ACCEPTANCE AND DISENGAGEMENT: TEMPORAL, ENERGETIC AND PAIN RECOVERY EFFECTS AS THE COSTS OF CONTROL IN COPING WITH PAIN

by

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Abstract

Two studies examined the hypothesis that acceptance and control-based interventions for pain have specific self-regulatory costs and benefits. Both studies consisted of volunteers from a sample derived from the pool of psychology students at the University of Manitoba. Relative to control-based coping, acceptance was predicted to be associated with: 1) Normalization of time distortion; 2) Faster post-stimulus pain recovery 3) Preservation of self-regulatory energy required for acts of self-control; 4) Stronger pain coping self-efficacy beliefs, relative to two control-based coping strategies: suppression and distraction, and 5) improved pain tolerance. Study I (N=180) showed no group differences for pain tolerance, retrospective duration judgments or self-efficacy ratings, and weak evidence of differential pain recovery effects. As predicted, temporal speed ratings were slower for the suppression condition relative to the distraction condition. In Study II the pattern of condition effects for temporal speed was replicated though the statistical main effect only approached significance. In Study II (N=190), between-group differences were detected for pain tolerance, pain recovery, retrospective duration judgments and self-efficacy belief variables. As predicted the distraction group showed higher pain tolerance than the suppression group. Contrary to prediction, the difference between distraction and acceptance for pain tolerance was not significant. Contrary to predictions the greatest normalization of retrospective duration distortion occurred in the distraction condition. As predicted, post-intervention self-efficacy ratings were higher for acceptance than suppression but the difference between acceptance and distraction was not significant. Predicted pain recovery effects were also detected in Study II such that pain ratings for the suppression and distraction conditions were higher than for the acceptance condition at 60 and 120 seconds post-tolerance. Hypothesized between-group differences for self-regulatory-strength depletion were not confirmed. Possible reasons for lack of difference between acceptance and distraction on pain tolerance ratings and ego depletion measures, as well as possible future research directions were discussed.

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Chapter One

Introduction

The purpose of the research presented here was to better understand the differences between acceptance interventions and control-based coping through assessment of coping costs. The importance of a more nuanced understanding of such costs is important for both practical and theoretical reasons. Even early summaries of the literature on coping indicated that the efficacy of avoidant and non-avoidant coping strategies depended partly upon whether immediate or long-term effects were examined (Suls & Fletcher, 1985) and long-term coping efficacy may be partly a function of the accrual of strategy-specific coping costs. The research described here attempted to make a more comprehensive assessment of coping costs than has been carried out previously within a single experimental study. The objective was to define and operationalize specific costs in the context of coping with physical pain. These costs were selected based upon theoretical considerations related to the hypothesized impact upon two different coping modalities: specifically, acceptance and control-based coping. Therefore, the results of the studies presented here bear upon theoretical understanding of the process of acceptance, control-based coping, the dynamics of coping with pain in general, and potentially upon issues related to clinical decision-making such as intervention selection.

'Third Wave' or Contextual Therapies In Clinical Psychology

The last twenty years has seen tremendous growth in the exploration and application of Third Wave or contextual therapies in clinical psychology (Hayes, Follette & Linehan, 2004). A non-exhaustive list of Third Wave therapies would include: Acceptance and Commitment Therapy (Hayes, Strosahl & Wilson, 1999), mindfulness based stress reduction **(**Kabat-Zinn, 1990) and dialectical behaviour therapy (Linehan, 1994). These approaches target the processes and context of aversive thoughts, feelings, memories, emotions, and sensations rather than their content (Hayes, Luoma, Bond, Masuda & Lillis, 2006). The efficacy of contextual therapeutic interventions have been demonstrated for many psychological problems including the prevention of relapse in depression (Ma &Teasdale, 2004), alleviation of anxiety symptoms (Eifert & Heffner, 2003), mixed anxiety and depression (Hoffman, Sawyer, Witt & Oh, 2010), management of mood fluctuations in borderline personality disorder (Linehan, 1994) mitigation of panic symptoms (Levitt, Brown, Orsillo & Barlow, 2004) and the alleviation of suffering and improvement of well-being and daily functioning in cases of chronic pain (Dahl, Wilson & Nilsson, 2004).

Acceptance and Control-Based Therapies

While acceptance-based therapies seek to cultivate non-judgmental contact with aversive mental events and disengage overt control of distressing experience, traditional control-based therapies such as behavioural therapy

and cognitive behavioural therapy, focus explicitly on alleviating distress by altering, challenging, re-appraising, or otherwise exerting forms of control over the content of private experience (Hayes & Duckworth, 2006). For example, cognitive behavioural therapy for depression has an explicit focus on monitoring, identifying, and challenging negative automatic thoughts and direct deconstruction of beliefs through Socratic questioning and other techniques of cognitive restructuring (Beck, 1995).

Control-based approaches such as cognitive behavioural therapy which focus on symptom alleviation and mastery over private experience have been shown to be effective relative to non-treatment control interventions for a very wide variety of psychological problem: Meta-analyses have shown effect sizes for cognitive behavioural treatments to be large for unipolar depression, panic disorder, social phobia, and post-traumatic stress disorder, and moderate for marital distress, anger, somatic disorders and chronic pain (Butler, Chapman, Forman & Beck, 2006). Not withstanding this evidence, one concern articulated by Third Wave theorists is that the direct focus of cognitive behavioural interventions on evaluation and alteration of mental content could activate learned, maladaptive verbal routines regarding the necessity and usefulness of control, with the consequence of exacerbation of aversive symptoms, especially when those symptoms are not easily addressed by assertive forms of control or are unavoidable or resistant to change (Dahl, Wilson, Nilsson & Hayes, 2005).

Acceptance in Contextual Therapies

Cultivation of an attitude of welcoming or "acceptance" towards private events is a central component of most contextual therapies. For example, the Mindfulness-Based Stress Reduction program developed by Kabat-Zinn and colleagues (e.g., Kabat-Zinn, 1990) employs multiple forms of meditation practice coupled with deliberate cultivation of acceptance towards all aspects (i.e., both positive and negative) of internal cognitive, emotional, and somatic experience. Dialectical behaviour therapy incorporates acceptance inductions and mindfulness interventions to help individuals with severe emotion and behaviour regulation problems tolerate extreme mood fluctuations and refocus goals and behavior more productively (Linehan, 1994). Acceptance and Commitment Therapy (ACT) employs experiential exercises, delivered via non-linear linguistic vehicles such as metaphor and paradox to promote "defusion" of language and action, de-centered awareness, acceptance of aversive internal events, and disengagement from iatrogenic coping strategies (Hayes, Strosahl & Wilson, 1999).

Defining Acceptance

How to define acceptance? For the purposes of this research a trans-theoretical approach will be taken and the construct will be examined through a variety of theoretical lenses in order to discern common constructs and processes. Hayes et al. (1999), working from the perspective of Acceptance and Commitment Therapy, a neo-behavioural approach, have stated that

acceptance (of distressing internal events) is, at one level, simply the "opposite of avoidance" (p. 77). Hayes and colleagues have discussed this most often in the context of "experiential avoidance" a psycho-behavioural response tendency defined by unwillingness to remain in contact with aversive internal experience and resulting in mental maneuvers focused on avoidance. Hayes and colleagues have argued that rather than assuaging distress, experiential avoidance serves to maintain or exacerbate symptoms. Conceptually, within the Acceptance and Commitment Therapy framework, the cultivation of acceptance is hypothesized to bring about "cognitive defusion" a decoupling of learned associations between mental behaviours and verbal rules with consequent disengagement from experiential avoidance tendencies (Hayes et al., 1999). There is some support for this view, in that self-report levels of experiential avoidance are positively correlated with anxiety, depression and trauma (Hayes et al., 2004) and high levels of self-report experiential avoidance are associated with lower tolerance of aversive experiences such as acute pain as well as increased use of dysfunctional coping strategies (Zettle, et al. 2005).

Acceptance as Active Willingness

In Acceptance and Commitment Therapy and mindfulness-based approaches acceptance is viewed as choiceful and active as opposed to involving passivity or resignation. On this view acceptance is a "…willingness to remain in contact with and to actively experience particular private

experiences" (Hayes et al., 1994, page 34). This idea has received support from studies showing that acceptance appears to have both a behavioural component: "activity engagement" and psychological or motivational component termed "pain willingness"[1] in patients suffering from chronic pain (McCracken, Vowles & Eccleston, 2004). Self-report of pain willingness has also been shown to be related to factors such as pain intensity and quality of life, and to mediate the impact of negative thoughts on quality of life for patients with hemophilia (Elander, Robinson, Mitchell & Morris, 2010). The cultivation of "willingness" is an essential component of several Acceptance and Commitment Therapy interventions; for example, the "Willingness Scale Metaphor" is a canonical Acceptance and Commitment Therapy intervention, where individuals are asked to "turn up" their "willingness scale" to improve their capacity to willingly embrace difficult experiences (Hayes et al, 1999).

Acceptance as Present Moment Awareness

Another view of acceptance relates to the complementary nature of acceptance and mindful awareness. Mindfulness has been conceptualized as combining an active, accepting, non-judgmental meeting of experience and a particular quality of awareness or attention (Kabat-Zinn, 1990). Although some authors have embraced this two-component model of mindfulness, incorporating: 1) present moment awareness and 2) acceptance of the

[1] Pain Willingness was defined in this study as "recognition that avoidance and control are often unworkable methods of adapting to chronic pain" (p. 161, 2004).

contents of awareness (Bishop et al., 2004) it is not clear whether acceptance and present moment awareness can be separated conceptually or functionally. Warren-Brown and Ryan (2004) have suggested that the act of acceptance is implicit in the process of present moment awareness in that "embedded within the capacity to pay attention and sustain awareness of what is occurring is an openness and acceptance of it" (p. 245p) and have reported statistical evidence that the two constructs may be redundant.

Acceptance as Re-appraisal

From a cognitive perspective the cultivation of acceptance might also be conceptualized as a form of reappraisal, as acceptance could involve a re-framing of aversive thoughts, sensations and emotions as mental events that *can* be accepted and experienced instead of suppressed or avoided[2]. Gross (1998) distinguishes between antecedent-focused and response-focused emotion regulation. Antecedent-focused forms of regulation such as reappraisal occur early in the time-sequence of the emotion regulation pathway before emotional responses are triggered, whereas response-focused forms of regulation such as behavioural or emotional suppression occur much later and in response to triggering of emotional responses. In this view, acceptance could be viewed as a kind of meta-reappraisal process, where its effectiveness lies in a shift to viewing all experience and especially

[2] The writer recognizes that the hypothesis that acceptance is a form of re-appraisal process is anathema to the Acceptance and Commitment Therapy theoretical stance. However, as mentioned above, this section of the thesis attempts to take a trans-theoretical approach to defining acceptance processes.

aversive experience, as bearable, observable and transient, as opposed to unbearable, immersive, and inescapable.

Viewing acceptance as a (meta) re-appraisal process has implications for understanding the consequences of acceptance-based interventions, in that meta-reappraisal could potentially pre-empt the activation of response-focused emotion regulation efforts that are cognitively costly in terms of disruption of cognitive processes and depletion of self-regulatory energy reserves (Richards & Gross, 2000). From a cognitive perspective, such Acceptance and Commitment Therapy interventions as the 'Passengers on the Bus' Metaphor (Hayes et al., 1999) might operate by allowing individuals to re-appraise and reframe difficult emotional and sensory experiences before they occur. The 'Passengers on the Bus' metaphor likens aversive emotional and sensory experiences to unruly passengers on a bus who can be simply allowed to be unruly without concern about negative consequences while the driver (the patient or client) focuses on what is important (driving the bus). This metaphor could be viewed as altering the appraisal of aversive experiences from threatening events requiring attention and mental resources to events that simply can be allowed to exist within awareness without fear of further difficulty or harm.

Acceptance as 'Yielding' Control

Using a four-quadrant model of control processes Shapiro (1998) posited several different forms of mental control based upon whether control involves

assertive mental action or deliberate yielding and whether the affective valence of control is positive or negative. On this view, “positive assertive control” is defined as goal-oriented action; “negative assertive control” corresponds to active attempts to master or change experiences that are not easily amenable to control--in self-regulatory terms, essentially a form of over-control (Shapiro, 1983). “Negative yielding control” is conceptualized as a form of under-control, a passive resignation in the face of challenge; whereas, “positive yielding” or “letting go” control is conceptualized as a deliberate, active and positively valenced yielding to experience; in short, acceptance. An emphasis on the active nature of acceptance as a deliberate yielding experience opens the possibility that acceptance could be viewed as a qualitatively different form of control.

Acceptance: Common Constructs

In summary, acceptance can be viewed through different theoretical lenses as having various putative component processes. First, through the lens of mindfulness, acceptance can be thought of as a conscious and choiceful welcoming of experience, complementary to, or indivisible from, present moment awareness, that promotes experiencing of the ongoing thought-stream without undue or pathological engagement. Negative experiences which might otherwise capture attention and engage avoidant coping efforts would simply be noticed in the ongoing thought-stream and pass through awareness ideally without disrupting the stream of experience. Through the

lens of Acceptance and Commitment Therapy, acceptance could be thought of as involving choiceful willingness and defusion of learned verbal-behaviour routines with consequent, disengagement from non-productive or destructive attempts at control, or an: "…active and aware embrace of…private events…without unnecessary attempts to change their frequency or form, especially when doing so would cause psychological harm" (Hayes et al., 2006, page. 7). Though a cognitive lens acceptance could be a form of re-appraisal that offsets the necessity of engaging in energy-demanding and cognitively costly forms of emotional regulation (Richards & Gross, 2000). Finally, acceptance could be conceptualized as a form of 'yielding control (Shapiro, 1998). Regardless, of the theoretical lens, however, it seems clear that certain kinds of psychological costs, whether conceptualized as secondary to experiential avoidance or to attempts to regulate emotional states through cognitive means, or replaced by present moment awareness, may be mitigated by the cultivation of acceptance.

Research Objective 1

Forms of avoidant or control-based coping may have psychological or self-regulatory costs. Hypothetically, these costs are mitigated by acceptance-based interventions. Therefore, in this research potential costs were defined and operationalized based on review of relevant literatures. The hypothesis that these costs are mitigated by acceptance was tested

using between-groups comparisons of indices of costs for an acceptance intervention and control-based coping.

Research Objective 2

Given that acceptance may be understood as a form of "yielding control," acceptance interventions may impact beliefs about the ability to cope, and confidence in dealing with aversive challenges. Therefore acceptance may also have a concomitant benefit relative to avoidant or control-based coping: the strengthening of beliefs regarding coping with challenging psychological events, usually defined as perceived self-efficacy (Bandura, 1989; 1997). Therefore, a second objective of the current research was to assess whether acceptance and control-based interventions had differential effects on perceived coping self-efficacy.

Both of these research objectives were pursued in the context of coping with a specific type of aversive experience: physical pain. As such, literature on control-based coping and acceptance interventions in the context of pain experience is reviewed below.

Psychological Factors and Pain

It is now well accepted that the experience of even the mildest acute or transient pain can be conceptualized as complex, multi-modal, and profoundly influenced by emotional, motivational and cognitive influences (Hainline, 2005). This idea that multiple physiological pathways, including neocortical (i.e., executive, cognitive, evaluative, motivational) and limbic

(emotional, affective) systems influence ascending input from sensory nociceptors has now been accepted for over forty years (Melzack & Casey, 1968), and a range of psychological factors have been demonstrated to influence the experience of pain. For example, it has been found that adjustment to chronic pain is moderated by psychological factors such as pain catastrophising, pain-related anxiety and helplessness (Keefe, Rumble, Scipio, Giordano & Perri, 2004).

Cognitive Behavioural Therapy and Chronic Pain

Cognitive behavioural therapy has been a first-line of therapy for chronic pain for over thirty years and encompasses a very broad range of strategies (Butler et al., 2006). These include, identification and challenging of maladaptive thoughts and beliefs about pain experience; distraction from pain experience or relaxation to decrease physical tension; monitoring, assessing and changing pain behaviours, as well as targeting other factors, such as the behaviour of family members and caregivers who reinforce pain behaviours or maladaptive pain beliefs about daily activities or fear of further injury or increased pain (Turk, Swanson & Tunks, 2008).

Despite its status as an effective approach to the management of chronic pain, there are a substantial proportion of chronic pain patients who do not benefit from cognitive behavioural interventions (Vlaeyen & Morley, 2005). Further, some writers have argued there is little evidence that somatic treatments focusing exclusively on the quantitative reduction of reported pain

improve the daily functioning of chronic pain patients (Hayes & Duckworth, 2006). Chronic pain, they argue, may be more usefully conceptualized as a disorder of experiential avoidance in that much of the disability and suffering experienced by chronic pain patients could arise from attempts to (unsuccessfully) avoid pain-related sensory experiences and thoughts. Given these factors it has been argued that contextual approaches such as Acceptance and Commitment Therapy that focus on disconnecting pain-related verbal routine from behaviour and promote willingness to experience unavoidable pain may represent a more route to improved functioning for some chronic pain patients (Dahl et al., 2005).

Acceptance-Based Interventions, Control-based Coping and Chronic Pain

Acceptance- and control-based interventions for chronic pain have been examined using a variety of approaches and dependent measures. Self-report of acceptance is associated with decreased pain, avoidance, depression and psychosocial disability, as well as improved work status and daily activity McCracken (1998). Esteve, Ramirez-Maestre & Lopez-Martinez (2007) showed self-report of acceptance to be inversely related to functional impairment in chronic pain patients. Coping by diverting attention from pain or ‘praying and hoping’ is associated with increased report of pain and poorer functioning, whereas acceptance was associated with less reported pain, disability, depression, pain-related anxiety and improved daily functioning

(McCracken & Eccelston, 2003). Patients who struggled less to cope with pain and engaged in fewer avoidant responses and attempts at palliative coping experienced less depression, anxiety and showed improved daily functioning (McCracken, Eccleston & Bell, 2005).

Acceptance-based interventions for chronic pain based on ACT principles have been associated with decreased disability and symptom report for individuals at risk for long-term disability due to pain (Dahl et al. 2004). In a treatment outcome study McCracken, Vowles & Eccleston (2005) found that significant improvements in well being and functioning were positively correlated with increased in acceptance. Mindfulness-based interventions cultivating an accepting, welcoming stance to pain were shown to be associated with decreased self-report of suffering for chronic pain patients (Kabat-Zinn, 1982; Kabat-Zinn, 1990**;** Kabat-Zinn, Lipworth, & Burney, 1985).

A wide range of studies has demonstrated differential outcomes for acceptance and control-based interventions for persistent pain. In the following section research focusing on the processes underlying differential efficacy of acceptance and control-based interventions for pain are reviewed. The studies described below, incorporating experimental designs, transient analogue pain with normal populations are of specific relevance as they served as the basis for the methodology and design of the experiments presented here.

Laboratory Studies of Acceptance Interventions,

Control-Based Coping in Analogue Pain

A number of studies have contrasted acceptance- and control-based interventions using analogue acute pain in laboratory settings. Hayes and colleagues examined the impact of control and acceptance-based rationales on cold-pressor pain tolerance (Hayes, Bisset, et al., 1999). This study used a pre-post intervention design with ninety-minute acceptance-based, control-based, and placebo rationales interposed between two cold-pressor challenges. The results showed higher pain tolerance in the acceptance-rationale condition compared relative to either control-rationale or placebo conditions. As well, participants in the acceptance rationale condition showed a post-intervention decrease in belief in the causal connection between language-based reasons and behaviour (i.e., the believability of “reasons” as a justification for action (Hayes, Bisset et al. 1999), indicating, for these authors, that increases in pain tolerance were associated with acceptance-based defusion of verbal reasons and behaviour (i.e., in this case defusion of the connection between pain-related thoughts and escape behavior such as withdrawing the arm from cold water). This result is consistent with a previous unpublished study (Korn, 1997) demonstrating higher pain tolerance for acceptance over cognitive-behavioural rationales, as well as a relative

decrease in pain tolerance for a cognitive behavioural rationale after multiple cold pressor trials[3].

