individual studies were included thus enlarging the pool of synthesized reports. Moreover, four participants' characteristics (the population from which the participants were recruited, their cognitive level, their gender, and their pre-treatment anger severity level) and

three study characteristics (the study design, treatment modality, and the study publication status) were examined as potential moderating variables. In addition to hypotheses tested in this study, post-hock analyses were conducted to address questions or ideas that emerged once the study results were known. This chapter will first discuss each hypothesis testing results in turn, second, discuss the post-hock analyses results, and conclude with discussion of the study's limitations and the results' implications for practice, policy, and research.

## Discussion of the Results

### Comparing Pre-Post and Between-Groups Studies

Hypothesis 1 posited that studies using single-group pretest-posttest design will yield larger effect sizes than studies using between-groups design. This hypothesis was not supported by the current study results because there was no significant discrepancy in effect sizes yielded by studies of different designs, such as randomized controlled trials, nonequivalent control group studies, and single-group pretest-posttest studies. This finding is not consistent with the previously computed difference between results of studies using between-groups design and studies using a pre-post design (DiGiuseppe & Tafrate, 2003). This finding is, however, consistent with theory of an effect size as a standardized measure that allows synthesis of findings from different studies and populations (Borenstein, 2009; Borenstein, Hedges, Higgins, Rothstein, 2009).

### The magnitude of the overall effect size

Hypothesis 2 posited that the range of anger treatment effect sizes will be $g = 0.60$ to $g = 0.90$ (medium-to-large). The overall effect size yielded by the current study, combining post-treatment and follow-up results, was $g = 0.584$, 95% CI [0.480, 0.687]. At post-treatment the overall effect size was $g = 0.576$, 95% CI [0.475, 0.677], and it increased to $g = 0.727$, 95% CI

[0.526, 0.928], at follow-up. These results were slightly lower than the effect sizes reported by previous meta-analyses. For example, Edmondson and Conger (1996) reported effect sizes ranging from *d* = 0.64 to 0.82 in adults; Beck and Fernandez (1998) reported an overall effect size *d* = 0.70 for CBT treatments with adults, adolescent, and children; DiGiuseppe and Tafrate (2003) reported an overall effect size *d* = 0.71 in adults; and Del Veccio and O'Leary (2004) reported effect sizes ranging from *d* = 0.61 to 0.90.

**Conjectures about why current meta-analysis overall effect size differs from effect sizes reported by previous meta-analyses.** The difference between results of the current study and previous meta-analyses findings could be explained by several factors.

First, the difference is not a large one and it might be a result of natural variation of treatment effects in the population of studies. Second, the current study used Hedges' *g*, a statistic which is more conservative than Cohen's *d* used in previous meta-analyses to compute effect sizes. Hedges' *g* yields slightly lower effect sizes than Cohen's *d* because it accounts for small samples bias. Cohen's *d* overestimates effect sizes in small samples, such as the samples of many treatment outcome trials. In the current study a correction was applied to Cohen's *d* by multiplying it by the correction factor, *J*, which values range from zero to one (see Chapter II for details). This computation resulted in Hedges' *g*. In the current study the overall Hedges' *g* was 0.584, 95% CI [0.480, 0.687] while the corresponding Cohen's *d* was 0.598, 95% CI [0.490, 0.707].

Moreover, the current study excluded reports of treatments longer than 18 sessions while none of the previous meta-analyses excluded longer treatments. Due to inconsistent findings of the previous meta-analyses it is not clear at this time whether longer treatments indeed yield larger effect sizes than the brief ones do. One meta-analysis (Del Veccio & O'Leary, 2004),

however, concluded that longer treatments are more efficacious than short ones. Therefore, the exclusion of longer treatments might have contributed to decrease of the overall effect size of the current study.

In addition, the current study focused on anger as an emotional state and it did not include measures of constructs like aggression, which have been found to yield the largest treatment effects among anger-related constructs (DiGiuseppe & Tafrate, 2003). Incidentally, DiGiuseppe and Tafrate's effect size on anger measures equals the overall effect size that they reported ($d$ = 0.71), an effect size computed using measures of anger as well as aggression and other dependent variables that produced smaller effect sizes, e.g. self-esteem or relationships. Beck and Fernandez (1998) and Sukhodolsky, Kassinove, and Gorman (2004) also included measures of aggression to calculate overall effect size in their meta-analyses, which yielded $d$ = 0.70 and $d$ = 0.67 respectively. These researchers did not, however, report separate effect sizes for anger versus aggression treatments. Considering DiGiuseppe and Tafrate's finding that aggression measures yield larger effect sizes in adults than measures of the actual anger do, some of the previous meta-analyses might have reported larger overall effect sizes of anger treatment than the overall effect size of the current study because they included measures of aggression in their operationalization of anger as a dependent variable.

Finally, the slightly smaller mean effect size yielded by this study might be to some extent due to the inclusion of a large number of clinical samples, samples that were often associated with smaller effect sizes of anger treatment. For example, six studies with medical patients ($g$ = 0.125, 95% CI [-0.170, 0.420]) and four studies with veterans ($g$ = 0.332, 95% CI [-0.132, 0.797]) were included in this meta-analysis. Only five out of these ten studies were included in previous meta-analyses (four in DiGiuseppe & Tafrate's, 2003, and two in Del

Veccio & O'Leary's, 2004, studies).

The inclusion of different study designs in one analysis could not have contributed to the slightly lower than previously found overall effect size of the current study because there was no statistically significant difference between effect sizes yielded by different study designs. The method of the pre-post effect sizes calculation used in the current study, a method which produces a smaller effect size yielded by the pre-post studies, could not have contributed to the difference in effect sizes of the current and previous meta-analyses either. This is because most of the previous meta-analyses did not combine pre-post and between-group designs to compute the overall effect size. The publication bias also does not explain this difference. Thirty one percent of studies included in this meta-analysis were not published. Similarly, DiGiuseppe and Tafrate' (2003) meta-analysis included 33% unpublished studies, Beck and Fernandez' (1998) meta-analysis included 30% unpublished studies and Del Veccio and O'Leary's meta-analysis included 26% unpublished studies. This synthesis indicated that the published studies report significantly higher effect sizes than the unpublished studies, which illustrated the well-known publication bias phenomenon (Borenstein,Hedges, Higgins, & Rothstein, 2009; Cooper, Hedges, & Valentine, 2009; Lipsey & Wilson, 2001). Nonethelles, the results of previous meta-analyses would have been affected similarly by the publication bias since they included a comparable proportion of unpublished studies.

**Heterogeneity of the Results**

Hypothesis 3 posited that the results of this meta-analysis will be heterogeneous. The results of the current study support the hypothesis of heterogeneity as indicated by the overall $Q = 153.583$, $P = 0.000$. The significant $Q$ suggests that the obtained mean effect size does not represent true effect of anger treatment and that there is a significant dispersion of the results.

Moreover, a large proportion of the observed variability of results due to real variation of the effect sizes in the population, as indicated by *I-squared* = 52.469. This result is consistent with four of the previously conducted meta-analyses (Del Veccio & O'Leary, 2004; DiGiuseppe & Tafrate, 2003; Edmondson & Conger, 1996; Sukhodolsky et al., 1995).

**Selected Participants' Characteristics as Anger Treatment Moderators**

Hypothesis 3 also posited that the results will be heterogeneous across different participants' groups and that the group membership will moderate the treatment results. The participants' characteristics predicted to moderate results were: The population from which the participants were recruited, the participants' cognitive level, the participants' gender, and the severity of the participants' pretreatment anger levels.

**Does the population from which the participants were recruited moderate anger treatment effects?** Hypothesis 3a posited that the population from which the participants were recruited will moderate anger treatment effect sizes. Grouping of the included studies by the population from which the participants were recruited revealed significant differences between effect sizes of these subgroups, thus confirming Hypothesis 3a. The effect sizes varied from $g$ = 0.969 in psychiatric outpatient population to $g$ = 0.125 in medical patients. No previous study reported similar moderator analysis; therefore, no studies are available with which these results could be compared. Two of the subgroup effect sizes computed in the current study seem to be surprising and will be discussed next.

***Anger treatment with medical patients.*** A discovery of small treatment effect sizes in medical patients is one of the surprising results of this study. The category of medical patients in the current study included people suffering from hypertension, cardiac problems, fibromyalgia, and traumatic brain injuries. Anger is hazardous to health (see Suinn, 2001, for a review of

studies) and low efficacy of anger treatment with people who already suffer from medical conditions calls for development of more effective ways of helping them to overcome their problematic anger.

The current meta-analysis included six individual studies with a total of 184 medical patients. All of the studies used standardized measures of anger and implemented cognitive-behavioral treatments consisting of four to eight sessions. Five of the studies were randomized controlled trials and one study was a nonequivalent control group trial. The studies' design and the quality of dependent measures, uniformity of treatment, and homogeneity of the group results ($Q_{within}$ = 4.837, $P$ = 0.437) seem to indicate that this is a robust finding. However, this finding cannot be generalized to treatments longer than eight sessions or treatment models other than CBT.

One study excluded from this meta-analysis due to unusual length and dosage of treatment (De Leon, Powell, & Kaplan, 1991) yielded an effect size $g$ = 0.787 of anger treatment with male patients who suffered from cardiac problems. This treatment lasted four and a half years and consisted of monthly CBT anger management sessions during the first year of treatment followed by sessions held every second month for the reminder of the treatment. Although the question arises whether factors other than anger treatment had an impact on the outcomes during this long time with minimal dosage of therapy, it might be that longer treatment is indicated for medical patients. More research is needed to establish variables moderating anger treatment in people with medical problems, variables such as chronic pain (Burns, Johnson, Devine, Mahoney, & Pawl, 1998), and to enhance effectiveness of anger interventions in this population.

***Anger treatment with people with intellectual disabilities.*** The second surprising finding

of this study was the large average effect size of anger treatment ($g$ = 0.863) with people with intellectual disabilities. Due to their cognitive limitations which are associated with difficulty processing abstract concepts and retaining information, people with intellectual disabilities do not seem to be good candidates for treatment techniques which require understanding of written materials, recognition and manipulation of cognitive processes, and understanding principles of the cognitive techniques. The finding of large effect sizes of CBT treatment in people with intellectual disabilities is also not consistent with a notion that the evidence favors behavioral interventions such as Applied Behavioral Analysis or manipulation of reinforcement systems when treating people with intellectual disabilities (e.g. Sturmey, 2004). All eight individual studies included in this synthesis used CBT treatment models. Six of them (75%) used Novaco's anger treatment model, which combines stress inoculation procedure, a behavioral technique, with cognitive restructuring, a purely cognitive technique (Taylor & Novaco, 2005). Two studies used Benson's treatment model (Benson, 1992), which combines relaxation techniques with thought-stopping self instructions and problem-solving.