In a subsequent study Gutierrez, Luciano, Rodriguez and Fink (2004) used a similar pre-post intervention design with interposed twenty-minute control-based and acceptance-based interventions but employed increasing levels of electric shock over a longer time period to assess the impact of acceptance and control based interventions at both high and low pain intensities. They showed an acceptance-based intervention with mindfulness and commitment components to be associated with higher pain tolerance than a content-matched control-based intervention, especially at high pain levels. The control-based intervention group showed an overall decrease in subjective report of pain intensity relative to the acceptance condition but no improvement in pain tolerance. These authors also obtained a behavioural measure of the "believability" of pain experience by comparing pain tolerance levels with reports of subjective pain intensity. This revealed that over half of the participants in the acceptance condition showing increased subjective pain levels in the post-intervention pain challenge also showed improved pain tolerance; while in the control-based condition all of the participants showing an increase in subjective pain intensity showed a decrease in pain tolerance. The authors concluded that the apparent dissociation between tolerance and

[3] In Korn (1997) the acceptance intervention did not show higher tolerance than an attention-placebo condition over multiple cold pressor trials. These two conditions were equivalent.

pain intensity reflected an acceptance-based disconnection of private pain events (i.e., subjective pain intensity) and overt pain behaviour (i.e., pain tolerance).

Masedo and Esteve (2007) contrasted acceptance and control-based strategies within a self-regulatory framework. This followed upon previous research by Cioffi and Holloway (1993) showing that instructions to suppress pain-related thoughts and sensations resulted in slower pain recovery and an increased tendency to interpret a neutral vibratory stimulus as unpleasant relative to distraction and sensory monitoring instructions. Cioffi and Holloway (1993) interpreted this phenomenon as a somatic version of the ironic 'rebound' effects observed after thought suppression, where the frequency of a previously suppressed thought may increase in awareness after a period of conscious suppression of a to-be-avoided thought (Wegner, 1994)[4].

In their study Masedo and Esteve (2007) contrasted acceptance-based and control-based interventions with a spontaneous coping (control), assessing differential post-pain recovery effects at thirty and sixty seconds

[4] Wegner and colleagues have posited that suppression-based mental control engage two processes: The first, a conscious search for content matching a desired end-state (i.e., the elimination of a thought); the second, a sub-conscious search for mental content inconsistent with the desired end state (e.g., the to-be-eliminated thought). Under conditions of stress, high cognitive load or capacity limitation, the monitoring process is hypothesized to allow mental content antithetical to the goal of the conscious process to enter awareness, resulting in paradoxical increase in awareness of the to-be-suppressed thought (Wegner, et al., 1987). There is also evidence that thought suppression can result in "rebound" phenomenon, where a suppressed thought may show a significant increase in frequency some time after a period of successful suppression (Wegner, 1994).

post cold pressor tolerance. Employing three twenty-minute therapist-delivered interventions interposed between two cold-pressor challenges, these authors replicated the Hayes, Bisset, et al.(1999) finding of higher pain tolerance for acceptance relative to a spontaneous coping and control-based (in this case, suppression) condition. Further, the spontaneous coping group showed higher pain tolerance relative to suppression. Suppression also showed significantly higher ratings of pain intensity and distress at both thirty and sixty seconds post tolerance; however, these differential suppression-based pain recovery effects were only observed relative to acceptance which, the authors argued, could have reflected the use of multiple strategies in the spontaneous coping condition[5].

It is important to note that several studies have failed to show higher pain tolerance for acceptance relative to control-based coping. Using a within-subjects design with counter-balanced acceptance and control-based interventions, Keogh, Bond, Hamner, and Tilston (2005) showed higher affective pain responses for women for a control-based intervention but no difference between acceptance and control-based groups for tolerance of

[5]Masedo and Esteve (2007) reported a-posteriori analyses of coping strategy use for their spontaneous coping control group, indicating that participants used a range of strategies. They emphasized that the control-based nature of most of the strategies may have resulted in the lack of difference observed for spontaneous coping and suppression in rebound and recovery effects. Another possibility is that multiple strategies were also employed in the suppression condition. In some ways this seems possible in that suppression may be conceptualized as a potentially frustrating and difficult strategy for dealing with a stimulus as salient and aversive as cold pressor pain.

cold pressor pain. This study employed relatively brief interventions, which could explain the lack of observed between-group effects. However, a more recent study, contrasting comprehensive, sophisticated, well-designed and balanced, and highly experiential acceptance and control (suppression) interventions also failed to detect differences between acceptance and suppression with increasing levels of electric shock (Paez-Blarrina, Luciano, Gutierrez-Martinez, Valdivia & Rodrigues-Valverde & Ortega, 2008). Despite the lack of pain tolerance differences Paez-Blarrina and colleagues noted that more participants reporting high pain levels persisted in the acceptance than in the suppression condition consistent with predictions regarding acceptance-based cognitive defusion and previous studies showing "believability" effects for acceptance (Hayes, Bisset, et al., 1999; Gutierrez, et al., 2004).

The Costs of Control and the Benefits of Acceptance:

A Self-Regulatory Approach

With the exception of Masedo and Esteve (2007) no study has examined self-regulatory costs nor attempted to assess any other possible self-regulatory benefits of acceptance or control-based interventions. If acceptance promotes disengagement from control-based strategies, pre-empts energy draining emotion regulation, or mitigates experiential avoidance then improvements in pain tolerance after successful acceptance induction should also be associated with changes in self-regulatory indices

that directly reflect such disengagement. Further, if acceptance-based interventions represent a form of “letting go” control (Shapiro, 1998) and promotes detached processing of pain-related experiences, improvements in participant’s beliefs in their own ability to cope with future pain might also be associated with improvements in pain tolerance.

Chapter Two

Definition and Selection of Dependent Variables

This chapter will outline the empirical research and logic behind the selection of dependent variables to assess costs and benefits of an acceptance intervention and of control-based coping. These include: self-regulatory energy costs, costs related to the distortion of temporal experience, and costs related to the lengthening of pain recovery due to post-pain rebound effects.

Cost 1: Pain Rebound and Recovery Effects

Increases in pain due to the suppression of pain-related thoughts prior to pain induction (Sullivan, Rouse, Bishop & Johnston, 1997) or during pain experience (Cioffi & Hollway, 1993) have been show to result in subsequent increases in perceived pain. Pain "rebound" may be conceptualized as evidence of having incurred a significant cost in that differential pain rebound is associated with slower recovery to a non-pain state (Cioffi & Holloway, 1993). Differential somatic rebound effects for sensory-monitoring, suppression, and distraction strategies have been shown to be associated with slower post-pain recovery for suppression and distraction relative to sensory-monitoring strategies for cold pressor pain up to 120 seconds post-tolerance (Cioffi & Holloway, 1993) and to 60 seconds post pain tolerance for acceptance and suppression (Masedo & Esteve, 2007). The importance and severity of any time-related recovery "cost" partly depends upon how long it

extends once tolerance is reached. One of the aims of this study is to replicate and extend the findings of Masedo and Esteve (2007) and test whether differences in pain recovery cost for acceptance and control-based interventions also extend to 120 seconds post-tolerance.

Variable 1: Index of Pain Rebound and Recovery

Previous assessments of pain rebound and recovery effects have utilized pain ratings (Cioffi & Holloway, 1993) and pain and distress ratings (Masedo & Esteve, 2007). In both previous studies, a visual analogue scale (VAS) approach was utilized to assess subjective pain experience. Therefore, the dependent measures for post-pain experience variables included VAS pain intensity, distress, and unpleasantness ratings made at intervals of 60 seconds and 120 seconds post-cold pressor tolerance.

Cost 2: Self-Regulatory Strength Depletion

The finding of complementary deficits across diverse self-regulation tasks implies the existence of a single, limited resource pool of energy for self-regulatory acts (Baumeister, Bratslavsky, Muraven, & Tice, 1998). This resource pool is hypothesized to allow for short-term dedication of energy to self-regulation efforts. However, prolonged acts of self-control requiring sustained effort are hypothesized to deplete the resource, resulting in a refractory period where further acts of self-control are compromised. “Ego depletion” refers to a state of transient exhaustion of this limited resource pool caused by self-regulatory activity such as over-riding automatic

responses, impulse control, active self-control of appetitive behaviour, control of emotional responses, suppression of motor responses or habitual expressive behaviours (Muraven & Baumeister, 2000).

One of the tasks consistently associated with ego-depletion effects is thought suppression, where it is hypothesized that sustained deliberate attempts to banish thoughts from awareness depletes the limited resource (Baumeister et al. 1997). Similarly, one might speculate that sustained resistance from allowing attention to habitually come to rest on a painful stimulus (as would occur in when attempting to distract the self from pain) could also be expected to cause ego depletion effects. The necessity to focus attention away from pain and to sustain that focus over time against the highly salient and powerfully motivating activation of nociceptors could be expected to require expenditure of self-regulatory energy[6]. As such, ego depletion effects could potentially arise from attempts to either suppress pain-related thoughts and sensations or distract the self from pain-related experience. Finally, toleration of a painful stimulus when escape is possible, as in the cold pressor test, is also associated with ego-depletion effects (Schmeichel & Zell, 2007).

[6] In some contexts distraction has been shown to mitigate ego depletion effects (Alberts et al., 2008). However, this was demonstrated with a task that did not have the highly compelling, salient and aversive qualities of the cold pressor. It is expected therefore the whatever benefit is provided by distraction will be offset by the very powerful impact of cold pressor pain such that distraction is likely to show ego-depletion effects that are less severe than suppression (see hypotheses section, Study II).

Variable 2: Index of Self-Regulatory Strength Depletion

Researchers have used a host of measures and procedures to assess post self-control ego depletion effects (Muraven, Tice & Baumeister, 1998). Most often these effects are demonstrated using pre- and post-depletion tasks that hypothetically engage the limited self-regulatory resource pool but lack easily detectable procedural and functional similarities (Baumeister, 1998). In a study examining the impact of distraction on ego depletion Tyler and Burns (2008) used an ego depletion pre-task consisting of supporting a weight at a pre-ordained angle with the forearm. A multiplication task where participants worked on a virtually endless number of tedious multiplication problems until they "wished to" stop was the measure of post-regulation depletion. Lack of persistence or, 'giving up' on this somewhat boring task was the measure of post-depletion persistence, or ego depletion. This multiplication task has been used in several previous studies and shown to be sensitive to prior depletion (Vohs, Baumeister & Ciarocco, 2005; Tyler & Burns, 2008).

The combination of the multiplication task with a weight-lifting persistence task seemed analogous to the experimental set-up in this current research, where the cold pressor task was used as the self-regulatory depletion pre-task. Both the cold pressor and the multiplication task are technically persistence tasks. However, in the case of the cold pressor there is a very conscious focus on lasting as long as the pain can be tolerated,

whereas for the math calculation persistence task, the emphasis is on working at the math problems for as long as the participant 'feels like it'. Therefore, the persistence aspect is much less overt; as such, the math task and the cold pressor were thought to be sufficiently different for use in the context of this experiment.

Cost 3: Time Distortion

In outlining a phenomenology of pain experience, Leder (1987) referred to the 'centripetal mode' of pain in which attention is directed inward by pain and there is a concomitant constriction of experience. He argued that this change in focus has a direct impact on temporal experience:

> This centripetal force exerted by pain also reorganizes the temporal domain. As pain calls us incessantly back to the *here*, so we are drawn to the *now* by the aching tooth, the cramping stomach. Pain reveals the latent possibility of the sensory world to trap us in the present (p. 256, 1987).

Qualitative and clinical studies of chronic pain patients and experimental studies of analogue pain in normal populations support the view that pain distorts subjective temporal experience. In a qualitative study of the phenomenology of chronic pain Hellstrom and Carlson (1996) found that patients suffering from intermittent pain caused by physical trauma often reported experiencing a sense of being trapped within a "longlasting now" in which time seemed to slow down during pain and the present moment to

dilate becoming “viscous” (page 421, 1996). Using a multiple-choice format Somov (2001) found that sixty-nine percent of cases in a sample of patients with somatic, neuropathic and mixed varieties of pain endorsed: “when in pain time drags,” and eleven percent endorsed: “when in pain, time stands still,” indicating that some forms of pain produce a subjective sense of time both slowing and extending.

Pain experience is also associated with retrospective distortions of estimated duration. Somov (2001) found that patients reporting higher overall intensities of pain tended to over-estimate retrospective durations. A similar result was found in a study showing that headache patients retrospectively over-estimated the duration of a reading task (Bilting, Carlsson, Menge, et al.1983). It is important to note that in both of these studies, time estimation was not assessed during an actual episode of pain. Therefore, these over-estimation effects may reflect the tendency of long-standing pain to truncate temporal experience to the present, resulting in a chronic imbalance in temporal orientation (Zimbardo & Boyd, 1999). This idea receives some support from the Bilting et al. (1983) finding that temporal over-estimation effects were normalized after successful treatment.

The effects of pain on retrospective duration estimates are quite different if tasks are carried out during pain experience. Headache patients experiencing a migraine attack retrospectively under-estimated the length of respiratory and EMG biofeedback sessions relative to patients who were

headache-free during these treatments (Isler, Solomon, Spielman & Wittlieb-Verpoort, 1987). When free of headache symptoms these headache patients over-estimated the length of a reading task relative to normal controls, similar to the results of Somov (2001) and Bilting et al. (1983). Isler et al. (1987) attributed retrospective under-estimation of subjective time during respiratory biofeedback and EMG sessions to decreases in information processing during migraine attacks associated with avoidance of sensory stimuli due to migraine symptoms. Isler and colleagues situated this interpretation within Ornstein's (1969) hypothesis that retrospective duration estimates are based upon the amount of information encoded in memory for a given interval; they conjectured that information encoding would decrease during pain when migraine patients avoided external stimuli in order to decrease or prevent exacerbation of migraine symptoms.

The finding that pain is associated with under-estimates of retrospective duration has been extended in studies utilizing acute pain in laboratory settings with college samples. Thorn and Hansell (1993) found that normal subjects under-estimate retrospective durations during the cold pressor task; however, provision of a specific time goal (e.g., "last for 300 seconds") eliminated this effect. Thorn and Hansell argued that the provision of a specific time goal resulted in changes in time expectancy effects and normalization of duration judgments. However, it also possible (and perhaps more parsimonious) that having a specific time goal allowed for either

conscious or more accurate timing *during* the task, or a clearer future focus and a better balance of future and present orientation—and thus more accurate retrospective duration estimates.

Hellstrom and Carlsson (1997) asked participants to make retrospective time judgments at 120 seconds and 300 seconds after cold pressor immersion, finding under-estimation of retrospective duration at both intervals relative to within-subjects no-pain control condition. Hellstrom and Carlsson also queried participants directly about their subjective temporal experience during the cold pressor; specifically, whether participants thought about time, the past or the future, during the cold pressor. All of the participants reported being "totally in the present" during the cold pressor; sixty percent of the participants thought about "earlier pain" and forty percent of the participants reported experiencing time as "long and slow."

The finding of retrospective under-estimation of duration during chronic pain and during acute cold pressor pain seems to be inconsistent with the concomitant finding that time seems to also slow down during a painful episode. It might be expected that time would be perceived as both long and slow only if the duration of a pain-filled episode is over-estimated. However, the finding of these two temporal effects--retrospective under-estimation of duration after the cold pressor, and the subjective experience of slowed temporal speed--can both be explained within a contextual change model of retrospective timing (Block & Reid, 1979). This model posits that the amount

of contextual change encoded for a given time period determines the retrospective duration estimate for that period. ‘Context’, is defined in terms of changes in environment, mood, and type of processing, and more complex stimuli or sequences with many shifts in processing, would be remembered as longer (Zakay & Block, 1997). During pain one could posit that contextual change decreases radically, due heightened focus on the relatively undifferentiated pain experience. In the relative absence of contextual change time would seem to ‘drag’ (i.e., nothing is happening) and temporal durations would also be under-estimated as little would have been remembered as occurring during the remembered interval.

Variables 3 and 4: Indices of Temporal Duration and Temporal Speed

Previous studies examining the distortion of retrospective duration have relied upon a paradigm where retrospective duration is estimated at specific intervals from the onset of pain (Thorne & Hansell, 1993; Hellstrom & Carlsson, 1997). However, in the case of the research presented here pain tolerance was also a variable of interest; as such, a verbal (in this case, written) retrospective duration estimate made at the moment at which pain tolerance was reached was used as a measure of retrospective duration distortion. As pain tolerance was expected to vary across cases and conditions, the actual dependent variable for analysis was a ratio of estimated tolerance over actual tolerance, a measure that is commonly used in timing studies as an index of retrospective duration (Block & Zakay, 1997).

With respect to predictions regarding condition effects on retrospective judgments, it was predicted that acceptance induction would result in an improved ability to allow pain to pass through awareness freely, with several consequences: First, there would be an increased capacity to encode pain as information or context, second there would be an increased capacity to process information external to pain as context and thus normalization of time distortion relative to control-based interventions. Hellstrom and Carlsson (1997) employed a qualitative approach utilizing open-ended questions and Somov (2001) used a multiple-choice format to retrospectively assess pain-related temporal velocity. A VAS rating scale was used in a study of temporal speed in mania and depression (Bschor, et al. 2004). In the present study a similar structured approach will be used, incorporating an anchored rating scale with opposite anchors at time seemed to: "fly by very quickly" and "slowed to a standstill," and a midpoint indicating that time, "seemed to move along at its usual speed."

Benefit of Acceptance: Pain Coping Self-Efficacy

Beyond alleviating the putative negative effects of control-based coping strategies, acceptance-based interventions also offer potential benefits relative to control-based methods of pain control. One possibility is that acceptance may be associated with increases in perceived self-efficacy. Bandura (1989; 1997) has argued that perceived self-efficacy beliefs, or "people's beliefs about their capabilities to exercise control over their lives"

(p. 1175, 1989) are a central determinant in self-regulatory success. Changes in self-efficacy beliefs are associated with improved cold pressor tolerance (Litt, 1988). Perceived self-efficacy has been shown to mediate the effects of training in cognitive coping on cold pressor tolerance (Bandura, O'Leary, Taylor, Ghauthier & Grossard, 1987). Higher pain coping self-efficacy is also associated with decreased heart rate response during the cold pressor (Weisenberg, Schwarzwald & Tepper, 1996).

With clinical pain, self-efficacy beliefs are associated with decreased avoidance behaviours (Asghari & Nicholas, 2001) and functional self-efficacy has been shown to be a stronger predictor of physical performance than fear of injury for chronic pain patients (Lackner, Carosella & Feuerstein, 1996). Stronger self-efficacy beliefs have been observed in chronic pain patients who are more accepting of their pain experience (Viane, Crombez, Eccleston et al. 2004).

One could speculate that the differential efficacy of acceptance relative to control is mediated in part through changes in self-efficacy beliefs. Control-based coping strategies such as distraction and especially suppression may be associated with decreased feelings of mastery and pain control self-efficacy, as they may partially undermine the goal of coping with pain via cost accrual. This may be most clearly true for suppression, which may exacerbate the problem it is attempting to alleviate via rebound effects and result in repeated coping failures. The latter possibility is important as

failure to control pain experience has negative physiological (i.e., increased heart rate) and psychological (increased anger) consequences (Janssen, Spinhoven & Arntz, 2003).

Cioffi and Holloway (1993) have previously shown that baseline to post-intervention self-efficacy ratings as measured by confidence ratings of possible tolerance times for a future pain experience, remained stable for a group using a sensory-monitoring strategy and decreased for a group using a suppression strategy. They summed up the potential negative consequences of suppression on self-efficacy succinctly:

> … if suppression heavily taxes both one's coping resources and one's perceived control over mental events…the stressor becomes subjectively more severe, and one's coping resources become subjectively more paltry. This combination is likely to negatively bias expectations about the quality of future physical sensations and may also produce physiological changes of anxious expectation such as muscle tension and vasoconstriction (pp., 281-282, 1993).

In the case of the present study it is expected that Cioffi and Holloway's finding of decreased self-efficacy for suppression relative to suppression will be replicated; however, acceptance is expected to result in increases in pain coping self efficacy from baseline to post-intervention (unlike in Cioffi and Holloway, 1993).

Dependent Variable 5: Pain Coping Self-Efficacy

As has been customary in many studies of pain coping self-efficacy, this construct will be assessed using an anchored 0 - 100 scale (Bandura, 1997). Ideally, self-efficacy judgments focus on specific goals (Bandura, 1989). In the present case, as the object of goal setting would be pain tolerance the judgments would likely be based upon specific time-goals for pain tolerance (Cioffi & Holloway, 1993). However, because temporal indices were also dependent variables in this study a straightforward rating of the potential to persevere given similar future pain circumstances was used to assess self-efficacy in order to avoid biasing temporal judgments.

Dependent Variable 6: Pain Tolerance

All previous studies comparing acceptance and control-based interventions have utilized pain tolerance as a basic measure of intervention efficacy. As such, cold pressor pain tolerance in minutes and seconds was also assessed in this research.

Multiple Strategy Use and Spontaneous Strategy Use

Masedo and Esteve (2007) reported data on spontaneous strategy use for their spontaneous strategy control condition. To facilitate interpretation of intervention effects, in the research presented here, data on unassigned and assigned strategy use, and baseline spontaneous strategy use was collected. The question of spontaneous strategy use and the relative use of different kinds of ancillary strategies is of intrinsic theoretical and

clinical interest. It could be argued that frequency of spontaneous strategy use reflects the relative familiarity of different coping strategies. In attempting to train individuals to use specific strategies, knowledge of high frequency alternatives and of the relative familiarity of the to-be-trained strategy may help to assist in designing intervention protocols. This is of practical relevance in that matching of preferred coping style with intervention approach has been shown to influence pain thresholds in normal subjects (Forys & Dalquist, 2007). Further, spontaneous strategies may be important in the context of determining baseline tolerance and thus in the estimation of intervention effects.

Chapter Three

Outline of Study I and Study II, Method, and Procedure

The two studies outlined below were designed to test predictions regarding putative differences in acceptance and control-based interventions on indices of self-regulatory cost and benefit. The following chapter will outline in capsule form the rationale, specific hypotheses, design, as well as dependent measures used for each of the two studies presented here. This is followed by the methods section containing, a description of the procedures and samples used in each study.

Study I: Acceptance and Control-Based Interventions: Effects on Pain Tolerance, Temporal Duration and Temporal Speed Estimates, Pain Rebound Effects, and Pain Control Self-Efficacy

Rationale for Study I

In Study I hypotheses related to differential effects of acceptance and control-based interventions on cold pressor pain tolerance, temporal variables, pain rebound and recovery effects, and self-efficacy were assessed. In Study I (and Study II) two control-based interventions (distraction and suppression), were compared to an acceptance intervention based on Acceptance and Commitment Therapy (ACT) principles. The rationale for using ACT interventions was straightforward as all previous research examining the questions related to this thesis and summarized above have also used versions of ACT protocols and interventions. The

rationale for the use of suppression as a canonical control-based strategy is also straight forward as suppression has been used in previous studies examining pain rebound effects (Cioffi & Holloway, 1993; Masedo & Esteve, 2007) and also is well documented as a putative source of ego-depletion effects (Baumeister et al, 1998).

Distraction interventions have also been incorporated into previous studies as a representative form of control-based coping (Gutierrez et al., 2004; Hayes et al., 1999). Distraction may be an effective strategy for pain control as long as pain levels are relatively low (Leventhal & Everhart, 1979) and pain is short-lived (Beers & Karoly, 1979). The positive effects of distraction for cold pressor pain are sometimes not evident until after pain has been experienced (Christenfeld, 1997). It is assumed here that the self-regulatory costs for distraction strategies may be incurred later in the cold-pressor experience than in the case of suppression, and that early on distraction may have some positive benefits relative to suppression. Therefore, distraction was assumed have short-term benefits and costs that increase with time, and was predicted to have effects on dependent variables, which would be intermediate between acceptance and suppression; thus it's inclusion in this study.

The first of the two studies outlined below assessed whether acceptance-based interventions and control-based interventions had differential effects on pain tolerance, time distortion, pain rebound effects,

and pain control self-efficacy. The general and specific hypotheses for Study I were as follows:

General Hypothesis: Study I

Acceptance was predicted to alter the reaction to and experience of cold-pressor pain so as to show increased pain tolerance, normalization of temporal distortion, mitigation of pain rebound effects, and strengthened pain coping self-efficacy beliefs relative to control-based interventions. These hypotheses were evaluated using the following variables: retrospective duration estimates, retrospective estimates of temporal speed, pain tolerance, pain experience ratings of pain intensity, distress and unpleasantness and pain coping self-efficacy ratings. The specific hypotheses tested in Study I were as follows:

Hypothesis I-A. Acceptance was predicted to show higher pain tolerance as measured by total minutes and seconds of cold pressor immersion than distraction and suppression with distraction intermediate between suppression and acceptance.

Hypothesis I-B. Acceptance was predicted to show faster pain recovery as assessed by pain intensity, unpleasantness and distress ratings relative to both distraction and suppression, with distraction intermediate between suppression and acceptance.

Hypothesis I-C. Differential pain recovery effects were predicted to extend to 120 seconds (two minutes) post-tolerance.

Hypothesis I-D. Acceptance was predicted to show normalization of time distortion effects as (assessed by a ratio variable of estimated tolerance over actual tolerance) relative to both distraction and suppression.

Hypothesis I-E. Acceptance was predicted to show normalization of time distortion effects as assessed by the temporal speed estimate variable relative to both distraction and suppression, with distraction intermediate between suppression and acceptance.

Hypothesis 1-F. Acceptance was predicted to show higher post-intervention pain coping self-efficacy ratings relative to suppression, with distraction taking an intermediate position between acceptance and suppression.

Study II: The Effects of Acceptance and Control-Based Coping Self-Regulatory Strength Depletion

Rationale for Study II

One hypothetical consequence of avoidant control-based coping strategies involves a putative energy cost. In fostering disengagement from such strategies acceptance-based interventions may result in a measurable saving in the energy cost of coping as indicated by decreases in so-called "ego depletion" effects (Baumeister, Muraven & Tice, 1998) relative to control-based coping. Study II tested this hypothesis by examining the impact of an acceptance intervention and control-based coping strategies for cold pressor pain on a subsequent self-regulatory strength depletion task, specifically a multiplication persistence task which has previously been shown to be sensitive to the effects of prior depletion (Tyler & Burns, 2008). In Study II it was hypothesized that the greatest ego-depletion effects would be observed for the suppression condition, given previous evidence that thought suppression has been shown to consistently result in decrements in performance on subsequent self-regulation tasks (Baumeister et al., 1998). Distraction was hypothesized to engender an intermediate cost, as it requires an individual to maintain focus on a peripheral distracting task against a very persistent, compelling and salient stimulus (i.e., cold pressor pain). This cost may be partially offset by the fact that on-line distraction may partially mitigate the effects of ego-depletion (Alberts et al., 2008). Acceptance was

hypothesized to show the least ego depletion effects for at least two possible reasons: First, acceptance was hypothesized to promote disengagement from attempts to control or avoid pain experience, lessening the energy cost; second, he adoption of an accepting, welcoming stance toward pain experience, the "defusion" and dissociation of verbal rules from non-productive coping actions, and the instigation of commitment to a singular goal of maintaining pain tolerance, should result in a lessening of participant's effortful struggling against the urge to withdraw their forearm from the pain of the cold pressor, and therefore also decrease the energy cost of active self-control required for the cold pressor task itself.

General Hypothesis: Study II

Acceptance was predicted to result in reduced ego depletion effects relative to control-based interventions of suppression and distraction, with suppression showing the greatest evidence of ego-depletion followed by distraction and acceptance with the least.

Hypothesis II-A. The greatest degree of persistence in solving math problems was expected for acceptance (despite the fact that participants in the acceptance condition were also predicted to have longer pain tolerance times (and theoretically have exacted a greater overall energy cost in maintaining arm cold-water immersion). The shortest math persistence times were expected for suppression while distraction was hypothesized to take an intermediate position between suppression and acceptance.

Method

Participants: Study I and Study II

Study I Sample. A total of 640 undergraduate psychology students in the University of Manitoba Psychology Department Participant Pool took part in initial screening for Study I. Of this total, 267 volunteered for an experimental session via the web-based Participant Pool. Fifty-two participants (19.5%) were excluded because of high baseline pain tolerance levels (i.e., pain tolerance above a threshold of five minutes). One participant failed to complete the study. Two participants were excluded because they were not native speakers of English. One participant was excluded because of a recent dominant forearm injury. One participant was excluded because a metal implant from a previous injury influenced sensory experience of cold. In all there were 210 participants in the Study I sample prior to data screening, including eighty-four men and one hundred twenty-six women.

Study II Sample. A total of 314 undergraduate psychology students in the University of Manitoba Psychology Department Participant Pool participated in initial screening for Study II. Screening for Study II was carried out via an on-line survey web site (Survey-Gizmo). Students who completed on-line screening questionnaires and attended experimental testing sessions were awarded participant pool credits for participation. Of the initial sample of 314 participants a total 244 signed up for the first testing session (baseline

cold pressor). Thirty-eight of these participants (15%[7]) were excluded from completing Study II because of high baseline pain tolerance levels (i.e., pain tolerance above a threshold of five minutes). One participant declined to participate in the second part of Study II study. In all 205 participants completed Study II. The average age of participants was 19.6 (SD = 2.6 years). There were 86 men and 119 women in the Study II sample prior to data screening.

Apparatus

Cold Pressor. Pain induction was accomplished via a standard cold-pressor apparatus consisting of a plastic camping cooler filled with ice-chips and water. For both Study II and I water temperature was maintained at 2.5 - 4.5 degrees Celsius. Water temperature was monitored using a digital thermometer. Ice was added to the cooler on an as-needed basis to maintain water temperature. A fish-tank water pump ensured constant water circulation. Water was also changed regularly to maintain hygiene. An identical cooler filled with room temperature was utilized for skin temperature stabilization prior to cold pressor immersion and for practicing pain experience ratings.

[7] Relative to previous studies (Hayes, Bisset, et al., 1999; Masedo & Esteve, 2007) the rate of exclusion of high tolerance participants was relatively low (in these studies rates were 58% and 42.8%, respectively).

Study I and Study II Screening Measures

All participants were screened for previous, current or past history of chronic pain, recent physical injury to the dominant or non-dominant forearm and medical conditions (e.g., Reynaud's disease, hypertension, arthritis) which would exclude participation due to higher medical risk or bias results. To minimize the likelihood of participants having difficulty understanding the video interventions non-native English speakers were also excluded. Exclusion criteria were included in the advertisement for the experiment, consent forms and in a questionnaire filled out prior to participation (see Appendix A).

Study I Screening: Psychometric Measures

Participants were also screened to allow for assessment of trait or dispositional variables relevant to the experience of pain and the process of acceptance. The purpose of this screening was to insure that intervention groups did not differ with respect to these variables. The screening instruments included:

Dispositional Mindfulness. Of the 180 participants in Study I, 154 completed a self-report measure of dispositional mindfulness, the Mindful Attention Awareness Scale (MAAS) developed by Warren-Brown and Ryan (2003). This 15-item scale utilizes items indexing the absence of mindfulness (e.g., "I find it difficult to stay focused on what's happening in the present") and has adequate reliability (Cronbach's Alpha = .86 for a community

sample; Cronbach's Alpha = .81 for Study I sample). A modified state version of the MAAS has been shown to effectively capture changes due to a mindfulness-based intervention in cancer patients and as a trait measure the MAAS appears to be a valid and reliable index of dispositional mindfulness (Warren-Brown & Ryan, 2003; see Appendix A).

Pain Catastrophising. Of the 180 participants in Study I, 155 completed the Pain Catastrophising Scale (PCS). The PCS is 13-item scale measuring an exaggerated, negative orientation toward painful or noxious stimuli (Sullivan, Bishop & Pivik, 1995). The PCS is thought to consist of three sub-components (rumination, magnification and helplessness) and has been shown to have good reliability (Cronbach's Alpha = 0.93; Osman et al., 1997; Cronbach's Alpha = .92 for total PCS score in the Study I sample). Examples of items from the scale: Rumination: "I anxiously want the pain to go away"; Magnification: "I keep thinking of other painful events"; Helplessness: "It's awful and I feel that it overwhelms me" (see Appendix A).

Anxiety Sensitivity. Of the 180 participants in Study I, 151 completed a self-report measure of Anxiety Sensitivity, which is defined is the fear of anxiety-related bodily sensations and cognitions, arising from the belief that such sensations may have harmful consequences, or that anxiety-related cognitions augur loss of control (Reiss, 1991). The Anxiety Sensitivity Index (ASI) is a 16-item self-report measure assessing three different factors: fear related to physical concerns, mental incapacitation concerns, and social

concerns (see Appendix A). The ASI is the most widely used measure of the anxiety sensitivity construct and its reliability and predictive validity are well established (Petersen and Reiss, 1992). Cronbach's Alpha for the total ASI score in Study I sample was: .84.

Study II Screening Measures.

Study II screening involved the same measures as Study I as well as a trait measure of self-control: the Self-Control Scale (SCS; Tangey, Baumeister & Boone, 2004). The SCS is a 36-item scale measuring self-report of behaviours presumed indicative of dispositional self-regulatory competence (see Appendix A). The SCS has been shown to have good reliability (Cronbach's Alpha = 0.89; Cronbach's Alpha = .80 in the Study II sample) and to be related to higher GPA and self-esteem, better personal skills and lower reports of binge eating and alcohol abuse. SCS scores are related to performance on behavioural indices of self-control, such as the cold pressor test (Schmeichel & Zell, 2007).

Self-Report Measures, Study I

Four self-report measures were used as indices of variables in Study I. All of these measures are outlined below and presented in Appendix B.

Self-Report Measure 1: Visual Analogue Scale (VAS) Pain Intensity, Distress and Unpleasantness

Pain experience was assessed using measures of: pain intensity, pain unpleasantness, and distress. Participants rated each of these using a

visual analogue scale (VAS) a common and reliable method for assessing pain (Eggebrecht, Bautz, Brening, Pfingsten & Franz, 1989). Participants made a vertical mark through a 75-millimeter horizontal line anchored at: "no (intense, unpleasant, distressing) at all" to "extremely intense," "extremely unpleasant" or "extremely distressing" (see directly below and in Appendix B).

PAIN INTENSITY

No pain at all _____ **Extremely Intense Pain**

Self-Report Measure 2: Retrospective Duration Judgments

After reaching post-intervention tolerance participants gave a written estimate in minutes and seconds of how long they kept their arm in the cold water (See Appendix B).

Self-Report Measure 3: Retrospective Temporal Speed

Participants made a retrospective estimate of temporal speed during the post-intervention cold pressor after they had reached tolerance. They were asked to retrospectively rate the speed at which time seemed to pass during the cold pressor task, where the ratings were anchored at 10 (time seemed to: "fly by very quickly)"; 0 (time seemed to: "slowed to a standstill," and 5 (time seemed to: "move by at its usual speed"; see Appendix B).

Self-Report Measure 4: Pain Coping Self-Efficacy

Participants rated their confidence that they could withstand a future immersion of their forearm in ice water for a longer time than previously, using an anchored rating scale; 0 (Not confident at all) and 100 (Extremely confident; see Appendix B).

Self-Report Measure 5: Assigned Strategy Effectiveness

At the end of the experiment, participants rated the effectiveness of the intervention to which they had been assigned using an 11-point scale (this measure was included with manipulation and compliance checks; see Appendix E).

Objective Measures, Study I

Pain Tolerance

Pain tolerance measured in minutes and seconds was used as an objective measurement of coping effectiveness in both Study II and Study I.

Self-Report Measures, Study II

For Study II all Study I self-report measures were retained including: Temporal Speed (see description in Study I, and Appendix B) Retrospective Duration Judgment (see description in Study I, and Appendix B); Pain Coping Self-Efficacy Ratings (see Appendix B). These measures were retained in order to potentially allow for replication of results using a slightly different experimental design and conditions. In Study II pain experience was assessed using a slightly different procedure and different measures than in

Study I (see next section, directly below). Self-efficacy was also assessed using a slightly different method (see Appendix B).

Study II Visual Analogue Scale (VAS) of Pain Intensity

For Study II only VAS ratings of pain intensity were assessed. Three ratings were made: at pain tolerance and then at two subsequent sixty-second post-tolerance intervals. Therefore, for Study II, VAS measure of pain intensity was assessed at tolerance (T = 0), at sixty seconds post tolerance (T = 60) and 120 seconds post pain tolerance (T = 120). The VAS rating scale used in Study II is presented in Appendix B.

Additional Self-Report Measures Study II

Fatigue Ratings

After completing the baseline and post-intervention cold pressor tests, participants in Study II rated fatigue level using a 7-point scale (see Appendix B) to assess whether observed ego depletion effects were accompanied by self-report of fatigue as has been observed in previous studies (Muraven, Tice & Baumeister, 1998).

Objective Measures Study II

Pain Tolerance

As In Study I, pain tolerance time was an objective measure of pain coping effectiveness.

Ego Depletion Task and Measures

The task used to assess ego depletion effects was a multiplication persistence task shown to be sensitive to the effects of prior ego depletion (Tyler & Burns, 2008). In this task participants are presented with a sheaf of complex (3 digit X 3 digit) multiplication questions and are asked to work at them for as long as they wish to. The rationale behind this task is that the work of completing many multiplication questions is boring, tedious and somewhat frustrating and that the effect of prior ego depletion on self-control is reflected in a tendency to give up on the task, that is a failure to persist. Previous research has shown that most depleted participants tend to give up long before either a ceiling time of 30 minutes (Vohs & Heatherton, 2000; Vohs, Ciarocco & Baumeister, 2005) or 20 minutes (Tyler & Burns, 2008) is reached.

Manipulation and Compliance Checks, Study I and II

Participants completed a series of checks designed to assess compliance with assigned intervention strategy and to gather information concerning unassigned strategy use and spontaneous baseline strategy use. Data on multiple strategy use was deemed important to the interpretation of intervention. The video intervention in this study was a somewhat novel approach to intervention delivery; therefore it was deemed important to collect comprehensive data on compliance.

Post-Experimental Intervention Recall

As a qualitative post-experiment check, participants were asked to write down as much as they could recall of the intervention instructions to assess whether they paid attention to the video and understood the basic thrust of their assigned intervention.

Strategy Use

Participants read descriptions of each of the three possible intervention strategies (acceptance, distraction and suppression) and rated their use of each of the three possible strategies during the post-intervention cold pressor on an 11-point scale anchored at 0 (“never used the strategy”) and 10 (“constantly used the strategy”). This was a general measure of compliance with the video tutorial and instructions and a means of assessing unassigned strategy use. It was expected that in each of the three intervention conditions participants would report using the intervention they had been assigned and taught more consistently than the other two unassigned intervention strategies.

Strategy Application

Participants rated the ease of application of their assigned strategy using an 11-point scale, where 0 was anchored at “never able to apply my strategy”) and 10 was anchored at “constantly able to apply my strategy” (see Appendix E).

Forced Choice Assigned and Unassigned Strategy Use

A subset of the participants in Study I (Primary, N = 123, Secondary and Tertiary, N = 121) and all of the participants in Study II (N = 190) indicated which of the three possible strategies represented their primary, secondary and tertiary choice irrespective of their assigned strategy (see Appendix E).

Spontaneous Baseline Strategy Use

Participants recalled strategy use during the adoby during the baseline. Responses were recorded on data sheets. For Study II participants read and answered a question in writing (see Appendix B).

Additional Manipulation and Compliance Checks, Study II

Effort Ratings, Study II

All participants in Study II completed the same manipulation and compliance checks as participants as in Study I and an additional assessment of the amount of effort put in to the assigned coping strategy, as well as into the two (unassigned) coping strategies (after having read written descriptions of all three strategies). Effort ratings were deemed to be of importance as an additional measure of compliance and check on intervention balance. Effort ratings were made using on an 11-point scale, where 0 = ‘no effort at all’ and 10 = ‘maximum effort’.

Spontaneous Baseline Strategy Use, Study II

For Study II, the baseline and post-intervention cold pressor tests took place in separate sessions on different days; therefore, baseline strategy use could be assessed at the end of the baseline session and prior to assignment to intervention condition or exposure to manipulation and compliance checks.

Debriefing

After completing the manipulation and compliance checks all participants were thanked and debriefed. Because the experiment was ongoing, participants were not given a complete explanation of hypotheses during debriefing. Instead they were given a general outline of the purpose of the study and told when and where they would be able to pick up a detailed summary of the results at a later date (see Appendix D).

Intervention Design: Study I and Study II

The experimental interventions consisted of two control-based (suppression, distraction) and one acceptance-based intervention presented via video monitor (Study I) or via computer monitor (Study II). The three interventions were developed by the principle investigator based upon ACT interventions used in previous studies (Zettle, et al., 1999, Gutierrez, Luciano, Rodriguez & Fink, 2004; Masedo & Esteve, 2007), and recorded and edited on DVD-video by the author for video presentation to participants for individual testing. The interventions were recorded on DVD for two reasons: to minimize random error from changes in the presentation across participants and to make it possible for undergraduate research assistants to assist in individual testing

of participants. The primary goal of intervention design was to create intervention scripts that were experiential and interactive. This was deemed to be especially important given that the experiential/metaphoric ACT interventions seek to cause change through contact and engagement with the metaphors themselves and potentially require a degree of experiential involvement for effectiveness (Eifert & Heffner, 2003).