The inclusion of cognitive techniques in these treatment models does not prove the efficacy of using the cognitive techniques with this population. An argument could be made that the treatment is efficacious due to the behavioral components of the treatment package and that the impact of the cognitive components on the treatment results is unknown. However, it is also possible that the cognitive techniques enhance behavioral interventions or that they are efficacious as a standalone treatment. The diagnostic category of intellectual disabilities includes several levels of cognitive impairment and variety of cognitive styles associated with frequently co-occurring diagnoses of Autism Spectrum Disorders, Cerebral Palsy, and other more idiosyncratic conditions. It is possible that behavioral techniques work better with clients

who are seriously cognitively impaired while cognitive techniques work better with clients who function on higher levels of the intellectual disability. Studies using dismantling procedures to compare elements of a treatment model, for example cognitive restructuring versus relaxation, could establish which elements of the existing anger treatment models are effective for which groups of people with intellectual disabilities. No such studies have been published to date.

**Does cognitive level moderate anger treatment effects?** Hypothesis 3b posited that anger treatment effect sizes will be moderated by the participants' cognitive level. This hypothesis could not be fully tested because the included studies, with the exception of studies with people with intellectual disabilities, did not report IQ levels of the participants. Therefore, two populations with presumably different cognitive abilities – students and people with intellectual disabilities – were compared in an attempt to gauge the issue of possible moderating effects of cognitive abilities on the efficacy of anger treatment. In the current study people with intellectual disabilities showed large effect sizes resulting from anger treatment ($g$ = 0.863) while college students showed medium-to-large effect sizes resulting from anger treatment ($g$ = 0.682). The difference in effect sizes of these two populations was not significant.

The treatments for people with intellectual disabilities consisted of eight to eighteen sessions and included a total of 222 subjects. All of the studies used standardized measures of anger that were adapted to the needs of people with intellectual disabilities. There were three randomized control trials, three nonequivalent control group studies, and two single-group pretest-posttest studies. The treatment results for this population were homogeneous ($Q_{within}$ = 10.533, $P$ = 0.160). The treatment with students consisted of five to nine sessions and included a total of 869 participants. All studies with students were randomized controlled trials and used standardized measures of anger. The treatment results for students were also homogeneous

($Q_{within}$ = 8.965, $P$ = 0.833).

A series of questions need to be posed when comparing results of anger treatment with students and people with intellectual disabilities: How much the adaptation of treatment models to the needs of people with intellectual disabilities changes the original models, what is the impact of adaptation of the instruments measuring anger experience in this population on treatment outcomes, and what is the impact of treatment length on the results? A full response to these questions exceeds a scope of this study; however, it should be noted that treatments for students were predominantly based on the CBT model developed by Deffenbacher and his team, while treatments for people with intellectual disabilities were predominantly based on Novaco's model. Novaco's model was originally created for the general population and then adapted to work with people with intellectual disabilities. Therefore, the direct comparison of these two populations might be confounded. On the other hand, the argument could be made that both Deffenbacher's and Novaco's treatment models, as well as other models used to treat anger with these two populations, are just variations on the same theme and all represent the CBT treatment.

Similarly, the differences in instruments used to assess treatment outcomes with these two populations need to be acknowledged. However, the instruments used to measure anger of people with intellectual disabilities were predominantly modified versions of the instruments used with the general population. The psychometric qualities of these modified instruments are comparable to the qualities of the original instruments (see Chapter I for details). Therefore, differences between the original instruments and the instruments adapted to the needs of people with intellectual disabilities do not seem to be more prominent than the differences existing among variety of anger measures used with the general population.

Finally, there is a difference in the length of treatments. People with intellectual

disabilities received eight to eighteen sessions and college students received five to nine sessions of anger management treatment. Treatments for people with intellectual disabilities are designed to allow more time to address each treatment point, which means that they tend to include more sessions than a typical anger treatment.

The expectation that CBT treatments will result in smaller effect sizes in people with intellectual disabilities was not confirmed by the current study. This is consistent with the results of Sukhodolsky et al.'s (2004) meta-analysis. Sukhodolsky et al. report no significant difference in response to CBT anger treatment between fifteen to seventeen year-olds and seven to ten year-olds, the two groups representing presumably different cognitive developmental levels. It should be noted that in Durlak, Fuhrman, and Lampman's (1991) meta-analysis, the cognitive-developmental level related to age was found to significantly moderate results of CBT in children and adolescents, but the scope of the problems treated with CBT in their study was not limited to anger.

**Does gender moderate anger treatment effects?** Hypothesis 3c posited that gender will moderate anger treatment effect sizes. This study indicates that women respond better than men to anger management treatments. This is consistent with Sukhodolsky et al.'s (2004) meta-analytical finding that a higher proportion of boys in groups negatively correlated with effect sizes related to anger treatment. This finding is not consistent, however, with DiGiuseppe and Tafrate's (2003) report of no moderating impact of gender on anger treatment results.

This meta-analysis synthesized treatment outcomes based on self-report measures of anger. Therefore, a question arises whether women indeed improved more than men or whether they were particularly prone to the social desirability bias and reactivity bias (see Chapter I). Women might self-report more improvement as dictated by social expectations and their gender

roles.

Despite the common notion that women suppress anger expression more than men do because of differential socialization of this emotion in female and male children, empirical findings on gender differences in anger expression are inconsistent (see Sharkin, 1993, for a review of studies). Moreover, the existing measures of anger include both genders in their normative samples and normative studies report no significant impact of gender on their parameters. For example, Spielberg and Reheiser (2004) indicate that the internal consistency of STAXI-2 was not influenced by gender in their normative sample of 1,644 adults. Another example is a study done by Bartz, Blume, and Rose (1996) who investigated the issues of social desirability and self-report measures of anger in the context of gender differences in a sample of 509 college students. They did not find significant gender differences in social desirability. In their hierarchical multiple regression model that included social desirability, negative affect, and anger expression, "gender and its interactions accounted for less than 1% of the variance" (Bartz et al., 1996, p. 247).

There are subtle differences in anger expression between men and women. For example, women cry when angry more often than men, but these differences are not captured by standard assessment instruments (Thomas, 2007). The measurement issues, however, do not seem to explain the large gender difference in response to anger treatment detected by this meta-analysis.

One possible explanation of the gender difference in response to anger treatment comes from studies on gender roles and gender stereotypes (e.g. Chen & Bargh, 1997; Brown-Givens & Monahan, 2005). This explanation goes beyond measurement issues. Anger might be deeply imbedded in the male identity and it might be difficult for some men to forgo this socially accepted and socially imposed part of their gender role. Women, on the other hand, are primed

by social female stereotypes and it might be easier for them to alter their experience and expression of anger in congruence with the typical female gender role. This explanation is plausible but by no means sufficient, particularly given changes in gender roles and gender stereotypes in the American society. There are certainly women who seem to embrace acting angrily toward others as a part of their identity. Popular reality shows, films, and video games more and more often show women who hit and swear.

Finally, differences in anger socialization between individualistic and collectivistic cultures should be taken under account when considering the gender difference in response to anger treatment. The current state of research limits the meta-analysts' ability to compare the response to anger treatments of male and female participants coming from the variety of cultures existing worldwide. The impact of the female gender roles and stereotypes on anger experience, anger expression, and response to anger treatment is likely to vary depending on the cultural context which is largely missing from the existing studies. Future studies should explicate the source of discrepancy between male and female effect sizes in response to anger treatment, and find factors contributing to this phenomenon.

**Does anger severity level moderate anger treatment effects?** Hypothesis 3d posited that the participants' pretreatment anger severity level moderates anger treatment effect sizes. This hypothesis was not supported by the results of the current study, which showed no association between the participants' pretreatment anger levels and treatment effect sizes. This is consistent with Sukhodolsky et al.'s (2004) finding in children. Both the current study and Sukhodolsky et al.'s study reveal a trend of the moderate pretreatment anger severity levels being associated with slightly larger effect sizes than the low and high pretreatment anger severity levels, but this difference is not statistically significant.

Most of the individual studies recruit participants who test high on anger measures, which makes it difficult to detect differences in response to anger treatment by participants with different pretreatment anger severity levels. Statistically, this restriction of range of anger severity creates a situation in which heterogeneity of the results is not expected (Glass & Hopkins, 1996). Although this might be the nature of the data, a finer operationalization would likely open the possibility to see variability among the "severely angry" participants and to create more categories within this group. For example, looking at specific dimensions of anger experience (e.g. anger control, frequency and intensity of anger episodes, or anger expression) would likely assist the researcher in finer operationalization of the anger severity construct.

Finally, there is a flaw in a manner in which anger severity was operationalized in the current meta-analysis: Anger as an emotional experience was confounded with actions associated with or resulting from the participants' angry feelings, such as child or intimate partner abuse. Maintaining focus on anger as an emotional state, as proposed throughout this study, was not upheld in the anger severity operationalization.

**Selected Study Characteristics as Anger Treatment Moderators**

Treatment modality and the report publication status were tested as potential moderator variables. Below I discuss the impact of these two study characteristics on anger treatment effect sizes.

**Does treatment modality moderate anger treatment effects?** According to Hypothesis 4, treatment modality was expected to moderate anger treatment results with individual anger treatments yielding greater magnitude of effect sizes than group anger treatments. This hypothesis was not confirmed in the current study, which results showed that modality of treatment (individual versus group treatment) did not affect the overall effect size of anger

treatment. This finding is consistent with Sukhodolsky et al.'s (2004) report of no moderating effect of treatment modality in children. This finding is not consistent, however, with DiGiuseppe and Tafrate's (2003) report of significantly larger effect sizes of individual then group anger treatment.