Interventions

All three intervention scripts had a 4-component structure consisting of: 1) Introduction and brief rationale, 2) Description of interventions, 3) Interactive/experiential component (involving actively practicing/engaging with, a coping strategy or with key concepts of a coping strategy), 4) Summary and conclusion. The introduction and rationale segment of all three interventions presented each strategy as a useful and effective approach to coping with distressing thoughts, feelings, or sensations, generally, as well as those related to pain. The summary-and-conclusion segment of each intervention incorporated a “Swamp Metaphor” adapted from Hayes & Strosahl (1999). The swamp metaphor, as originally conceived by Hayes and colleagues, is a metaphoric injunction designed to promote focus on a desired goal (i.e., a valued goal attained by crossing an unpleasant swamp, or in the present case, keeping the arm in the cold water for as long as possible) and to foster acceptance and willingness to welcome and allow distressing thoughts feelings, and sensations to pass through awareness

without focusing undue attention upon them while focusing on that goal. In Study I the swamp metaphor was altered in the distraction and suppression conditions to cultivate a focus on task-specific aspects of the interventions rather than acceptance of thoughts, feelings and sensations. For Study II a modified version of the original swamp metaphor with a less powerful goal/commitment focus was used in the acceptance, distraction and suppression conditions.

Acceptance Intervention Design. The acceptance script incorporated ACT metaphors selected to facilitate disengagement from control-based strategies and an open, willing, welcoming, mindful stance towards pain experience (Hayes & Strosahl, 1999; see Appendix C). The acceptance-based intervention script used the following three ACT principles delivered via experiential and metaphoric vehicles. Principle 1) The tendency to escape and avoid distressing thoughts, feelings and sensations is part of the problem when trying to cope with such thoughts, feelings and sensations, as attempts at control exacerbate distressing thoughts, feelings, sensations. This was demonstrated interactively and experientially for each participant by presenting, describing and having participants experience a Chinese Finger Trap (Eifert, & Heffner, 2003). Principle 2) Choiceful Willingness is a solution to the problem of escape and avoidance. This principle was communicated through the ACT “Willingness Scale Metaphor” which was narrated on video (Hayes, Strosahl & Wilson, 1999). Principle 3) Thoughts and feelings are not

"reasons" for behaviour. This was presented via the "Passengers on a Bus Metaphor" (Hayes Strosahl & Wilson, 1999). The acceptance script concluded with the ACT "Swamp Metaphor" which emphasized the importance of focusing on a valued goal while allowed distressing or aversive internal experiences to exist and pass through awareness.

Distraction Intervention Design. The distraction intervention script had the following design components: 1) Rationale: moving attention away from distressing thoughts, sensations and feelings by distracting the self with something pleasant can bring relief from pain. 2) Intervention: Participants selected a memory of a pleasant event to mentally replay during the pain task, and wrote it down (thus creating a personal script and encoding that script in memory). In order to increase the likelihood of their applying the task vigorously, participants were urged to choose an event that: could be re-imagined over a period of time, was rich in sensory details, and emotionally positive. The approach of using mental imagery as opposed to, for example, a vigilance task was deemed to be appropriate given that the use of such imagery has been demonstrated to be as effective as using an actual event or experience as a focus for distraction (McCaul & Mallott, 1984). 3) Participants were then asked to mentally practice re-imagining the event they had written down, as if it was a "movie in your mind" 4) The distraction script, like the other scripts ended with a modified "Swamp Metaphor," in which participants were urged to distract themselves from distressing thoughts

feelings and sensations as a means to attain the valued goal of keeping their forearm in the cold water for as along as they were able (See Appendix C). For Study II, a modified version of the swamp metaphor was used which was designed to somewhat reduce the goal focus and increase participant's focus on, and use of the distraction task (see Appendix C).

Suppression Intervention Design. The suppression intervention was based upon the thought-stopping procedure adapted by Masedo and Esteve (2007). The intervention had the following components: 1) Introduction and rationale: In the rationale, suppression was described as a natural and spontaneous way that people cope with distress, and thought stopping was presented as a well-used and effective clinical technique that participants could learn and utilize to suppress distressing thoughts, feelings and sensations systematically, as those thoughts, feelings and sensations appeared in awareness; 2) The thought-stopping technique was demonstrated on the video followed by participant practice (aloud and silent) using neutral thoughts; 3) Participants practiced thought stopping using experimenter-narrated pain-related thoughts; 4) Participants were presented with the modified swamp metaphor where they were enjoined to use suppression to facilitate the goal of keeping their arm in the cold water for as long as possible (see Appendix C). For Study II a modified version of the swamp metaphor was used which was designed to somewhat reduce the goal focus and increase participant's use of the actual suppression task (See

Appendix C). The length of each script was: Acceptance, 21 minutes; Distraction 19 minutes; and Suppression, 18 minutes.

Experimental Design and Analysis

Study I Design and Analysis

Study I involved a pre-to-post interposed intervention design incorporating a baseline cold pressor task, followed by assessment of baseline dependent variables, then by random assignment to one of the three interventions (suppression distraction, acceptance). Participants were screened for medical problems and completed screening measures relevant to acceptance and control-based coping prior to baseline. Participants with pain tolerance higher than a pre-set threshold of five minutes were excluded from further participation and their baseline data was not used. Participants who did not exceed the pre-set threshold of five minutes pain tolerance completed the second part of Study I immediately after completing the baseline cold pressor. After assignment to intervention condition, they viewed a video intervention followed by a post-intervention cold pressor and then assessment of post-intervention dependent variables. For both Study II and I time-related dependent measures (retrospective temporal speed, and retrospective duration judgments) were assessed only once, after the post-intervention cold pressor. The temporal variables were assessed only a single time, after the interventions as a baseline assessment might have alerted participants to be aware of time during the experiment and thus

biased post-intervention time estimates and ratings. For the same reason, pain intensity, distress and unpleasantness ratings were not assessed during the cold pressor as the regular assessment intervals could cue participants to focus on time. All other dependent variables, including pain tolerance, VAS pain intensity, unpleasantness and distress ratings, pain coping self-efficacy ratings were assessed after both the baseline cold pressor and after post-intervention cold pressor. For statistical analysis of post-intervention between-subjects effects, the baseline measurements served as covariates for analysis of covariance procedures as has been the practice in previous studies (Hayes et al., 1999) Masedo & Esteve, 2007). Hypotheses related to these variables were assessed using fully between-subjects analysis of variance procedure with two between-subjects factors, sex and intervention condition (see Figure 1).

Study II Design and Analysis

Variables assessed for replication in Study II were analyzed using the same procedures as in Study I. The multiplication persistence variable was assessed as a post-intervention variable and therefore hypotheses related to multiplication persistence were assessed with a completely between-subjects analysis of variance procedure with multiplication persistence as the dependent variable and intervention condition and sex as the between-subjects factors (see Figure 1).

Figure 1

Design and Procedures for Study I and Study II

STUDY I	STUDY II
Mass screening (groups of 30-50) Interval: 8-12 weeks On-line sign-up for Experimental Session	On-line screening and on-line sign-up for Baseline Cold Pressor Interval: 1 week
<u>Part 1:</u> Baseline Cold Pressor Pre-Int. Assessment of DV's	<u>Session 1:</u> Baseline Cold Pressor Pre-Int. Assessment of DV's
Interval: 5-10 minutes	Interval: 1 week
<u>Part 2:</u> Assignment to Condition Video Intervention (Acceptance/Suppression/Distraction)	<u>Session 2:</u> Assignment to Condition Video Intervention (Acceptance/Suppression/Distraction)
(Interval: 20 minutes)	(Interval: 20 minutes)
Post-Intervention Cold pressor	Post-Intervention Cold pressor
Post-Int. Assessment of DV's Manipulation Checks Debriefing	Post-Int. Assessment of DV's Ego depletion DV Manipulation Checks Debriefing

While the design of Study II was essentially the same as Study I, the procedure for Study II diverged from Study I in one way: the pre- and post-intervention cold pressor tests were not carried out in the same session but on different days, usually a week apart (see Figure 1). The cold pressor test is in itself an ego depletion task requiring that participants resist the powerful urge to remove their arm from pain-inducing cold water (Schmeichel & Zell, 2007). As such, there was some concern that having participants carry out two cold pressor tasks in one experimental session might be too fatiguing and result in ceiling effects for self-regulatory strength depletion, masking any

between-group differences due to acceptance versus control-based coping. Therefore, the baseline cold pressor test and post intervention cold pressor test were carried out in different sessions. As the design of Study I and Study II were similar they afforded the opportunity to replicate of Study I hypotheses under slightly different experimental conditions. Therefore, results for each independent variable from Study I and Study II are reported together for comparison purposes. Specific procedural differences in Study I and Study II are outlined in the methods section below.

Procedure

Study I Screening

Participants signed up for group screening through the web-based participant pool at the University of Manitoba. Large groups of participants (30-50 participants at a time) completed a consent form (see Appendix A) and screening measures.

Study II Screening

For Study II, a consent form and four screening questionnaires (MAAS, ASI, PCS, SCS) were delivered via a web-based survey application (Survey-Gizmo).

Study I Individual Testing

Eight to twelve weeks after the start of preliminary screening participants signed up via web-based participant pool for the second part of a study examining “Stress and Coping Styles.” The principle investigator and a

male research assistant trained by the principle investigator and blind to the hypotheses of the study ran all sessions. Due to resource limitations it was not possible to randomize or counterbalance gender of testers. During Study II and I, deliberate care was taken to minimize and formalize interactions with participants, especially during the cold pressor tests to minimize experimenter demand effects that may differentially influence acceptance-based interventions (Roche, Forsyth & Maher, 2007). The experimenters minimized eye contact and assumed a neutral body posture during the cold pressor test to offset any possibility of cuing or influencing tolerance times. For Study II, experimenters were out of view, behind the participant, during the cold pressor.

Upon arrival at the testing room all participants filled out a screening questionnaire to insure that they had no previous or current medical conditions or other factors (e.g., recent injury) which would incur risk to their safety or health, or exclude them from participation in the individual testing (see Appendix A). After reading and co-signing a consent form participants were invited into the research room and asked to place any jewelry or watches in a sealed container. This was done in part to prevent water damage to valuables but more importantly to prevent participants from incidental awareness of *time* (e.g., by glancing at a wristwatch) prior to, during, or while making time-related judgments or estimates. All paper-and-pencil measures and/or written instructions were presented to the participant

in a binder and the participants were informed that the presentation of the open binder indicated that it was time for them to focus on the materials in the binder.

Visual Analogue Scale (VAS) Pain Rating Scales Practice. Seated next to an open cooler filled with room temperature water participants practiced the VAS pain intensity, unpleasantness, and distress ratings with a non-noxious stimulus--immersion of the non-dominant arm in room-temperature water. Participants were directed to immerse their arm in the water, the experimenter timed sixty seconds and then asked the participant to remove their arm from the water and then to make two ratings of the three VAS variables at two subsequent intervals (60 seconds and 120 seconds post-tolerance).

Baseline Cold Pressor (No Intervention). Prior to the baseline cold pressor participants immersed their non-dominant forearm in room-temperature water for two minutes in order to normalize skin temperature. Next, participants were seated beside a second cooler containing the ice water slurry and listened to instructions (see Appendix D) indicating that when the experimenter said ‘start’ they were to immerse their non-dominant forearm in the ice water for as long as possible. In order to increase motivation to persist at the task all participants were informed that the longer they held their arms in the water the likelier it would be that experimental data would be useful in assisting individual with chronic pain. This type of

admonition was used in a previous study to cultivate commitment prior to participants enduring a series of escalating painful electric (Gutierrez, Luciano, Rodriguez & Fink, 2004)[8]. It was also emphasized to participants that they had complete control of forearm immersion and utterly free to withdraw their forearm from the cold water at any time during the experiment. The experimenter recorded the elapsed time from initial immersion to arm withdrawal from the ice water with a digital stopwatch as an index of pain tolerance.

A ceiling of five minutes was observed for the baseline cold pressor and participants who reached this limit were directed to terminate immersion. Baseline tolerance times of five minutes and over were assumed to reflect high pain tolerance levels and these participants were excused from the study. The five minute ceiling was imposed to increase the power of the experimental interventions, the assumption being that the interventions were designed for individuals for whom tolerating pain was difficult; and that individuals with high pain tolerance would likely not require the interventions nor necessarily utilize them (Hayes, et al., 1999; Masedo & Esteve, 2007). A pain tolerance ceiling of six minutes was imposed for the post intervention cold pressor test. The post-intervention threshold was set higher than the

[8] This type of commitment admonition may have been so powerful for the shorter, more acute cold pressor task as to partially overwhelm condition effects and was therefore eliminated from the three interventions for Study II.

baseline threshold (i.e., at six minutes) in order to capture intervention effects.

Post Baseline Cold Pressor Visual Analogue Scale Pain Ratings. After reaching baseline tolerance participants completed VAS scales of pain intensity, unpleasantness and distress at post tolerance intervals of 60 seconds and 120 seconds.

Post Baseline Cold Pressor Self-Efficacy Rating. After completing the VAS ratings, participants were presented with instructions and ratings scales to assess perceived pain coping self-efficacy and provided a written rating (Measures section above, and see Appendix A)

Video Interventions and Post-Intervention Cold Pressor. After completing the baseline cold pressor and prior to the post-intervention cold pressor, participants viewed a DVD-video presentation of one of three sets of intervention instructions corresponding to Acceptance, Distraction or Suppression intervention strategies. Prior to watching the video participants were asked to leave the research room while the experimenter set up the room and inserted the assigned video into the DVD player. Participants were invited back into the room and told their task for the next twenty minutes was to watch and learn as much as possible from the video so they would be able to apply what they learned during the next cold pressor. The experimenter then left the participant alone in the room to watch the video intervention. After viewing the video each participant underwent a second cold pressor.

Prior to the second cold pressor the experimenter explicitly instructed participants to use what they had learned in the video they had watched to cope with the upcoming cold pressor.

Post Intervention Cold Pressor Retrospective Duration Ratings. Immediately after reaching pain tolerance, participants were asked to estimate the amount of time (in minutes and seconds) their forearm had been immersed in the cold water. Participants read instructions and recorded their estimate on a provided form (see Appendix D).

Post Intervention Cold Pressor Temporal Speed Rating. Immediately after making the retrospective time rating, and on the same form in the blue binder, participants were asked to estimate and rate the speed at which time seemed to pass during the post-intervention cold pressor. This was done using the 11-point scale (see 'Measures Section, above or Appendix A). Participants circled a number on the 10-point scale to indicate their retrospective rating of temporal speed during the post-intervention cold pressor.

Post Intervention Cold Pressor Pain Experience Ratings. After completing the two time-related measures participants made VAS ratings of pain intensity, unpleasantness and distress at intervals 60 seconds and 120 seconds.

Post Intervention Cold Pressor Pain Coping Self-Efficacy Rating. After completing the time-related measures and VAS indices of pain experience

participants made a second rating of their perceived self-efficacy to withstand a future cold pressor test. This involved rating the same self-efficacy statement used after the baseline cold pressor (see Experimental Measures, above, and Appendix A).

Manipulation and Compliance Checks and Debriefing. After the last experimental ratings scale participants were directed to work through the manipulation and compliance check ratings at their own pace, including ratings of assigned and unassigned strategy use, assigned strategy application, forced-choice primary, secondary and tertiary strategy ratings, and for Study II, effort. For both Study II and Study I an additional dependent variable was also collected at this time: assigned strategy effectiveness. Once completed, participants were debriefed and thanked for their participation.

Study II Individual Testing

One to two weeks after completing on-line screening questionnaires, participants took part in a fifteen-minute long baseline session during which they were instructed in pain experience ratings and underwent the baseline cold pressor. The principle investigator and a male research assistant trained by the principle investigator and blind to the hypotheses of the study carried out all individual testing. As in Study I care was taken to minimize and formalize interactions with participants, especially during the cold pressor tests. As in Study I, after arrival at the testing room all participants filled out a

screening questionnaire for previous or current medical conditions or excluding factors. After reading and co-signing a consent form, participants were invited into the research room and asked to remove any jewelry or watches and to place these in a sealed container.

Visual Analogue Scale (VAS) Pain Rating Scales Practice. Participants practiced VAS ratings for pain intensity by immersing their non-dominant forearm in room-temperature water. After one minute the experimenter asked the participant to remove their arm from the water and to make three VAS ratings, an initial rating, and then two more ratings at intervals of 60 seconds.

Baseline Cold Pressor (No Intervention). Study II involved the same procedure for the baseline cold pressor as Study I. As in Study I, a ceiling of five minutes was observed for baseline cold pressor immersion and participants who reached this limit were directed to terminate immersion and excused from further participation in the experiment. As mentioned above, instructions for the baseline cold pressor were altered for Study II to de-emphasize commitment and goal-focus (see Appendix D).

Post- Baseline Cold Pressor Visual Analogue Scale Pain Ratings. After attaining baseline tolerance each participant completed pain intensity VAS rating scales. Participants made pain intensity ratings at: tolerance = 0, and at subsequent intervals of 60 seconds and 120 seconds post-tolerance.

Post-Baseline Cold Pressor Self-Efficacy Rating. This involved the same materials and procedures as in Study I.

Post-Baseline Cold Pressor Fatigue Rating. After completing the baseline self-efficacy measure, participants made a fatigue rating using the 7-point scale (see Appendix B).

Baseline Spontaneous Strategy Assessment. Participants indicated on a form provided whether they had used a coping strategy during the baseline cold pressor. If they had used a strategy they were asked to provide a written description.

This marked the end of the baseline testing session. At this point each participant made an appointment to return to complete the second testing session.

Video Intervention and Post-Intervention Intervention Cold Pressor. One week to ten days after completing the baseline cold pressor test participants returned for a second testing session. Upon arrival at the testing room participants completed and co-signed a consent form outlining basic experimental procedures and experiences as well as medical exclusion criteria (See Appendix A). Participants then viewed a DVD-video presentation of one of three sets of intervention instructions corresponding to acceptance, distraction or suppression intervention strategies. For Study II participants viewed the video interventions on an 18” iMac computer screen.

After viewing the video each participant underwent the post-intervention cold pressor. Instructions, materials and procedure for the post-intervention cold pressor were the same as in Study I, with the exception that an additional element was added to the cold pressor instructions where participants were asked explicitly to take a few moments to think back and reflect upon what they had learned on the video and how they were going to apply it during the cold pressor task. This was done to help focus participants more explicitly on using their assigned strategy during the post-intervention cold pressor.

Post Intervention Cold Pressor Pain Intensity Rating, Tolerance = 0. After reaching tolerance participants completed the first VAS pain intensity rating at Tolerance+0 seconds and then the two temporal measures. One minute elapsed between completion of the initial VAS rating and the second pain intensity VAS ratings at 60 seconds post-tolerance. All participants had sufficient time to complete the temporal measures within that time interval.

Post Intervention Cold Pressor Retrospective Duration Judgments and Temporal Speed Ratings. These involved the same materials and procedures as in Study I.

Post-Intervention Cold Pressor Pain Intensity Rating, 60 and 120 second post-tolerance. After completing the temporal measures participants made two additional VAS pain intensity ratings at intervals 60 seconds and 120 seconds post tolerance.

Post Intervention Cold Pressor Pain Coping Self-Efficacy Rating. This measure involved the same instructions as in Study I. However, instead of marking a rating scale with 10-point gradations from 0-100 participants were asked to write down a rating between 0-100. The objective of this was to allow for greater variability in ratings (i.e., more than 10-point gradations; see Appendix B).

Post Intervention Cold Pressor Fatigue Rating. After completing the post-intervention self-efficacy measure, participants made second a fatigue rating using the 7-point scale (see Appendix B).

Post Intervention Cold Pressor Ego Depletion Task. After completing the fatigue rating participants were presented with a three-quarter inch thick sheaf of sheets of multiplication problems[9]. Upon each sheet of paper were twenty 3 digit x 3 digit multiplication problems (see Appendix D). Participants were told that the experiment was over and that the experimenter was collecting data on a new task that involved completing math problems. Participants were instructed to work on the math problems for as long as they wished to and that when they wished to stop they were to open the door of the lab room and inform the experimenter, who would be seated in the hallway. Usually, no more than three minutes elapsed between the time

[9] Usually less than three minutes elapsed between reaching post-intervention pain tolerance and starting the math persistence task. The break between the post-intervention cold pressor and the start of the math persistence task was kept to a minimum to mitigate the possibility that ego depletion effects would dissipate. Time is a factor in this kind of experiment as some ego depletion effects have been shown to decrease after a period of about ten minutes given optimal circumstances (Tyler & Burns, 2008).

participants reached post-intervention tolerance and completed pain experience, temporal and fatigue ratings, and were seated at the table to start working on the multiplication persistence task. When the participant opened the door of the room the experimenter stopped timing and recorded the elapsed time. The time that participants spent working on the math problems was used as an index of general persistence or self-regulatory strength depletion.

Manipulation and Compliance Checks. Participants worked through manipulation checks of assigned and unassigned strategy use, application and assigned and unassigned strategy effort, forced-choice primary, secondary and tertiary strategy ratings, as well as an additional dependent variable, strategy effectiveness. Participants were then debriefed and thanked for their participation.

Chapter Four

Results

Chapter 4 includes a description of data screening and outlier analyses, a brief summary of statistical procedures, followed by presentation of the results of compliance and manipulation checks and assessment of spontaneous strategy use at baseline. This is followed by presentation of the results for the analyses of hypotheses related to key dependent variables of pain tolerance, pain experience, temporal variables, ego depletion and self-efficacy. As replication of results was a secondary goal of this research the Study II and Study I results for each dependent variable are presented together for comparative purposes.

Data Screening, Study I, Study II

Prior to data analysis pain tolerance, self-efficacy, temporal, pain intensity, distress and unpleasantness, and multiplication persistence variables were examined for accuracy of data entry, missing values, and fit of distributions to the assumptions of multivariate analysis. The baseline variables--those measured prior to random assignment to intervention condition, were examined without separating the data into intervention groups. Post-intervention measures were examined separately according to intervention group. One temporal variable, the retrospective duration judgment ratio underwent an additional outlier analysis. This is presented in

the text accompanying description of the data analysis and results for this temporal variable.

Study I Sample

The initial Study I sample consisted of 210 cases. The breakdown by intervention group was: acceptance (n = 78), distraction (n = 62) and suppression (n = 70).

Study I Data Screening

Thirty cases from the initial Study I sample of 210 participants were excluded due to extreme values. For variables measured at baseline, cases with variable z score greater than z = +3.00 or less than z = -3.00 were designated outliers. In the case of post-intervention scores (where group n's were less than n = 80) a more stringent criteria was used and cases with z score values of greater z = +2.5 or less than z = -2.5 were excluded (Schwab, 2002). Using these criteria, two cases were deleted due to excessively high baseline pain tolerance scores, one from the acceptance group and one from the distraction group. A total of five cases were excluded from the acceptance group due to extreme scores (> z = +2.5) on the retrospective time variable (two cases), low scores on the temporal speed variable and retrospective time variable (one case) and low scores on the baseline self-efficacy variable (one case) and post-intervention self-efficacy variable (one case). A single case was deleted from the distraction condition due to a low score on the retrospective time variable. A total of three cases

were deleted from suppression group, two due to high scores on the retrospective time variable, one due to high scores on the temporal speed variable, and one due to high scores on the retrospective time and temporal speed variable. Four cases were dropped due to high scores on baseline pain experience variables: one of these came from the acceptance condition and three from the distraction condition. Four cases were dropped from the acceptance condition, three from the distraction condition and three from the suppression condition due to extreme scores on the post-intervention pain experience variables (pain intensity, unpleasantness and distress). Additionally, three cases were dropped from the analysis due to unusually low scores on the baseline cold pressor. Although not technically statistical outliers, these cases had baseline cold pressor tolerances that were exceptionally low (less than 10 seconds) and raise doubts about their willingness or ability to adhere to the study requirements 'to keep your arm in the water for as long as possible'. Using Malanhobis distance with $p < .0001$, one additional case was deleted from the acceptance condition as a multivariate outlier. After exclusion of univariate and multivariate outliers, the n's for each intervention condition were as follows: acceptance ($n = 63$), distraction ($n = 54$) and suppression ($n = 63$) or $N = 180$ cases in total. Descriptive statistics for the screened data set of 180 participants is presented in Tables 1 and 2.

Table 1

Descriptive Statistics For Pain Tolerance, Self-Efficacy and Temporal Variables by Condition at Baseline and Post-Intervention for Study I (N=180)

		Baseline					Post-Intervention				
Variable	Cond.	Mean	Standard Deviation	Range	Skew	Std Error (Skewness)	Mean	Standard Deviation	Range	Skew	Std. Error (Skewness)
Pain Tolerance	Acc.	67.0	67.6	263.0	1.784	.302	161.5	125.8	342.0	.582	.302
	Dis.	77.8	71.2	361.0	1.617	.325	178.7	122.3	370.0	.439	.325
	Sup.	68.3	64.1	270.0	1.882	.302	168.2	123.8	345.0	.335	.302
Pain Coping	Acc.	64.1	23.4	90.0	-.690	.302	66.8	22.2	90.0	-.469	.302
Self Efficacy	Dis.	63.7	24.0	100.0	-.684	.325	63.6	25.6	90.0	-.331	.325
	Sup.	60.8	23.6	90.0	-.385	.302	58.6	26.7	90.0	-.241	.302
Temporal						Acc.	3.90	1.75	8.0	.371	.302
Speed						Dis.	4.29	2.27	10.0	.291	.325
Ratings						Sup.	3.34	1.78	8.00	.744	.302
Retrospective						Acc.	114.3	99.5	410.0	1.097	.302
Time						Dis.	124.7	95.3	325.0	.752	.325
Judgments						Sup.	112.8	90.15	356.0	.815	.302

Table 2

Descriptive Statistics For Pain Intensity, Distress and Unpleasantness by Condition at Baseline and Post-Intervention, Study I (N=180)

		Baseline					Post-Intervention				
Variable	Cond.	Mean	Standard Deviation	Range	Skew	Standard Error (Skewness)	Mean	Standard Deviation	Range	Skew	Standard Error (Skewness)
Pain Intensity	Acc.	27.4	17.9	75	.535	.302	31.5	18.6	76	.213	.302
(60 Seconds)	Dis.	27.2	19.6	73	.611	.325	26.0	18.6	69	.753	.325
	Sup.	28.4	18.4	74	.579	.302	31.7	20.7	75	.371	.302
Pain Intensity	Acc.	14.8	14.8	58	1.21	.302	18.9	15.5	58	.709	.302
(120 Seconds)	Dis.	12.8	13.6	51	1.079	.325	16.3	15.9	62	1.112	.325
	Sup.	13.3	15.0	61	1.69	.302	20.3	18.1	71	1.153	302
Pain	Acc.	36.7	19.8	75	-.065	.302	33.9	18.9	73	.129	.302
Unpleasantness	Dis.	38.8	18.9	68	.001	.325	30.8	18.9	73	.482	.325
(60 Seconds)	Sup.	39.4	21.4	75	-.169	.304	36.7	19.7	75	.028	.302
Pain	Acc.	20.8	17.7	63	.521	.302	19.8	15.9	58	.891	.325
Unpleasantness	Dis.	17.7	16.2	54	.813	.325	20.2	17.9	66	1.079	.325
(120 Seconds)	Sup.	18.44	17.7	73	1.297	.302	23.5	19.6	75	.869	.302
Pain	Acc.	20.9	20.5	75	.793	.302	21.7	19.2	69	.591	.302
Distress	Dis.	19.2	18.6	68	1.04	.325	14.8	16.6	61	1.361	.325
(60 Seconds)	Sup.	19.5	19.7	70	.846	.302	20.5	19.6	64	.756	.302
Pain	Acc.	11.2	15.6	54	1.457	.302	10.9	13.0	46	1.217	.302
Distress	Dis.	6.3	9.6	46	2.235	.325	9.5	13.7	60	1.80	.325
(120 Seconds)	Sup.	6.9	10.3	42	1.739	.302	10.9	15.3	61	1.79	.302

Study II Sample

For Study II, the initial sample consisted of 205 cases. The breakdown by intervention group was: acceptance (n = 73), distraction (n = 66) and suppression (n = 66).

Study II Data Screening

A total of fifteen cases with extreme scores were deleted. Four cases were excluded because of extreme values ($z > +3.00$) on the baseline pain tolerance measure: one from the acceptance condition, two from the distraction condition, and one from the suppression condition. One case was excluded from the distraction condition due to an extreme score on baseline pain intensity. One case was excluded from the acceptance condition and one case was excluded from the suppression condition due to extreme values on the initial post intervention pain intensity measure. Six cases were excluded due to high values on the baseline pain intensity measure taken at sixty seconds post tolerance, three from the suppression condition and three from the acceptance condition. Finally, a single case was excluded from the suppression condition due to an extreme value on the retrospective duration judgment variable. There were no multivariate outliers. Exclusion of the fifteen outliers from the sample left an experimental sample of 190 cases, with 67 cases in the acceptance condition, 63 cases in the distraction condition and 60 cases in the suppression condition. Descriptive statistics for the screened sample for Study II are presented in Tables 3 and 4.

Table 3

Descriptive Statistics For Pain Tolerance, Self-Efficacy, Fatigue Ratings and Time Variables for Three Intervention Conditions at Baseline and Post-Intervention for Study II (N=190)

		Baseline					Post-Intervention				
Dependent Variable	Cond.	Mean	Standard Deviation	Range	Skew	Std Error (Skewness)	Mean	Standard Deviation	Range	Skew	Std. Error (Skewness)
Pain Tolerance	Acc.	49.4	44.3	221.0	2.309	.293	159.9	138.2	344	.524	.293
	Dis.	58.3	48.7	222.0	1.778	.304	181.6	133.8	348	.223	.304
	Sup.	57.3	46.2	213.0	1.954	.309	139.0	122.7	351.0	.781	.309
Pain Coping Self Efficacy	Acc.	63.7	22.3	95.0	-.561	.293	65.1	25.6	100.0	-.518	.293
	Dis.	66.9	26.1	100.0	-.862	.304	63.8	25.0	100.0	-.457	.304
	Sup.	66.2	26.2	98.0	-.971	.309	55.6	31.4	100.0	-.230	.309
Fatigue Ratings	Acc.	2.94	1.56	6	.376	.293	3.14	1.63	6	.245	.293
	Dis.	2.98	1.41	5	.278	.304	3.27	1.59	7	.668	.304
	Sup.	2.73	1.63	6	.595	.309	2.75	1.38	6	.349	.309
Temporal Speed Ratings						Acc.	3.79	2.0	9.0	.480	.293
						Dis.	4.29	2.6	10.0	.506	.304
						Sup.	3.23	1.94	9.0	1.036	.309
Retrospective Duration Judgments						Acc.	101.4	123.1	715	2.359	.293
						Dis.	120.9	105.9	590	1.814	.304
						Sup.	83.2	95.9	595.0	2.939	.309

Table 4

Descriptive Statistics For Pain Intensity, Distress and Unpleasantness by Condition at Baseline and Post-Intervention, Study II (N=190)

		Baseline					Post-Intervention				
Dependent Variable	Cond.	Mean	Standard Deviation	Range	Skew	Standard Error (Skew)	Mean	Standard Deviation	Range	Skew	Standard Error (Skew)
Pain Intensity (0 Seconds)	Acc.	58.6	12.5	47	-.821	.293	58.6	15.8	58	-1.023	.293
	Dis.	56.2	15.7	59	-.934	.304	59.2	14.9	75	-1.635	.304
	Sup.	56.9	12.9	60	-1.03	.309	60.8	11.1	52	-1.299	.309
Pain Intensity (60 Seconds)	Acc.	34.5	16.5	64	-.114	.293	31.2	18.3	67	.322	.293
	Dis.	27.4	17.6	61	.152	.304	34.3	17.6	73	.218	.304
	Sup.	32.0	16.2	68	.271	.309	36.6	17.3	74	.060	.309
Pain Intensity (120 Seconds)	Acc.	13.2	14.1	62	1.553	.293	13.8	15.9	65	1.484	.293
	Dis.	10.5	11.9	45	1.267	.304	18.3	18.3	70	1.233	.304
	Sup.	13.5	15.7	64	1.786	.309	19.4	18.8	75	1.079	.309

Screening Measures and Age, Study I

No between-group differences were detected for any of the screening measures, or for age. The results for one-way analysis of variance for the screening measures were: Pain Catastrophising scale: *F(*2, 151) = .206; p = .814; Anxiety Sensitivity Index *F(*2, 148) = 2.0; p = .131; Mindful Attention Awareness Scale, *F*(2, 152) = .109, p = .897). The groups also did not differ in age make-up, *F*(2,177) = 1.8, p = .16; see Table 5. Given that the three intervention groups did not differ with respect to the screening measures or age it was not necessary to control for such differences by using these measures as covariates for analysis of variance procedures for Study I.

Table 5

Descriptive Statistics for Screening Measures and Age by Condition, Study I

Measure	Condition		
	Acceptance Mean (*SD*)	Distraction Mean (*SD*)	Suppression Mean (*SD*)
MAAS	59.1 (10.4)	57.9 (10.3)	58.4 (7.9)
PCS	18.5 (10.0)	18.8 (10.0)	17.3 (10.0)
ASI	24.6 (9.53)	21.8 (10.3)	21.3 (8.8)
Age (months)	232.7 (20.7)	240.7 (36.6)	241.1 (51.0)

MAAS, Mindful Attention Awareness Scale; PCS, Pain Catastrophising Scale; ASI, Anxiety Sensitivity Index.

Screening Measures Study II

Study II results replicated Study I: Pain Catastrophising scale: $F(2, 140) = .639$; $p = .529$; Anxiety Sensitivity Index, $F(2, 149) = .876$; $p = .418$; Mindful Attention Awareness Scale, $F(2, 151) = 1.7$, $p = .179$. Additionally there were no group differences for the Self-Control Scale, $F(2, 129) = .068$, $p = .934$. The groups also did not differ in age make-up, $F(2,187) = 1.6$, $p = .21$ (see Table 6). Given that the three intervention groups did not differ with respect to the screening measures or age it was not necessary to control for such differences by using these measures as covariates for analysis of variance procedures for Study II.

Table 6

Descriptive Statistics for Screening Measures and Age (Months) by Condition, Study II

	Condition		
Measure	Acceptance Mean (*SD*)	Distraction Mean (*SD*)	Suppression Mean (*SD*)
MAAS	56.9 (14.6)	60.6 (11.6)	57.8 (9.2)
PCS	19.2 (10.7)	16.5 (10.5)	16.5 (10.0)
ASI	23.4 (10.3)	19.7 (8.27)	20.4 (8.3)
SCS	112.8 (12.0)	111.8 (10.6)	113.3 (10.6)
Age (months)	230.6 (16.9)	238.3 (34.4)	239.9 (40.4)

Assumptions for Parametric Analyses

Homogeneity of variance, linearity and normality assumptions were satisfied for all variables prior to parametric analysis. Variables departing from normality were transformed using procedures as outlined in Tabachnick and Fidell (2006). Generally, departures from normality were assumed to require transformation if the value of the skewness statistic was greater than +/- three standard errors of skewness (Tabachnick & Fidell, 2006). Any additional procedures used for specific analyses are outlined in the text accompanying specific analyses.

Tests of Significance, Planned Comparisons, and Post Hoc Tests

Hypothesis testing involved planned comparisons between each of the three intervention conditions for each of the dependent variables. The number of comparisons (3) exceeded the number of degrees of freedom for the between-groups mean square (k - 1, or 2). Therefore, the Sidak Test was used for planned comparisons. In the Sidak test alpha levels are adjusted for greater accuracy than the Bonferroni procedure, decreasing the possibility of Type II error (Howell, 1997).

For post hoc analyses where there was a violation of the homogeneity of variance assumption, the Games-Howell test was used; otherwise, the Gabriel test was used as it incorporates alpha level adjustment for unequal cell sizes (Toothaker, 2007). Given that patterns of effects were deemed to be of importance when examining replications for specific dependent

variables, near significant pair-wise comparisons and post hoc tests with results $p < .10$ were reported in the text. Gender was used as a between-subjects factor in all analyses; however, results for this factor were only reported if significant. Similarly, interaction effects were only reported if significant. Eta-squared (η^2) was calculated as an index of effect size for assessing analysis of variance effects. Typical effect sizes were interpreted as follows: Small = .01; Medium = .06; Large = .15; Tabachnick & Fidell (2006).

Retrospective Recall of Baseline Spontaneous Strategy Use, Study I

At the end of Study I participants indicated the type of strategy they had spontaneously applied during the baseline cold pressor. As participants had already been exposed to manipulation checks describing acceptance, distraction and suppression strategies (see Appendix D) they tended to use these labels (and a 'no strategy' label) to describe their baseline spontaneous coping strategies and so responses conformed to these four categories. Four participants did not respond to this question. These were coded as 'no strategy', an approach that was felt to be the most conservative way of dealing with these missing values.

Group differences in baseline spontaneous strategies were assessed using a one-way analysis of variance with spontaneous strategy category as a between-subjects factor and baseline cold pressor pain tolerance as the dependent variable. Baseline pain tolerance scores were positively

skewed (see Table 3); therefore, the analysis was carried out on the log transformed baseline tolerance data.

The results showed a significant main effect for spontaneous strategy use category, $F(3, 176) = 4.3$; $p < .006$. Baseline pain tolerance was longer in the spontaneous distraction group than the no-strategy ($p < .01$) group. The difference between the distraction group and the suppression group was also significant ($p < .044$). There were no differences between the distraction and the acceptance groups ($p = .617$) the acceptance and suppression groups ($p = .967$) and the acceptance and no-strategy groups ($p = .990$). Cell sizes and percentages of cases reporting spontaneous use of the four different classes of strategies are presented in Table 7 along with the transformed and untransformed means for baseline cold pressor tolerance. Clearly, spontaneous use of the three strategy choices and the no-strategy option were not equivalently distributed in the baseline sample, $\chi^2 (3, N = 180) = 60.53$, $p < .0001$. The majority of participants reported either spontaneously used distraction or no-strategy at all.

Table 7

Baseline Strategy Use Categories and (log_{10}) Transformed and Untransformed Baseline Means and Standard Deviations for Pain Tolerance for Study I

Strategy	n	Percent	Transformed(log_{10}) (SD)	Mean (SD) Untrans.
No Strategy	70	39	1.62 (.34)	59.5 (61.2)
Distraction	72	40	1.80 (.35)	87.6 (71.5)
Suppression	22	12	1.59 (.26)	49.6 (53.3)
Acceptance	16	9	1.67 (.39)	72.4 (76.9)
TOTAL	180	100		

Distribution of Spontaneous Strategies In Intervention Conditions, Study I

Unequal distribution of baseline spontaneous strategies represents a potential confound, for example, if all of the participants who spontaneously used distraction were assigned to the distraction condition there would be a match between baseline spontaneous strategy and assigned strategy which might differentially alter results for that single condition. This was investigated by created a contingency table of spontaneous strategy use by condition assignment to determine if frequency of spontaneous strategy types was the same for the three intervention conditions. The Chi-Square statistic was not significant, χ^2 (6, N = 180) = 9.3, p = .154, indicating that

distribution of spontaneous strategies in the three intervention conditions did not deviate from what would be expected by chance.

Discussion, Retrospective Recall of Baseline Spontaneous Strategy Use, Study I

In Study I distraction was the coping strategy used spontaneously most often (other than no strategy at all) at baseline. When participants spontaneously employed a coping strategy—and therefore were likely using a strategy that was familiar to them--distraction seemed to be the strategy of choice. Further, only distraction gave participants an advantage relative to the no strategy group. Distraction was also superior to suppression. The strategy least often spontaneously used was acceptance followed by suppression, suggesting, perhaps, that these strategies may have been the least familiar to participants.

For Study I, baseline spontaneous strategy use was assessed at the end of the experiment, after manipulation and compliance check ratings had been made. and after exposure to descriptions of all three intervention conditions. One concern was that this may have artificially limited participant's choice of strategies to the three interventions described in the compliance check section. The separation baseline and experimental sessions in Study II, offered an opportunity to assess spontaneous strategy use immediately after the baseline cold pressor, avoiding contamination of responses with manipulation checks: As such, at the end of the baseline

session participants wrote their response to an open-ended question querying their spontaneous strategy use during the baseline cold pressor (see Appendix B). By assessing spontaneous use prior to assignment to conditions and exposure to interventions it was hoped to arrive at a comprehensive picture of the strategies used by participants.

Retrospective Recall of Baseline Spontaneous Strategy Use, Study II

For Study II, a different procedure was used to assess spontaneous baseline strategy use. At the end of the baseline cold pressor screening session participants answered an open-ended question asking them to describe the strategy they had employed. Unlike Study I, self-report was potentially uncontaminated by exposure to interventions or descriptions of other strategies. This manner of assessment resulted in richer and more diverse descriptions of strategies. The reported strategies fell into eight categories[10].