It is possible that the discrepancy between the current study's and DiGiuseppe and Tafrate's results is due to variation in a population of included reports. The current study included 40 reports that were not incorporated in DiGiuseppe and Tafrate's meta-analysis, mostly due to the fact that many reports included in the current study postdate DiGiuseppe and Tafrate's meta-analysis. In addition, there were differences in inclusion criteria as well as possible retrieval differences, which resulted in DiGiuseppe and Tafrate's inclusion of 39 reports that were not incorporated in the current meta-analysis. Overall, there were only 25 reports that these two syntheses had in common.

**Does study publication status moderate anger treatment effect sizes?** Hypothesis 5 posited that publication status of the report does not moderate the magnitude of the reported effect sizes. This hypothesis was not confirmed. Unlike the previous meta-analyses (DiGiuseppe & Tafrate, 2003; Sukhodolsky et al., 2004), the current meta-analysis showed that published studies report larger effect sizes than the unpublished ones. This finding is consistent with a commonly voiced concern that the studies which report larger effect sizes of treatment have a greater chance to be published than the studies which report smaller effect sizes of treatment (Borenstein, Hedges, Higgins, & Rothstein, 2009; Lipsey & Wilson, 2001). This publication bias might alter the results of meta-analyses of treatment outcomes in the direction of inflating the treatment effect sizes. To avoid the publication bias, the current study incorporated 31% of the unpublished studies, a proportion comparable to the proportion found in the previous meta-

analyses. For example, Sukhodolsky et al.'s (2004) meta-analysis included 47.5% of unpublished studies, DiGiuseppe and Tafrate's (2003) meta-analysis included 33% unpublished studies, Beck and Fernandez' (1998) meta-analysis included 30% unpublished studies and Del Veccio and O'Leary's meta-analysis included 26% unpublished studies.

It is not clear why the two previous meta-analyses which also assessed the publication bias (DiGiuseppe & Tafrate, 2003, and Sukhodolsky et al., 2004), did not find the difference between effect sizes reported in published versus unpublished studies. One possible explanation is that these two meta-analyses and the current meta-analysis were based on different study samples, and differences in their results reflect natural variation in a population of studies or a sampling error. Sukhodolsky et al.'s meta-analysis synthesized studies done with children and adolescents, while the current meta-analysis synthesized studies done with adults. Moreover, as previously mentioned, there is only a partial overlap of reports included in the current study and DiGiuseppe and Tafrate's study, which could explain the difference between findings of these two meta-analyses of studies done with adult samples.

It is also possible that the different data analytic techniques used to detect moderator variables accounted for the discrepancy. The current study used subgroup analysis, while DiGiuseppe and Tafrate used regression analysis. Subgroup analysis is reported to be a more sensitive tool to detect moderator variables than the regression analysis (Cooper, Hedges, & Valentine, 2009; Viswesran & Sanchez, 1998); therefore, it is possible that the current study was able to detect differences which were more difficult to detect using regression analysis.

## Limitations of the Current Study

The current study's limitations stem from two sources. One is the state of research on anger treatment effectiveness. The second is the manner in which the current study was designed

and conducted. These two types of limitations will be discussed next.

**Limitations Due to the Current State of Research**

A number of new studies on anger treatment have been conducted between 2000 and 2010. Thirty six studies included in this meta-analysis (49%) were completed between 2000 and 2010. Despite this increasing development of the field, there are still areas where data is missing or scarce. The state of research on anger treatment effectiveness limited this study's ability to reach firmer or broader in scope conclusions in the following ways: (1) Some of the participant categories were underrepresented; (2) treatments longer than 18 sessions were underrepresented; (3) treatment models other than CBT were underrepresented; (4) measurement instruments assessing anger treatment results were missing important aspects of anger construct; (5) many individual studies did not report important participant characteristics; (6) many reports did not provide data with enough details; and (7) the individual studies did not apply random selection of the participants.

**Underrepresented participant categories.** This study could provide stronger results had more anger treatment outcome studies with veterans, psychiatric outpatient population, and drivers been completed. According to DelVeccio and O'Leary (2004), a minimum of five studies in each subgroup is needed to reach meaningful conclusions regarding the within-subgroup homogeneity, one of the indicators of the good fit of the moderator model. The current meta-analysis included only four studies with veterans, four studies with drivers, and three studies with outpatient psychiatric population. Therefore, the mean effect sizes for these subgroups of participants should be interpreted with caution and the results could not be generalized to these populations. In addition, there were no studies with inpatient psychiatric population that met inclusion criteria of this study. The state of research on anger treatment with these participants'

categories constrained the conclusions about moderating effect of the populations from which the participants were recruited on anger treatment. Despite these limitations the conclusion about the moderating effect of populations from which the participants were recruited on anger treatment results has a firm statistical basis.

Another limitation of the current meta-analysis is that the included anger treatment outcome studies tested almost exclusively participants representing individualistic cultures. This cultural bias constrains the conclusions of the current meta-analysis and limits the generalizability of its results. More anger treatment studies conducted with participants representing collectivistic cultures are needed to address this issue in the prospective meta-analyses of anger treatment results.