1) No-Strategy: Participants in this group responded that they had not employed any strategy at all.
2) Distraction: Any mention of the use of a technique or internal focus (e.g., counting), or some external focus (e.g., sounds outside the room) that was explicitly used as a target for engaging and/or moving attention away from pain was coded as distraction. If a phrase such as “tried not to think about

[10] To assess inter-rater reliability a clinical psychologist in private practice was asked to repeat coding. The concordance between two coders indicated substantial inter-rater agreement, *Kappa* = .809, $p < 0001$ (Vierra & Garrett, 2005).

it" was reported this was classified as distraction only if participants mentioned that they had focused on something else instead of the pain.

3) Suppression: Any response where participants reported that they "tried not to think about" the pain but did not report a focus for distraction or another technique was coded as suppression.
4) Acceptance/Goal Focus: Any response that explicitly mentioned allowing or accepting the experience of pain or focusing on the goal of maintaining task focus despite the pain.
5) Breathing: Any report or regulation of breathing that did not explicitly report focusing on using the rhythm of breathing as a distraction from pain.
6) Physical tension: Any report of physical/muscular tension that did not involve using tension as a distraction from the pain.
7) Physical Movement: Any report of movement of the fingers or arm not explicitly used as distraction.
8) Imaginal: Any strategy that focused on trying to change the sensation of cold by imagining the arm or the water becoming warmer.

The breakdown of spontaneous baseline strategies is presented in Table 8, below; these conform roughly to those reported by Wack and Turk (1984) for the cold pressor task.

Table 8

Spontaneous Strategy Categories Used for Baseline Cold Pressor, Study II

Strategy	n	Percentage
No Strategy	42	22
Distraction	57	30
Imaginal	3	1.5
Suppression	27	14
Acceptance	12	6.5
Breathing	7	3
Physical Tension	29	15
Physical Movement	13	7
TOTAL	190	100

Consistent with the results from Study I the largest spontaneous strategy category in the sample was the distraction category followed by the no-strategy category. For the purpose of further statistical analysis several of the categories were merged. The physical movement and physical tension categories might have been subsumed under ‘no strategy’ category in Study I. Therefore, one approach would have been to merge them with the ‘no strategy’ category in Study II. However, given that a large proportion of

participants in the sample used physical strategies, the comparison between no-strategy and these two strategies was deemed of interest. Therefore, the physical tension and physical movement categories were merged into a single category. There were only three cases in the 'imaginal' category. The use of mental imagery to alter physical experience seemed to be a control-based cognitive processing approach; therefore, it seemed most reasonable to include these three cases with the distraction category. Cases where the spontaneous strategy involving some form of relaxed breathing were included in the acceptance condition. The rationale for this was that the choice of a breathing strategy (when not explicitly identified as a method of distraction from pain) was assumed to implicitly involve allowing pain and discomfort to exist in awareness while focusing on breathing through the experience. After these category combinations were made there were five categories: no strategy, acceptance, distraction, suppression and physical response. The distribution of cases in the categories deviated from what might have been expected if participants had equal chance of selecting each strategy, $\chi^2(4, N = 190) = 26.3, p < .0001$.

The pattern of results for Study II showed some differences and some similarities with Study I. There was a significant main effect for spontaneous strategy category, $F(4, 185) = 3.2$; $p < .016$. Post hoc tests showed that there was a significant difference between the physical strategy ($p < .025$) group and the no-strategy group, indicating that the use

of physical strategy resulted in higher pain tolerance than no strategy at all. The difference between the no strategy group and the distraction group approached statistical significance (p = .055). In Study II, the difference between the no strategy group and the acceptance/goal focus group was near significant (p = .093). None of the other category differences were significant. Descriptive data for the merged categories is presented in Table 9.

Table 9

Percentage of Cases in Spontaneous Baseline Strategy Categories and Baseline Transformed and Untransformed Pain Tolerance (seconds) Means and Standard Deviations, Study II

Strategy	n	Percentage	Mean (SD) (log_{10})	Mean (SD) Untrans.
No Strategy	42	22	1.47 (.36)	44.6 (49.9)
Distraction	60	31.5	1.65 (.29)	56.1 (44.4)
Suppression	27	14	1.62 (.28)	52.2 (40.0)
Acceptance/Goal Focus/Breathing	19	9.5	1.70 (.29)	60.7 (43.6)
Physical Response	42	32	1.69 (31)	62.6 (49.9)
TOTAL	190	100		

Distribution of Spontaneous Strategies In Intervention Conditions, Study II

As in Study I, the Chi-Square statistic generated for the contingency table of strategy code by intervention condition was not significant, $\chi^2(8, N = 190) = 11.8$, $p = .162$) indicating that the frequency of spontaneous strategy types did not differ from what was expected by chance in the three intervention conditions.

Discussion, Spontaneous Baseline Strategy Use, Study I and Study II

For both Study I and Study II, the largest proportion of participants tended to use distraction if they reported using a structured cognitive strategy at all. Further, distraction tended to result in longer pain tolerance times relative to the no-strategy condition. For Study II, spontaneous use of the acceptance/goal focus strategy also tended to result in longer baseline tolerance times than the no-strategy condition; although this result should be interpreted with caution due to the marginal p value, relatively low number of subjects in the acceptance/goal focus/breathing group and the fact that the category was defined differently and somewhat more broadly than in Study I, subsuming goal focus and breathing strategies. Additionally, in Study II the physical activity group also had longer tolerance times than the no-strategy group. The simplest interpretation of this is, perhaps, that the act of creating muscle tension or generating physical movement, served as a source of distraction from pain, though it is also possible that muscular tension reflected an involuntary attempt to suppress pain.

In summary, the clearest result, relatively consistent across both studies, was that distraction seemed to be the spontaneous cognitive strategy of choice and this strategy tended to result in improved pain tolerance relative to no strategy at all. Further, acceptance, especially when defined quite specifically, was the strategy with the lowest likelihood of spontaneous use and therefore, likely the least familiar of the coping

strategies. Suppression was used less than distraction but seemed to be somewhat more familiar than acceptance, based on generally higher frequency of spontaneous use. Finally, in Study II where it could be assumed that assessment of spontaneous strategy use was more exhaustive, fully 22% of cases reporting using no strategy at all.

Manipulation Check Ratings for Strategy Use for Study I and Study II and Strategy Effort for Study II

For Study II, strategy use ratings were subjected to within-subjects analysis to compare use of assigned and unassigned strategies. For Study II, effort ratings were analyzed in the same fashion. Between subjects comparisons using intervention condition as a factor were also applied to assess use and effort as a function of assigned strategy alone across intervention conditions. As will become apparent below, for distraction and acceptance conditions the assigned strategies were used more consistently than in the suppression condition.

For Study II and I, the dependent variable of intervention effectiveness and the manipulation check of strategy application were quite highly correlated: $r_{Study\ I} = .687$, $p < .0001$; $r_{Study\ II} = .760$, $p < .0001$; therefore, strategy application was dropped from the analysis. Descriptive data for manipulation checks for Study I and Study II are presented in Table 10.

Table 10

Manipulation Check and Compliance Ratings for Strategy Use and Effort (11-point scale) by Condition for Study I and Study II

	STUDY					
	Study I			Study II		
	Condition			Condition		
Strategy	Acc.	Dist.	Supp.	Acc.	Dist.	Supp.
Acceptance Use	7.7 (2.0)	4.8 (2.7)	4.8 (2.8)	7.8 (1.9)	4.9 (3.0)	3.6 (2.9)
Distraction Use	5.1 (2.9)	7.5 (2.5)	7.5 (2.5)	3.9 (2.7)	7.8 (1.9)	7.6 (2.4)
Suppression Use	4.5 (3.0)	5.4 (2.9)	7.1 (2.0)	4.0 (3.1)	5.2 (2.9)	7.1 (2.3)
Strategy Use (Ass. Strat.)	7.7 (2.0)	7.5 (2.5)	7.1 (2.0)	7.8 (1.9)	7.8 (1.9)	7.1 (2.3)
Acceptance Effort				8.3 (1.4)	4.7 (3.3)	3.3 (2.9)
Distraction Effort				4.3 (2.7)	8.1 (1.8)	7.4 (2.4)
Suppression Effort				4.2 (3.1)	5.6 (2.9)	7.6 (2.2)
Effort (Assigned Strategy)				8.3 (1.4)	8.2 (1.8)	7.6 (2.2)

Study I and Study II Strategy Use For Each Condition

It was expected that ratings of assigned strategy use would be higher than unassigned strategy use (i.e., in the acceptance condition, acceptance ratings would be higher than distraction or suppression). The results revealed that for the acceptance and distraction conditions this prediction

was confirmed. However, in the case of the suppression condition, the ratings for distraction strategy use were higher than suppression use.

Study I: Strategy Use in the Acceptance Condition. In the acceptance condition there was a significant main effect for the within-subjects variable strategy, $F(2,124) = 27.1$; $p < .0001$. Acceptance strategy use in the acceptance condition was higher than suppression ($p < .0001$) or distraction ($p < .0001$) strategy use. There was no difference between distraction and suppression use in the acceptance condition ($p = .209$; see Table 10).

Study II: Strategy Use in the Acceptance Condition. Study II results replicated those from Study I as indicated by a significant main effect for the within-subjects variable Strategy, $F(2,132) = 51.0$; $p < .0001$. Acceptance strategy use in the acceptance condition was higher than suppression ($p < .0001$) or distraction ($p < .0001$) strategy use. There was no difference between distraction or suppression use in the acceptance condition ($p = .872$; see Table 10).

Study I: Strategy Use in the Distraction Condition. There was a significant main effect for the within-subjects variable Strategy, $F(2,106) = 21.0$; $p < .0001$. Distraction strategy use in the distraction condition was higher than acceptance ($p < .0001$) and suppression strategy use ($p < .0001$) while there was no difference between acceptance and suppression use ($p = .246$; see Table 10).

Study II: Strategy Use in the Distraction Condition. Study II results replicated Study I, as indicated by a significant main effect for the within-subjects variable strategy, $F(2,124) = 21.2$; $p < .0001$. Distraction strategy use in the distraction condition was higher than acceptance ($p < .0001$) or suppression ($p < .0001$) strategy use, while there was no difference between acceptance and suppression use ($p = 0.588$; see Table 10).

Study I: Strategy Use in the Suppression Condition. There was a significant main effect for the within-subjects variable strategy, $F(2,124) = 20.4$; $p < .0001$. Both suppression strategy use and distraction strategy use were higher than acceptance strategy use (both differences, $p < .0001$). This indicated report of equivalent use of assigned (suppression) and unassigned (distraction) strategies in the suppression condition.

Study II: Strategy Use in the Suppression Condition. Study II results replicated Study I (see Table 10), as indicated by a significant main effect for the within-subjects variable strategy, $F(2,118) = 20.4$; $p < .0001$. Suppression and distraction strategy use were higher than acceptance use ($p < .0001$). There was no difference between distraction and suppression strategy use ($p = .264$; see Table 10).

Direct Comparison of Assigned Strategy Use Across Conditions

Study I. There was no difference for assigned strategy use across the three assigned intervention conditions, $F(2, 177) = 1.40$; $p = .250$.

Study II. Results for Study II replicate Study I, $F(2, 187) = 2.4$; $p = .093$. Therefore, for both Study I and Study II, there was no indication that overall ratings of assigned strategy use differed across conditions.

Discussion, Strategy Use, Study I and Study II

The results for strategy use in Study II replicated those from Study I. Use of the acceptance and distraction strategies was higher in assigned conditions than use of unassigned strategies, as would be expected if participants were complying with instructions. However, ratings for distraction and suppression strategy use in the suppression condition were not significantly different. This finding is consistent with the hypothesis that participants in the suppression condition may have relied on distraction as an adjunct to suppression to a greater degree than participants in other conditions relied on unassigned strategies. It should be noted that the ratings generally indicated that multiple strategies were used in all conditions; however, in the suppression condition, it seemed clear that there was relatively high and specific ancillary use of distraction, or a compound strategy of distraction and suppression.

Finally, across intervention conditions ratings for assigned strategy use were generally quite high and there was no significant difference between conditions, indicating that the high distraction use in the suppression condition was likely not due to decreased use of suppression. As well, the lack of a between-group difference in strategy use suggests

that participants were not biased in their strategy use by some factor intrinsic to the design or delivery of the interventions.

Study II: Strategy Effort

Effort ratings were collected only for Study II. Each participant was asked to rate the degree to which they put effort into both assigned and unassigned strategies. It was expected that participants would report putting more effort into their assigned strategy than other strategies. As will be seen below, this was confirmed for the acceptance and distraction conditions but not for the suppression condition.

Study II: Acceptance Condition Effort. For effort ratings in the acceptance condition there was a main effect for strategy, $F(2, 132) = 71.0$, $p < .0001$, showing that effort put into the acceptance strategy was higher than for the distraction strategy ($p < .0001$) or suppression ($p < .0001$) strategies. There was no difference between distraction and suppression strategy effort ($p = .823$; see Table 10).

Study II: Distraction Condition Effort. For effort ratings in the distraction condition there was a main effect for strategy, $F(2, 132) = 71.0$, $p < .0001$, showing that distraction strategy was higher than acceptance strategy effort ($p < .0001$) or the suppression strategy effort ($p < .0001$). There was a strong trend for suppression effort to be higher than acceptance effort in the distraction condition ($p = .051$; see Table 10).

Study II: Suppression Condition Effort. For effort ratings in the suppression condition there was a main effect for strategy, $F(2, 118) = 61.4$, $p < .0001$, showing that suppression strategy effort and distraction strategy were both higher than acceptance strategy effort ($p < .0001$). However, there was no difference between distraction and suppression strategy effort ($p = .551$; see Table 10). This indicated that in the suppression condition participants reported putting equivalent effort into distraction and suppression.

Study II: Assigned Strategy Effort Ratings

When assigned strategy effort ratings were compared across conditions the main effect for condition was not significant, $F(2,187)= 3.3$; $p = .081$ (see Table 10).

Discussion, Effort Ratings, Study II

The effort rating results for Study II indicate that in the suppression condition equivalent amounts of effort went into suppression and distraction. More effort went into the suppression strategy than the acceptance strategy in the distraction condition. Overall these results are consistent with results for distraction strategy use (see above) showing that in the suppression condition the distraction strategy was used as much as the suppression strategy. Taken together these results indicate a degree of overlap in use or applied effort for the distraction and suppression strategies generally, and more specifically suggest that the distraction was commonly used in the

suppression condition. The finding of no overall difference in assigned strategy effort across conditions is further evidence of a lack of any systematic bias in the construction of the intervention.

Intervention Effectiveness Ratings, Study I and Study II

Although effectiveness ratings are not a form of manipulation check but a dependent variable, the results for effectiveness ratings are presented here due to their potential relevance to the interpretation of the results of strategy manipulation checks.

Study I: Assigned Strategy Effectiveness. For assigned strategy effectiveness in Study I there was a trend for acceptance and distraction to be rated as somewhat more effective relative to suppression. For ratings of strategy effectiveness there was a main effect for intervention condition, $F(2,177) = 3.68$; $p < .027$. Effectiveness ratings for the acceptance condition tended to be higher than for the suppression condition, though this effect was near significant ($p = .054$). Effectiveness ratings for the distraction condition also tended to be higher than for suppression though this effect was near significant ($p = .069$).

Study II: Assigned Strategy Effectiveness. For Study II, the pattern of results was similar to Study I, and somewhat stronger. There was a main effect for intervention condition, $F(2,187) = 3.92$; $p < .022$. Effectiveness ratings for acceptance were higher than for suppression ($p < .025$) and there was a trend for effectiveness ratings in the distraction condition to be

higher than for suppression, though this effect was not significant (p = .099). There was no difference in effectiveness for acceptance and distraction (p = .944). Mean effectiveness ratings are presented in Table 11.

Table 11

Effectiveness Ratings (11- point scale) by Condition for Study I and Study II

	Study	
Condition	Study I	Study II
Acceptance	7.1 (2.3)	7.1 (2.4)
Distraction	7.1 (1.7)	6.9 (2.2)
Suppression	6.2 (2.3)	6.1 (2.2)

Discussion, Assigned Strategy Effectiveness, Study I and Study II

The results for effectiveness ratings for Study II and I were generally consistent in showing that once the experiment was over, acceptance and distraction strategies were rated as somewhat more effective than the suppression strategy. The clearest result across the two studies was that the assigned strategy of acceptance tended to be rated as more effective than the assigned strategy of suppression. This opens the possibility that the higher degree of distraction use in the suppression condition occurred

because participants discovered that suppression was not entirely effective relied more heavily on distraction.

Primary Secondary and Tertiary Strategies (Forced Choice), Study I and Study II

Participants in both Study I and Study II retrospectively ranked their implementation of strategies using a forced-choice format. In Study I, 123 out of a possible 180 participants completed this measure. In Study II, using the same format, 184 out of the 190 participants in the sample completed the measure. The results described below showed that while the majority of participants in the acceptance condition ranked their assigned strategy first, in the distraction and suppression conditions there was much more strategy overlap. For the sake of brevity only the results for primary strategy ranking are reported in detail and the tables depicting results for secondary and tertiary strategy rankings are presented in Appendix F. The forced-choice ranking results for primary strategy are presented in Table 12.

Table 12

Forced-Choice Primary Strategy Ranking Expressed as Percentage of Participants Reporting Primary Use of Each Strategy by Condition, Study I

	Strategy		
Condition	Acceptance	Distraction	Suppression
Acceptance	74.4%	11.6%	14.0%
Distraction	9.2%	41.5%	49.2%
Suppression	20.0%	33.3%	46.7%

In the acceptance condition, acceptance was clearly ranked as the primary strategy. In the distraction and suppression conditions the results were less clear-cut. In the distraction condition, distraction was the primary strategy but suppression was selected frequently. In the suppression condition both suppression and distraction were ranked as primary strategy about as often. However, in the suppression condition the most commonly identified primary strategy was distraction not suppression.

Table 13

Forced-Choice Primary Strategy Use Expressed as Percentage of Participants Using Each Strategy by Condition for Study II

	Strategy		
Condition	Acceptance	Distraction	Suppression
Acceptance	78.3%	15.9%	5.8%
Distraction	6.3%	49.4%	44.3%
Suppression	9%	30.6%	52.8%

The results for primary strategy use for Study II essentially replicate the findings for Study I. However, qualitatively it appears that primary strategy use in Study II was a little better defined, with the highest number of participants in each condition reporting that their assigned strategy was their primary strategy (see Table 13).

Secondary Strategy Use, Study I and II

For the acceptance condition, distraction was the most frequently ranked secondary strategy. For the distraction condition, acceptance and suppression were the most frequently ranked secondary strategies. For the

suppression condition, suppression was most frequently ranked as the secondary strategy (see Appendix F).

The Study II results essentially replicated the pattern of secondary strategy used for Study I, with the exception that in the suppression condition the rankings for the three possible strategies appeared to be less well differentiated (see Appendix F).

Tertiary strategy Use, Study I and II

For the distraction condition, acceptance and then suppression were most frequently ranked as the final strategy choice. For the acceptance condition suppression and distraction were cited about equally as the final ranked choice. In the suppression condition acceptance was clearly the most common final choice (the least likely alternative strategy).

The tertiary strategy choice results for Study II replicated those for Study II (see Appendix F).

Discussion, Primary, Secondary and Tertiary Strategy Use, Study I and Study II

First, the qualitative strategy ranking results for both Study II, and I confirm that participants reported using multiple strategies. Second, in the acceptance condition the primary strategy tended to be the assigned strategy, while in the distraction and suppression conditions the reported primary strategy was less likely to be the assigned strategy. In Study I, for example, in the suppression condition, based upon the cell counts, the most

common primary strategy was distraction. The results are consistent with the findings from manipulation checks of strategy use and effort and together suggest that in the suppression condition there was may have been use of multiple or compound strategies (Wegner & Wentzlaff, 1997). The results from effectiveness ratings provide a clue as to why there was more overlap of with distraction in the suppression condition. There was a strong tendency for suppression to be rated as less effective than the other two strategies and certainly less so than acceptance. Therefore, it seems possible that in using suppression to cope with pain and finding that it was not as effective, participants tended to opt for another strategy or to alternate between strategies.

Post-Experiment Recall of Video Strategies

No formal analysis was carried out on participants written recall of the strategies they learned; however, it was clear from observing these records that all participants were able to recall the basic aspects of the techniques related on each video.

Analysis of Main Dependent Variables, Study I and Study II

The following sections present the analyses and results for the main dependent variables. All analysis of variance and covariance procedures reported below incorporated two between-subjects factors, intervention condition and sex. For the sake of brevity main effects for sex and interactions were only reported if significant. In all analyses presented

below marginal means presented in tables should be used to interpret ANCOVA effects though raw means are also presented in some tables for comparison purposes.

Post-Intervention Pain Tolerance (Hypothesis 1-A) Study I, Study II

The results outlined below will show that for both Study I and Study II there were large increases in pain tolerance from baseline to post-intervention, indicating that all interventions had a significant impact on participant's ability to tolerate cold pressor pain; however, Study I and Study II differed in that between-subjects effects were not detected in Study I.

Pain Tolerance, Study I

For Study I, there was a large baseline to post-intervention increase in pain tolerance, $t(179) = 15.5$, $p < .0001$. The difference between the untransformed grand mean for baseline pain tolerance ($M_{Baseline} = 70.5$, $SD = 66.6$) and the grand mean for post-intervention pain tolerance ($M_{Post\text{-}intervention} = 169.0$, $SD = 124.5$) was about 100 seconds. The effect size for this difference, based on means derived from untransformed baseline and post-intervention tolerance data was large (*Cohen's d* = .987).

The results of analysis of covariance using $\log_{10}$ (baseline pain tolerance) as a covariate revealed no evidence of a main effect for condition, $F(2, 173) = .036$, $p = .964$. Descriptive data on baseline and post-intervention pain tolerance are presented in Table 14.

Table 14

Baseline and Post-Intervention Pain Tolerance (in seconds) by Condition, Study I

	Pain Tolerance Assessment	
Condition	Baseline	Post-Intervention
Acceptance	67.0 (67.6)	161.5 (125.8)
Distraction	77.8 (71.2)	178.7 (122.3)
Suppression	68.3 (64.1)	168.2 (123.8)

Discussion, Study I

Study I results showed a large increase in pain tolerance from baseline to post-intervention that was not qualified by any between-subjects effects for intervention condition. Findings of no-difference between acceptance and control conditions for pain tolerance in the cold pressor test have been observed in previous studies but usually where the interventions were short relative to those used in this research (Keogh Bond, Hamner & Tilston, 2005), though it should be noted that in Keogh et al. (2005) gender by intervention effects *were* found for affective pain. Given that all three interventions used in the present study seemed to have equivalent and

large effects one question was whether all of the interventions actually had equivalent effects or whether some factors related to the procedure or instructions or the interventions themselves were mitigating group differences. Given that the size of the intervention effects were both large and generally consistent with those observed in previous studies,[11] the hypothesis that the apparent treatment effects reflected mere habituation or practice effects seemed unlikely.

One possible reason for the lack of group differences could have related to issues related to intervention compliance. Generally, the results of manipulation check analyses suggested that the suppression and distraction conditions had some similarities in that distraction was reported as being used as often in the suppression condition as in the distraction condition. Perhaps all conditions were similar because participants were ignoring intervention instructions. In order to test whether compliance with interventions played some part in the null result the analysis was run a second time on a high compliance version of the Study I sample. The prediction was that if the results were more powerful or differentiated in this sample, then the problem could be due to intervention compliance.

[11] The baseline to post-intervention change in pain tolerance for the present study was similar in magnitude to changes observed in Hayes et al. (1999). The baseline to post-intervention changes in pain tolerance were: Acceptance, 135.4 seconds, Control, 74.6, Placebo, 35.2)

Pain Tolerance for High Compliance Sample, Study I

A high compliance sub-sample of participants was generated by eliminating cases where assigned strategy use ratings were less than a score of 6 on the 11-point strategy use rating scale. Given that the mid-point of the strategy-use rating scale was between 5 and 6, a conservative definition of 'high compliance' resulting in the least loss of cases would correspond to elimination of cases above a rating of 6. The high compliance sample consisted of 151cases. Means and standard deviations for the three intervention conditions for this sample are presented in Table 15.

Table 15

Post-Intervention Pain Tolerance (in seconds) by Condition for a High Compliance Sample (N = 151) for Study I

		Pain Tolerance Assessment	
Condition	n	Baseline	Post-Intervention
Acceptance	54	68.5 (67.9)	167.2 (126.3)
Distraction	48	75.8 (68.6)	183.7 (120.8)
Suppression	49	68.4 (68.0)	165.3 (125.6)

The results of analysis of co-variance for the high compliance sample showed that neither the main effect for condition, $F(2, 144) = .077$, $p = .926$, or the gender by condition interaction, $F(2, 144) = 1.7$, $p = .188$, were significant, indicating that the lack of group differences was, based upon this analysis, not due to compliance issues.

Another possible reason for the null result for intervention condition could be a lack of differentiation among the interventions themselves. Therefore, the instructions and the video interventions were examined for factors that might conceivably have mitigated intervention differences and effects. Upon review, certain aspects of the intervention design and the cold pressor instructions seemed to be candidates as such factors: First, the cold pressor instructions contained a very strong commitment or goal-focus admonition presented both at baseline and post-intervention, where participants were admonished to try as hard as possible at the cold pressor task, for the benefit of chronic pain patients (see Appendix C). This admonition was also embedded in the swamp metaphor ending each of the three interventions. One hypothesis was that the repetition of a very strong goal or commitment focus at the beginning of each cold pressor and at the end of all three interventions may have made the distraction and suppression interventions too similar to the acceptance condition (and each other). That is, having all three interventions 'book-ended' by a goal or commitment-based admonition may have resulted in participants in all three

conditions focus purely on commitment to the goal of maintaining tolerance for the betterment of chronic pain patients to the detriment of using their specific coping strategies.

Given these factors, for Study II, the goal focus or commitment admonition was removed from the cold pressor instructions (although an admonition for participants to try as hard as they could and keep their arms in the cold water long as possible, was retained). The goal-focus admonition was also removed from the swamp metaphors ending all three conditions. Finally, in order to assist participants to focus more specifically on their assigned interventions an addition was made to the post-intervention cold pressor instructions that focused on having the participants reflect specifically on what they had learned on the video and how they would apply that knowledge during subsequent cold pressor.

Pain Tolerance, Study II

For Study II, there was a large increase in pain tolerance from baseline to post-intervention, $t(189) = 13.1$, $p < .0001$. The untransformed means for baseline and post-intervention pain tolerance, were: $M_{Baseline} = 54.1$, $SD = 46.9$, and $M_{Post\text{-}Intervention} = 155.1$, $SD = 131.7$, an overall baseline to post-intervention change of about 100 seconds. The effect size for the change from baseline to post-intervention was again large *Cohen' d* = 1.02. Analysis of covariance using ($\log_{10}$) pain tolerance as a covariate revealed that the large change in pain tolerance from baseline to post-intervention

was qualified by a significant main effect for condition, $F(2, 174) = 3.86$, $p < .041$; $\eta^2 = 0.042$; small effect). Planned comparisons showed that the source of the main effect was a near significant difference in post intervention pain tolerance for acceptance and suppression ($p = .055$) and a significant difference for distraction and suppression condition ($p < .047$, see Table 16). The difference between acceptance and distraction was not significant ($p = .998$).

Table 16

Baseline and Post-Intervention Pain (seconds) Tolerance by Condition, Study II

	Pain Tolerance Assessment	
Condition	Baseline	Post-Intervention
Acceptance	49.4 (44.3)	159.9 (138.2)
Distraction	58.3 (48.7)	181.6 (133.8)
Suppression	57.3 (46.2)	139.7 (122.7)

Discussion, Pain Tolerance Study I and Study II

Pain tolerance results for Study II represent a partial confirmation of hypotheses. The distraction group showed longer pain tolerance times than the suppression group and the difference between acceptance and suppression was near significant. However, the hypothesis of increased pain tolerance of acceptance over distraction was not confirmed. In fact the pain tolerance results for the distraction and acceptance condition were equivalent.

The question of whether procedural changes had an effect on the pain tolerance results for Study II is difficult to answer as there were other procedural differences between Study I and Study II that may have been responsible (e.g., one-week interval between baseline and post-intervention[12]). One result in support of the possibility that a decrease in goal focus or "commitment" may have had some effect was the finding that in Study II the mean baseline cold pressor tolerance was lower (M = 54.2, SD = 46.9) than the baseline cold pressor tolerance in Study I (M = 70.5, SD = 66.6). The Study I and Study II mean baseline pain tolerance difference was significant, $t(368) = 2.64$; $p < .009$. Qualitatively, examination of the pattern of means suggested that the largest changes from Study I to Study II occurred in the two control-base conditions. One might speculate

[12] It is also possible that the relatively short amount of time between baseline and post-intervention cold pressors (25-30 minutes) may have contributed to the lack of findings in Study I (Turk, Meichenbaum & Genest, 1983)

that the instructions to reflect on the intervention and how to apply it may have had differential impacts on tolerance: in the case of distraction, reflection may have in increased task focus and improved tolerance, while in the case of suppression the result of increased task focus was poorer tolerance, perhaps because of the discomfort associated with suppression.

Another consideration relates to the finding of no difference between the acceptance and distraction conditions. Previous studies have shown large differences between and acceptance and control-based approaches; however, in this case, such differences were not observed. A number of procedural and intervention-based possibilities for this lack of difference will be explored in the general discussion, however, here the question of whether the intervention, as delivered was able to produce the "cognitive defusion" element of ACT interventions can be partially addressed: in theory, one consequence of cognitive defusion should be a lack of association of pain intensity from pain tolerance. The idea is that if pain-related thoughts are defused from actions, then pain intensity should not influence willingness to continue at an aversive task. The correlation between post-intervention pain tolerance and pain intensity at tolerance + 0 seconds for Study I was, $r(67) = -.455$, $p < .0001$, no different from the distraction condition,$r(63) = -.473$, $p < .0001$. The suppression condition showed no reliable correlation between pain intensity and pain tolerance, $r(60) = -.155$, $p = .237$. It is difficult to interpret the latter result; however, the

result for acceptance is relatively clear: pain tolerance in the acceptance condition seemed to be strongly correlated with pain intensity. Thus it could be inferred from this that the cognitive defusion element of the ACT interventions was not active in this intervention and that the observed intervention effects related to other factors such as pain willingness or to the more mindfulness-based aspects of the acceptance which cultivated a perspective of noticing and allowing pain experience to pass through awareness.

Pain Recovery: Pain Intensity, Unpleasantness, and Distress Ratings (Hypothesis 1-B, 1-C), Study I and Study II

Results of analysis of pain experience variables for Study I and Study II will show that only weak evidence for differential pain rebound and recovery effects for any of the post-tolerance pain experience measures was detected in Study I. However, in Study II, the results were quite different and clear effects were detected.

For both Study I and Study II pain experience ratings assessed at each post-tolerance time interval were analyzed separately using analysis of covariance with baseline ratings for each time interval and each pain experience measure as covariates for the post-intervention pain ratings. The rationale for the use of individual analyses was that for some variables (but not others) the pain intensity ratings were positively or negatively skewed (see Table 2 and Table 4) and required transformation.

Pain Intensity, Study I

Pain Intensity at 60 Seconds Post Tolerance. For pain intensity ratings at 60 seconds post-tolerance the main effect for condition was not significant, $F(2, 173) = 1.85$, $p = .161$. Descriptive statistics are presented in Table 17.

Table 17

Pain Intensity VAS (0-75) Ratings and Post-Intervention Marginal Means by Condition at 60 Seconds Post-Tolerance for Study I

		VAS Intensity Rating at Tolerance + 60 Seconds		
Condition	n	Baseline Means (SD)	Post-Intervention Means (SD)	Post-Intervention Marginal Means (SD)
Acceptance	63	27.4 (17.9)	31.5 (18.6)	31.4 (15.7)
Distraction	54	27.2 (19.6)	26.0 (18.6)	26.2 (15.9)
Suppression	63	28.4 (18.4)	31.7 (20.7)	30.6 15.7)

Pain Intensity at 120 Seconds Post Tolerance. For pain intensity ratings at 120 seconds post-tolerance the main effect for condition was not

significant, $F(2, 173) = 1.31$, $p = .271$. Descriptive statistics are presented in Table 18.

Table 18

Transformed and Untransformed Marginal Means for Pain Intensity VAS Ratings 0-75) by Condition at 120 Seconds Post-Tolerance, Study I

		VAS Intensity Rating at Tolerance + 120 Seconds		
Condition	n	Baseline Means (SD)	Post-Intervention Means (SD)	Post-Intervention Square-Root Transformed Marginal Means (SD)
Acceptance	63	14.8 (14.8)	18.9 (15.5)	5.4 (1.52)
Distraction	54	12.8 (13.6)	16.3 (15.9)	4.9 (1.53)
Suppression	63	13.3 (15.0)	20.3 (18.1)	5.2 1.52)

Pain Unpleasantness, Study I

Pain Unpleasantness at 60 Seconds Post Tolerance. For pain unpleasantness ratings at 60 seconds post-tolerance the main effect was not significant, $F(2, 173) = 1.72$, $p = .181$. A weak trend in the marginal means was in the predicted direction (see Table 19).

Table 19

Means and Marginal Means for VAS Post-Intervention Pain Unpleasantness Ratings (0 – 75) by Condition at 60 Seconds Post-Tolerance for Study I

		VAS Unpleasantness Rating at Tolerance + 60 Seconds		
Condition	n	Baseline Mean (*SD*)	Post-Intervention Mean (*SD*)	Post-Intervention Marginal Mean (*SD*)
Acceptance	63	36.7 (19.8)	33.9 (18.9)	33.9 (18.9)
Distraction	54	38.8 (18.9)	30.8 (18.9)	30.8 (18.9)
Suppression	63	39.4 (21.4)	36.7 (19.7)	36.7 (19.7)

Pain Unpleasantness at 120 Seconds Post Tolerance. For pain unpleasantness ratings at 120 seconds post tolerance the main effect for condition was not significant, $F(2, 173) = 2.4$, $p = .096$. Although only a trend in the data, the direction of the main effect for condition was partially consistent with hypotheses, showing higher pain unpleasantness ratings for suppression relative to acceptance though this effect was not significant ($p = .10$; see Table 20).

Table 20

Transformed and Untransformed Marginal Means for Post-Intervention Pain Unpleasantness (0 – 75) by Condition at 120 Seconds Post-Tolerance for Study I

		VAS Unpleasantness Rating at Tolerance + 120 Seconds		
Condition	n	Baseline Mean (SD)	Post-Intervention Mean (SD)	Post-Intervention Square-Root Transformed Marginal Means (SD)
Acceptance	63	20.8 (17.7)	19.8 (15.9)	4.0 (1.6)
Distraction	54	17.7 (16.2)	20.2 (17.9)	4.2 (1.6)
Suppression	63	18.4 (17.7)	23.5 (17.6)	4.7 (1.6)

Pain Distress

Pain Distress at 60 Seconds Post Tolerance. For pain distress ratings at 60 seconds post-tolerance there was a main effect for condition, $F(2, 173) = 3.7$, $p < .027$; $\eta^2 = 0.023$. The transformed and untransformed marginal means for distress ratings at 60 seconds post-tolerance are presented in Table 21.

Table 21

Transformed and Untransformed Marginal Mean for Post-Intervention Pain Distress Ratings (0 – 75) by Condition at 60 Seconds Post-Tolerance for Study I

		VAS Distress Ratings at Tolerance + 60 Seconds		
Condition	n	Baseline Mean (SD)	Post-Intervention Mean (SD)	Post-Intervention Square-Root Transformed Marginal Means (SD)
Acceptance	63	36.7 (19.8)	20.8 (14.3)	4.33 (1.6)
Distraction	54	38.8 (18.9)	14.8 (14.4)	3.41 (1.64)
Suppression	63	39.4 (21.4)	21.0 (14.3)	4.14 (1.63)

Planned comparisons showed that the source of the main effect was a near significant difference between the distraction and acceptance groups (p = .06) and a significant difference between the acceptance and suppression groups (p < .05). These effects were not consistent with hypotheses, in that higher distress for acceptance relative to distraction was not predicted. Higher distress ratings for suppression relative to distraction were consistent with hypotheses. Equivalent distress in the acceptance and suppression conditions was also not predicted.

Pain Distress at 120 Seconds Post Tolerance. For pain distress ratings at 120 seconds post tolerance the main effect for condition was not

statistically significant, $F(2, 173) = .658$, $p = .519$). Descriptive statistics are presented in Table 22.

Table 22

Pain Distress VAS (0-75) Ratings and (log_{10}) Marginal Means for Post-Intervention Distress Ratings by Condition at 120 Seconds Post-Tolerance, Study I

		VAS Distress Ratings at Tolerance + 120 Seconds		
Condition	n	Baseline Mean (SD)	Post-Intervention Mean (SD)	Post-Intervention (log_{10})Transformed Marginal Means (SD)
Acceptance	63	11.2 (15.6)	10.9 (13.0)	0.70 (.42)
Distraction	54	6.3 (9.6)	9.5 (13.7)	0.66 (.43)
Suppression	63	6.9 (10.3)	10.9 (15.3)	0.75 (.42)

Correlations Between Pain Experience Variables and Post-Intervention Pain Tolerance, Study I

The results for Study I offered very minimal and somewhat inconsistent support for hypotheses concerning the hypothesized impact of suppression rebound effects on pain experience and perhaps called into

question whether the suppression intervention was being used effectively at all. This was especially concerning due to the finding that participants had reported complementing suppression with distraction. However, correlations between pain intensity measures and post-intervention pain tolerance offered potential evidence that participants in the suppression condition were using suppression and that suppression was having an impact on post-tolerance pain experience.

Bivariate correlations were generated for pain intensity, distress, unpleasantness and post-intervention pain tolerance for Study I. The results are presented in Table 23. These results showed that pain intensity and unpleasantness showed strong and statistically significant positive correlations with post-intervention pain tolerance in the suppression condition but not in the other two conditions. This suggested that in the suppression condition alone as cold pressor persistence increased post-intervention pain levels also to increase, whereas in the other two conditions no such change in association was found.

Specifically, the results showed that there were differences between correlations of pain intensity and pain tolerance at 120 second post-tolerance for the suppression and distraction conditions. The difference between acceptance and suppression was not significant (p = .09). For the correlation between pain unpleasantness at 120 seconds and pain

tolerance the difference between the correlations for the suppression and acceptance conditions was also not significant (p = .09).

Table 23

Correlations Between Post-Tolerance Pain Experience Variables at 60 and 120 Second Post-Tolerance and Post-Intervention Pain Tolerance Across Intervention Conditions, Study I

Pain Measure	Intensity		Unpleasantness		Distress	
Time	60 Sec.	120 Sec.	60 Sec.	120 Sec.	60 Sec.	120 Sec.
Acc.	.081	$.137_{b}$	-.004	$.108_{b}$	-.106	.117
Dist.	.025	$.038_{a}$	.065	.128	-.149	-.004
Sup.	.214	$^{***}.37_{ab}$	.163	$^{***}.342_{b}$	-210	-.015

*p < .05, **p < .01, ***p < .001
a (Fisher z-test difference between correlations significant, p < .05)
b (Fisher z-test difference between correlations: p < .10)

Discussion, Pain Recovery, Study I

The results for post-tolerance pain intensity, distress and unpleasantness ratings for Study I are notable for the presence of weak and marginal evidence for differential pain recovery or “rebound” effects across conditions. Higher unpleasantness ratings for suppression relative to acceptance at 120 seconds post tolerance were consistent with hypotheses

and also with correlational results showing stronger relationships between pain tolerance and pain unpleasantness in the suppression condition. The finding of higher distress ratings at 60 seconds post tolerance in the acceptance and suppression condition relative to distraction was not consistent with hypotheses, which predicted that post tolerance distress ratings for acceptance would be lower than both of the control-based interventions. The finding of stronger correlations between pain intensity and pain unpleasantness and pain tolerance for the suppression condition than for the other two conditions provides weak evidence that the suppression intervention may have been having a (weak) differential impact on pain recovery.

Examination of the procedure for assessing pain experience variables in light of the results of Study I indicated possible procedural modifications that were implemented to increase the likelihood of capturing rebound/recovery effects in Study II. Recall that in Study I the post tolerance dependent variables were assessed in the following order:

Figure 2

Time-Line for Assessment of Pain Experience Dependent Variables, Study I

Time From Pain Tolerance Variable Assessed	Variable
Within 60 seconds Post-Tolerance	Retrospective Duration Judgment
Within 60 seconds Post- Tolerance	Temporal Speed Estimate
At 60 seconds Post-Tolerance	Pain Experience Variables 1 (Pain Intensity, Unpleasantness, Distress)
At 120 Seconds Post-Tolerance	Pain Experience Variables 2 (Pain Intensity, Unpleasantness, Distress)

In Study I, pain experience variables were not assessed until 60 seconds post-tolerance. Further, the assessment of these variables was preceded by an interval of one minute during which participants were required to make relatively complex (and unexpected) retrospective judgments for the two temporal variables. Further, previous studies (Cioffi & Holloway;1993; Masedo & Esteve, 2007) differed in procedure from the present study in that they assessed pain experience at multiple intervals during the cold pressor, possibly increasing the salience of the experience of pain. Therefore, it seemed possible that the lack of effects could be due to: lack of salience of pain experience variables or interference from the interposed tasks (Quattrone, 1983).