**Insufficient data about longer anger treatments.** This meta-analysis was not planned as a study of anger treatment limited to short-term interventions. However, due to scarcity of the studies which implemented longer than 18 sessions anger reducing interventions, the decision was made to focus on the studies testing anger treatments with number of sessions typical for the field, which is one to eighteen. Thus, the few studies which tested longer treatments were excluded from this meta-analysis. This exclusion limits generalizability of this study results to short anger treatments. Some of the studies excluded due to the treatment length report quite impressive results. For example, Lindsay et al. (2004) report results that generated an overall effect of $g$ = 1,381, 95% CI [0.684, 2.077], of 40 anger treatment sessions with people with intellectual disabilities; and De Leon, Powell, and Kaplan (1991) report results that generated an overall effect size of $g$ = 0.787, 95% CI [0.633, 0.942], of four and a half years of anger treatment with post-myocardial infarction patients. More studies implementing longer anger treatments are needed.

**Insufficient data about anger treatments using models other than CBT.** Only six studies included in this meta-analysis tested the effectiveness of anger treatment using other than the broadly defined cognitive-behavioral models. These studies were: Process-oriented group counseling (Deffenbacher, McNamara, Stark, & Sabadell, 1990b), meditation (Dua & Swinden, 1992; Vannoy, 2005), forgiveness therapy (Lin, Mack, Enright, Krahn, & Baskin, 2004), acceptance and commitment therapy (ACT) (Saavedra, 2007), and the use of humor (Shocket, 1985). None of the included studies tested the effectiveness of psychodynamic anger treatment. This largely limits the generalizability of this study to treatments using the CBT models. Moreover, any conclusions regarding the other models included here would be premature since five of the models were tested in only one study each, and meditation was tested in only two studies.

**Limited ability of the existing anger measures to assess the breadth of the anger construct.** The existing instruments to measure anger levels represent state of the art when it comes to their psychometric parameters; however, they focus predominantly on the affective, physiological, or expression aspects of anger construct while largely leaving out cognitions that are a part of this construct. Also, some behavioral scripts or ways of expressing anger, such as crying, are not captured by the existing instruments. Therefore, any conclusions of this study are limited to anger as measured by the instruments used in the individual studies and these conclusions do not apply to the aspect of anger that are not captured by these instruments. Moreover, due to the design of the current meta-analysis, this study's conclusions apply only to self-report measures (see limitations due to the design of this study).

**Missing participants' characteristics.** Although most of the included studies provided data necessary to incorporate them in the current meta-analysis, some of them did not provide

sufficient participant descriptors. For example, the participants' race was often not reported resulting in only 42% of the studies providing such general racial information as the proportion of the Caucasian participants in the sample. Therefore, the description of an average study of this meta-analysis as including 58 % of Caucasians and 42% of people of other backgrounds (see Chapter III) should be taken with caution in so far as being able to validly and reliably comment on the efficacy of anger management treatments in non-Caucasians.

**Data provided without sufficient details.** Another problem with data reporting was that most of the studies did not provide demographic data of the treated and control groups separately but provided combined demographic data of these two participant categories, which did not permit more detailed description of the participants included in this study. Even more problematically, treatment results were often combined for male and female participants. Because gender was one of the potential moderators of anger treatment assessed in this study, lack of separate treatment outcome results for men and women limited the number of reports that were included in the analysis of gender as a moderator of anger treatment results. Despite these constrains the current study results indicate that there is a significant difference in effect sizes of the male versus female participants of anger treatments. The result suggests that gender differences should have been reported by all studies and that having done so would have enabled me to more validly test for gender differences in treatment outcomes.

Finally, two of the incorporated reports did not describe the treatment model that was used beyond characterizing the tested treatment as "anger management." The assumption that these were CBT treatments seems to be fair because CBT is the predominant treatment model in the field of anger management. Nonetheless, it is not entirely clear if the vague "anger management" label does not refer to some other form of anger treatment.

**Participants' recruitment.** The participants of the individual studies included in this meta-analysis were recruited via advertisement or from the existing treatment or correctional facilities. Random sampling was not always feasible or attempted. Moreover, there is a question of possible differences between the participants who agreed to partake in the individual studies and the participants who refused or did not respond to the recruitment efforts. These issues limit generalizability of the current study results.

**Limitations due to the design of this study**

While the current study indicates that there is a causal relationship between anger treatment and the treatment results, no causal relationships could be ascertained between the tested moderator variables and the magnitude of the effect sizes (Cooper, Hedges, & Valentine, 2009). The results indicate only that there is an association between certain participants' or studies' characteristics and anger treatment effect sizes. The conclusion about the existence of a causal relationship between implementation of anger treatment and treatment results could be drawn because there were 46 randomized controlled trials (RCTs) included in the current study, which show such a relationship. The remaining 27 included studies show similar results, which support the causal relationship indicated by the RCTs. However, since no individual study used randomization of the moderator variables, no causal relationship between the moderators and treatment results could be claimed.

Another limitation of the current study stems from the way the anger severity was operationalized. First, the variable of anger experience was confounded with anger-related actions. This methodological flaw constrains the current meta-analysis' conclusions regarding the impact of anger severity levels on treatment results. Second, the categorization of anger severity levels into low, moderate, and severe, proved to be too general to provide meaningful

data for the analysis of pretreatment anger severity as the treatment moderator. A finer operationalization would likely open the possibility to see variability among the "severely angry" subjects. For example, testing specific anger dimensions (as previously discussed) could help to refine this moderator analysis.

Finally, this study included solely the results of self-report instruments to measure changes in the outcome variable of anger. Only fifteen percent of individual studies included in the current meta-analysis used physiological measures of anger arousal and only seven percent used third-party reports of the participants' affective and behavioral attributes of anger. To maximize clarity of the current study's findings, only the self-reported results were included. The downside of focusing on the self-report instruments is that the results of the current meta-analysis cannot be extended to anger as gauged by other measures.

## Implications for Future Research

This study revealed that there is crucial data missing from sample descriptions in existing anger treatment studies: The authors of the synthesized studies usually presented combined demographics for treatment and control groups. Although random group assignment usually leads to equivalent groups, that is groups that should not differ much in demographic data, some differences still exist. Meta-analytical studies could detect subtle trends and links between sample demographics and study results if the data specific for each group were presented. For example, reporting demographic data separately for each treated and control group would enable researchers to conduct meta-analyses comparing various elements of anger treatment packages (dismantling procedures). This type of meta-analysis could be completed using the wealth of existing information about specific anger treatment procedures and their results. Unfortunately, such a synthesis would lack demographic data specific for subjects treated with distinct anger

treatment procedures.

In the light of gender differences in response to anger treatments, which this study revealed, it is crucial that all future anger treatment studies present results separately for men and women. This would expand knowledge of gender differences in relation to anger treatment and increase the power of future meta-analyses which could focus on factors contributing to gender differences in response to anger treatment. For example, with more such data available, treatment modality could be tested more effectively as a potential moderator of anger treatment in men.

Future research should also expand on this study's findings of differences in response to treatment of various treated populations. More studies are needed on anger treatment with veterans, drivers, and psychiatric patients, both outpatient and inpatient. The results of this study also call for development of more effective anger treatments for the populations that evidence small treatment effects, such as medical patients and veterans. One potential way to improve anger treatment results with these populations is to increase the treatment duration and/or number of sessions, and assess the impact of these treatment dosage manipulations on treatment effects. Research assessing the impact of combined effects of pain, anxiety, and anger on anger treatment in medical patients and veterans could also assist in designing more effective treatments for these populations. It might be that these clients would benefit from including pain and anxiety coping strategies into anger treatment models.

The current study also illustrates the underrepresentation of anger treatment models other than CBT in research. Only six out of 74 included studies were done using treatment models that were distinct from CBT. The paucity of research using psychodynamic approach to anger treatment is particularly problematic because there are more psychodynamic oriented therapists worldwide than therapist from any other theoretical orientation (Geller, Norcross, & Orlinsky,

2005). This means that a large proportion of angry clients participate in anger treatment which efficacy has not been tested. This also means that the field of anger treatment research is missing empirical data, which could invigorate work on new approaches to anger management treatments and potentially increase anger treatment efficacy. Future research should address this gap in knowledge and provide information that could improve anger treatment results.

## Conclusion

Poorly managed anger could be a serious social and psychological problem. Frequently experienced, excessive, and long lasting anger contributes to health and interpersonal issues and could result in violence and death. Despite the ramifications of such a destructive anger, little is known about factors that could foster or impede anger treatment results. The current study's central hypothesis was that anger treatment results are moderated by the participants' characteristics, such as the population they come from, their gender, anger severity, and cognitive level. Treatment modality and the individual studies' design and publication status were also examined to see their impact on anger treatment results. Meta-analytical methodology was used to synthesize 74 individual studies and analyze the combined data.

The current study supports findings of the previous meta-analyses of anger treatment with adults by confirming that anger treatment benefits the majority of people who participate in it. The average treatment effect sizes are medium at post-treatment ($g$ = 0.576) and medium-to-large at follow-up ($g$ = 0.727) as measured by the participants' self-report. These results are moderated by the population from which the participants are recruited. For example, anger treatments are highly efficacious for outpatient psychiatric samples and for people with intellectual disabilities, but their efficacy is small in samples of patients with medical problems and veterans. Further, the anger treatment results are moderated by the participant's gender:

Females respond to anger treatments better than males. According to the current study, anger treatment results are not moderated by the participants' pre-treatment anger severity or the variation in their level of cognitive functioning. The results are not moderated by the treatment modality or study design, either. There is a statistically significant difference between effect sizes reported by published versus not published studies, with published studies reporting larger effect sizes than the unpublished studies.

These results could be generalized only to cognitive-behavioral treatments of anger management because other treatment models have not been sufficiently or at all tested. The major findings of the current study are that anger management treatments work for about 72% of the participants and that the treatment results are affected by the participant's gender and the population that they come from. The list of variables moderating anger management treatments is by no means final. More research is needed to detect other potential moderating variables and to improve the existing anger treatment models. Future reports should provide more detailed data to enhance prospective meta-analytical studies. There is also a clear need to test anger treatments based on theoretical models other than CBT. Matching specific clients with anger treatments that are known to work for them will be possible when a variety of anger treatment models and strategies are developed and tested with a broad range of participant categories.

## APPENDIX A

### Studies Included in the Current Meta-Analysis


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## APPENDIX B

### Interrater Reliability Computations

**Calculations of $r_1$ for continuous data:**

Univariate Analysis of Variance (SPSS Output)

| | N |
|---|---|
| CODER: A | 330 |
| B | 330 |
| | |
| STUDY: Acton | 10 |
| Cary | 72 |
| Deffenbacher | 280 |
| Eamon | 72 |
| Grodnitzky | 30 |
| Hagiliassis | 24 |
| Ireland | 12 |
| Keyes | 24 |
| Lindsay | 24 |
| Rose | 12 |
| Watt | 96 |
| Wilner | 4 |

Tests of Between-Subjects Effects. Dependent Variable : DATA (SPSS Output)

| Source | Type III Sum of Squares | df | Mean Square | F | Sign. |
|---|---|---|---|---|---|
| Corrected Model | 241815.969[a] | 23 | 10513.738 | 19.245 | 0.000 |
| Intercept | 154184.978 | 1 | 154184.978 | 282.232 | 0.000 |
| CODER | 0.115 | 1 | 0.115 | 0.000 | 0.988 |
| STUDY | 241811.658 | 11 | 21982.878 | 40.239 | 0.000 |
| CODER * | 3.765 | 11 | 0.342 | 0.001 | 1.000 |
| STUDY | 347450.434 | 636 | 546.306 | | |
| Error | 858923.590 | | | | |
| Total | 589266.403 | | | | |
| Corrected Total | | | | | |

[a] R Square = 0.410 (Adjusted R Squared = 0.389)

$\mathbf{r_1}$ **=** 21,982.878 – 546.306 / [21,982.878 + 546.306 + 2(0.115 – 546.306)/12] = **0.955**

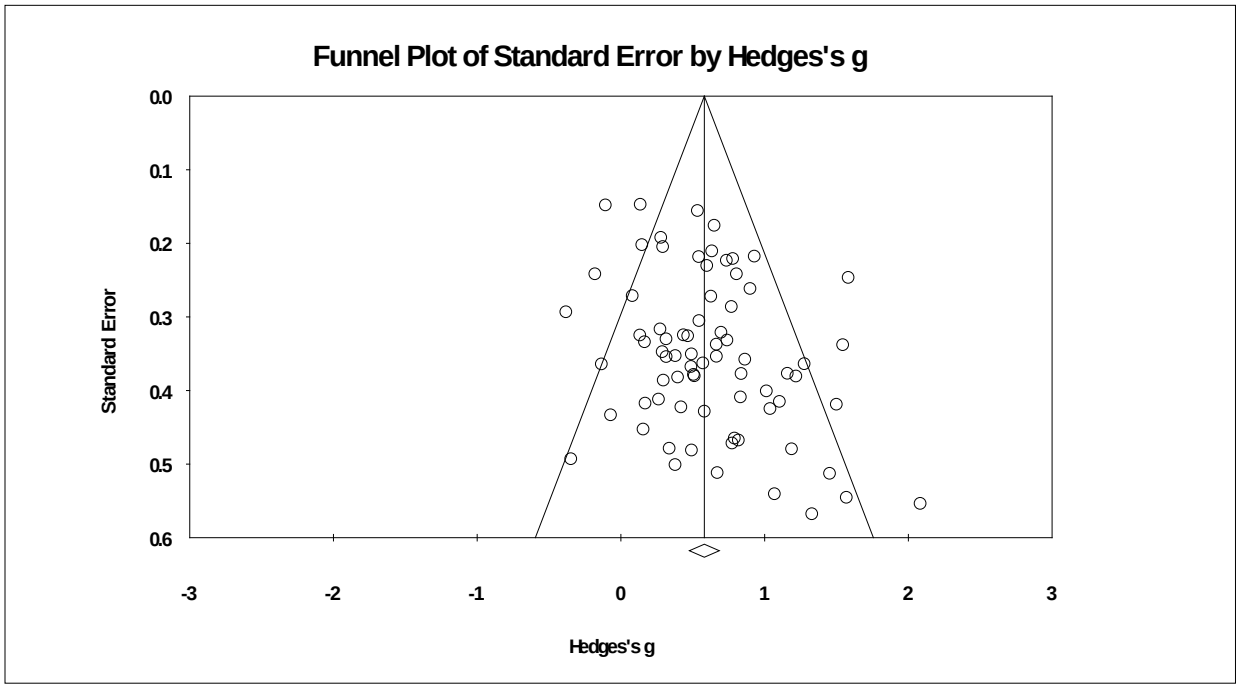
**Calculations of *K* for anger severity:**

| Coder B \ Coder A | Value | 1 | 2 | 3 | Sum |
|---|---|---|---|---|---|
| | 1 | 5 | 1 | 0 | 6 |
| Value | 2 | 0 | 1 | 3 | 4 |
| | 3 | 0 | 1 | 1 | 2 |
| Sum | | 5 | 3 | 4 | 12 |

$P_e = (6 \cdot 5 + 4 \cdot 3 + 2 \cdot 4) / 12^2 = 0.347$
$P_o = (5 + 1 + 1) / 12 = 0.583$
**K =** $(0.583 – 0.347) / (1 – 0.347) =$ **0.361**

**APPENDIX C**

**Publication Bias Data**




**Classic fail-safe N (CMA output)**

| | |
|---|---|
| Z value of observed studies | 15.579 |
| p-value of observed studies | 0.000 |
| Alpha | 0.050 |
| Tails | 2.000 |
| z for Alpha | 1.960 |
| Number of observed studies | 74.000 |
| Number missing studies that would bring p-value to > alpha | 4602.000 |

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