With these considerations in mind modifications were made to the pain experience assessment procedure for Study II. First, in order to streamline

the procedure only pain intensity was assessed. Further, pain intensity was first assessed when tolerance was reached (Tolerance = 0 seconds) in order to increase the salience of pain intensity in the post-tolerance period. The temporal variables were then assessed--but only *after* the initial pain intensity assessment was made. Pain intensity was then assessed a second and third time at 60 seconds and 120 seconds post-tolerance. These changes in procedure are outlined below in Figure 3 and the results for pain experience variables for Study II follows:

Figure 3

Changes to Procedure Implemented to Increase Sensitivity of the Pain Recovery Variable

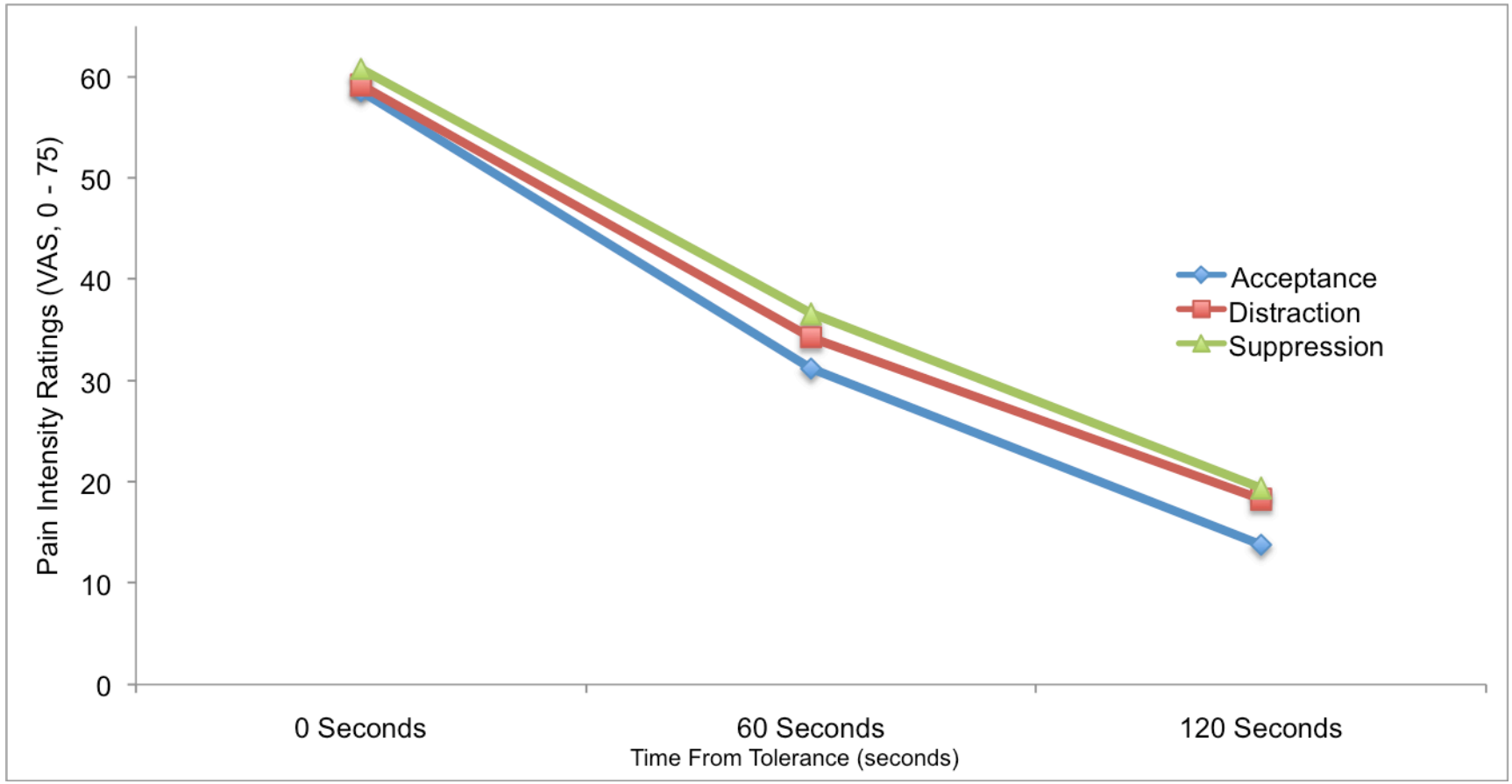
Time From Pain Tolerance Variable Assessed	Variable
0 Seconds	Pain Experience 1 (Pain Intensity)
Within 60 seconds Post-Tolerance	Retrospective Duration Judgment Temporal Speed Estimate
60 seconds Post-Tolerance	Pain Experience 2 (Pain Intensity)
120 Seconds Post-Tolerance	Pain Experience 3 (Pain Intensity)

Pain Intensity Ratings and Pain Recovery Effects (Hypothesis 1-B, Hypothesis 1-C), Study II

As in Study I, pain intensity ratings for each of the three post-tolerance time periods were analyzed individually using analysis of covariance with baseline pain intensity for each of the three ratings as a covariate. Pain intensity ratings at each time interval were analyzed independently as some variables (Pain Intensity at Tolerance + 0 seconds and Tolerance + 120 seconds) required transformation. The pattern of results for the untransformed marginal means is illustrated in Figure 4. The transformed and untransformed and marginal means are presented with each analysis.

Figure 4

Mean Pain Intensity at 0 Seconds, 60 Seconds and 120 Second Post-Tolerance by Condition, Study II



Pain Intensity Ratings at Cold Pressor Tolerance + 0 Seconds.

For pain intensity ratings recorded at tolerance the main effect for condition was not significant, $F(2, 183) = .994$, $p = .372$ (see Table 24). This finding is consistent with previous research with the cold pressor task that failed to detect group differences in pain experience prior to or at tolerance (Hayes et al., 1999) but inconsistent with the results of other studies (Masedo & Esteve, 2007)

Table 24

Pain Intensity VAS (0-75) Ratings and (Square Root) Post-Intervention Pain Intensity Ratings by Condition at Tolerance=0, Study II

		VAS Intensity Rating at Tolerance = 0			
		Baseline Mean (SD)	Post-Intervention Mean (SD)	Post-Intervention Marginal Means (SD)	
Cond	n	Untransformed	Untransformed	Trans.	Untrans.
Acc.	67	58.6 (12.5)	58.6 (15.8)	4.10 (1.5)	56.7 (13.2)
Dist.	63	56.2 (15.7)	59.2 (14.9)	3.84 (1.6)	59.8 (14.0)
Sup.	60	56.9 12.9)	60.8 (11.1)	3.77 (1.6)	60.8 (14.0)

Pain Intensity Ratings at 60 Seconds Post Cold Pressor Tolerance, Study II. For pain intensity ratings taken sixty seconds post tolerance there was a significant main effect for condition, $F(2, 183) = 4.18$, $p < .017$; $\eta^2 = .035$. The sources of this main effect were differences between the suppression and acceptance conditions ($p < .045$) and between the distraction and acceptance conditions ($p < .038$). Pain intensity ratings for distraction and suppression were not significantly different ($p = .892$; see Table 25). These results are consistent with findings showing differential pain recovery effects at 60 seconds post-tolerance for suppression contrasted with acceptance (Masedo & Esteve, 2007) and sensory-monitoring (Cioffi & Holloway, 1993).

Table 25

Pain Intensity VAS (0-75) Ratings and (Square Root) Pain Intensity Ratings by Condition at Tolerance+60 Seconds, Study II

		VAS Intensity Rating at Tolerance + 60 Seconds		
		Baseline Mean (SD)	Post-Intervention Mean (SD)	Post-Intervention Marginal Means (SD)
Cond.	n	Untrans.	Untrans.	Untrans.
Acc.	67	34.5 (16.5)	31.2 (18.3)	29.6 (16.0)
Dist.	63	27.4 (17.6)	34.3 (17.6)	36.9 (16.9)
Sup.	60	32.0 (16.2)	36.6 (17.3)	36.5 (15.5)

Pain Intensity Ratings at 120 Seconds Post Tolerance. For pain intensity ratings taken 120 seconds post tolerance there was a significant main effect for condition, $F(2, 183) = 3.81$, $p < .024$; $\eta^2 = .025$ (small effect). The source of this main effect was a near significant difference between suppression and acceptance ($p = .080$) and a significant difference between distraction and acceptance ($p < .040$). There was no difference between distraction and suppression ($p = .985$). Marginal means for transformed and untransformed pain ratings at 120 seconds post tolerance are presented in

Table 26. This result is consistent with previous research showing pain recovery effects extending to 120 seconds post tolerance (Cioffi & Holloway, 1993). This results represents an extension of the Masedo and Esteve (2007) results in showing differences between acceptance and control-based coping for pain recovery to 120 second post-tolerance.

Table 26

Pain Intensity VAS (0-75) Ratings and (Square Root) Pain Intensity Ratings by Condition at Tolerance + 120 seconds, Study II

		VAS Intensity Rating at Tolerance + 120			
		Baseline Mean (SD)	Post-Intervention Mean (SD)	Post-Intervention Marginal Means (SD)	
Cond.	n	Untrans.	Untrans.	Trans.	Untrans.
Acc.	67	13.2 (14.1)	13.8 (13.9)	3.27 (1.65)	13.6 (14.5)
Dist.	63	10.5 (11.9)	18.3 (15.3)	4.0 (1.75)	18.9 (15.3)
Sup.	60	13.5 (15.7)	19.4 (14.5)	3.72 (1.64)	18.6 (14.4)

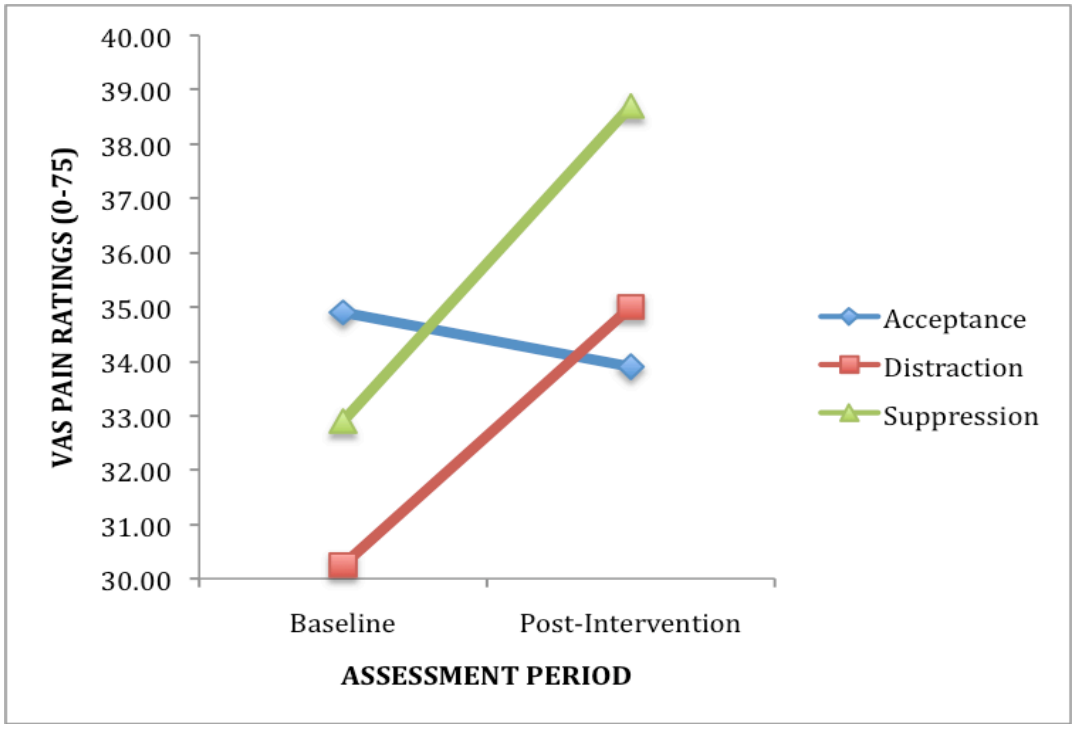
Pain Recovery, Repeated Measures

As a supplement to the primary analysis, a repeated-measures analysis was also run on the raw, untransformed pain intensity ratings. The first within-subjects factor in this analysis was a pre/post factor indexing change from

baseline to post-intervention, the second within-subjects factor was time-period, indexing the three periods at which VAS ratings were assessed. As usual there were two between-group factors, intervention condition and sex. The results of this analysis showed a main effect for the pre/post variable, showing an overall increase in VAS ratings from baseline to post-intervention, $F(1, 184) = 14.6$; $p < .0001$. There was also a significant group by pre/post interaction, $F(2, 184) = 6.67$; $p < .0001$, see figure 5, below, showing that the acceptance group showed no change in pain ratings from baseline to post-intervention, while the other two groups showed an increase.

Figure 5

Graph of Group by Pre/Post Interaction for VAS Pain Intensity Ratings (0-75), Study II



Discussion, Pain recovery, Study II

The results for pain intensity ratings for Study II assessed at tolerance, 60 and 120 seconds post tolerance reflect a partial confirmation of hypotheses with respect to pain 'rebound' and recovery effects. The finding of higher pain intensity ratings for suppression and distraction conditions relative to the acceptance condition at sixty seconds post-tolerance replicates the findings of Masedo and Esteve (2007) who found similar effects for pain intensity ratings at sixty seconds post tolerance. This also represents an extension of their findings in that in the present study differential pain

recovery effects for acceptance and control-based strategies were also detected at 120 seconds post tolerance, although in the present study these effects were strongest for the difference between acceptance and distraction. Cioffi and Holloway (1993) found differences between sensory monitoring and suppression strategies to two minutes post-tolerance. This result replicates their general finding that pain "rebound" effects may extend to two minutes post-tolerance. It should be noted that this was not an exact confirmation of hypotheses, as it was predicted that distraction would show intermediate effects between suppression and acceptance at each post-tolerance interval.

General Discussion, Pain Experience Variables Study I and Study II

The relatively clear findings for pain intensity recovery effects for Study II stand in contrast to the minimal effects observed Study I. The difference in results between Study II and I may have resulted from a procedural changes in Study II and I. In Study I pain intensity ratings were not taken at tolerance = 0 seconds. In fact, at tolerance = 0 participants were required to focus their attention away from pain in order to make retrospective time judgments and temporal speed estimates, both of which were completed prior to the first pain intensity, distress and unpleasantness ratings at sixty seconds post-tolerance. It seems possible that focusing attention away from pain immediately after pain tolerance was reached could have mitigated the salience of pain experience generally, so that whatever effects may have

been present had faded by the time the first pain experience ratings were taken at sixty seconds post-tolerance. The possibility that the changes in procedure may have made post-intensity pain ratings more salient receives some support from the finding that baseline pain intensity rating for Study II were higher (M = 31.4, SD = 16.9) than for Study I (M = 27.7, SD = 18.5; $t(368) = 2.0$; $p < .044$) as would be expected if the changes had made pain intensity at 60 seconds more salient or had mitigated the influence of factors which might have decreased pain intensity (e.g., intervening assessment of other variables). It is also possible, however, that changes made to the interventions and intervention instructions for Study II due to null condition effects for pain tolerance in Study I may have had an impact on the detection of pain recovery effects for Study II.

Time Variables (Retrospective Duration and Temporal Speed: Hypothesis 1-D Hypothesis 1-E), Study I, Study II

As will be shown below, the results for the temporal speed variable were partially consistent with hypotheses regarding the effects of self-control on subjective time. However, the results for the retrospective duration variable were not significant for Study I and inconsistent with hypotheses in Study II.

Hypotheses related to differences between the three interventions on the two indices of time perception: Retrospective Duration Judgments and Temporal speed were assessed using a completely between-subjects analysis of variance.

Retrospective Duration Judgments (Hypothesis 1-D)

The extent and direction of retrospective duration distortion is usually assessed using a ratio measure of retrospective duration divided by actual duration (Block & Zakay, 1997). In the case of the present studies this was a ratio of the following components:

Duration Distortion = (RDJ)/(PT), where:
RDJ = retrospective duration judgment
PT = pain tolerance

With this measure, a ratio value that is either less than or greater than one is interpreted as indicating a departure from accurate retrospective time estimation. A value greater than one indicates a retrospective over-estimation of duration and a value less than one indicates a retrospective under-estimation of duration. For the analyses reported in both Study I and Study II this ratio variable was positively skewed. Therefore, the distributions of the ratio variable for both Study I and Study II were examined for the presence of outliers and these were eliminated prior to analysis. This additional outlier analyses was deemed essential to maintain, if possible, the untransformed ratio measure as an index of duration estimation distortion. The description of the amended data screening procedures, as well as descriptive data, and transformation are described in results section for each of the two studies below.

Retrospective Duration Judgments, Study I

For Study I the ratio variable (RDJ/PT) was positively skewed (see Table 27). As can be seen in Table 27, elimination of five additional outliers decreased skewness to below +/- 3 SD's of the standard error of skewness for two of the three conditions. While skewness in the suppression condition was marginal the data were not transformed to preserve the interpretability of the ratio measure.

Table 27

Skewness and Standard Error of Skewness for RDJ/PT Ratio for Study I Sample (N = 180) and Study I Sample with Additional RDJ/PT Outliers Removed (N = 175)

	Study I Sample			
	Sample 1: N=180		Sample 2: N = 175	
Condition	n	Skewness (SE)	n	Skewness (SE)
Acceptance	63	1.994 (.302)	61	.432 (.306)
Distraction	54	.572 (.325)	53	.078 (.327)
Suppression	63	2.118 (.302)	61	1.080 (.306)

For Study I, the main effect for condition was not significant, $F(2, 169) = .018$, $p = .803$. The means and standard deviations for the RDJ/PT variable for Study II and I are presented in Table 28.

Table 28

Means and Standard Deviations for the RDJ/PT Ratio by Condition For Study I and Study II

	STUDY	
	Study I (N = 175)	Study II (N = 185)
Condition	Mean (SD)	Mean (SD)
Acceptance	.704 (.29)	.586 (.32)
Distraction	.686 (.24)	.722 (.35)
Suppression	.687 (.33)	.569 (.32)

Retrospective Duration Judgments, Study II

For the Study II sample the RDJ/PT ratio was also positively skewed and five outliers were removed. This did not sufficiently decrease skewness; therefore, prior to analysis a square root transformation was applied to the

ratio measure. The values of the skewness statistic for the ratio variable for the original sample (N = 190), the sample with ratio outliers removed (N = 185) and the transformed ratio are presented in Table 29.

Table 29

Skewness and Standard Error of Skewness for Skewness for RDJ/PT Ratio for the Study II Sample (N = 190) and Study I Sample with Additional RDJ/PT Outliers Removed (N = 185) and after Square Root Transformation by Condition

Sample	Sample 1: N = 190		Sample 2: N = 185		
Cond.	n	Skewness (SE)	n	Skewness (SE) Untrans.	Skewness. (SE) Trans.
Acc.	67	6.105 (.293)	66	1.451 (.295)	.288 (.295)
Dist.	63	4.683 (.302)	62	1.264 (.304)	.483 (.304)
Sup.	60	1.916 (.309)	57	1.211 (.316)	.309 (.316)

For Study II, the results of analysis of variance for both transformed and untransformed RDJ/Tolerance ratios were virtually the same. As such only the results for the untransformed variable are reported for ease of interpretation. There was a significant main effect for condition, $F(2, 179) = 3.71$, $p < .026$; $\eta^2 = 0.038$; small effect). Planned comparisons for the RDJ/PT ratio showed the greatest degree of duration judgment normalization

in the distraction condition. Mean RDJ/PT for distraction was larger (i.e., closer to a value of 1) than acceptance ($p < .04$) or for suppression ($p < .034$). The difference between suppression and acceptance was not significant ($p = .997$). These results were not consistent with hypotheses in showing that greatest degree of temporal normalization occurred in the distraction condition and not the acceptance condition and that suppression and acceptance showed the greatest and equivalent degree of time under-estimation. The results were consistent with hypotheses in that suppression seemed to display greater time under-estimation than distraction. Descriptive data for the RDJ/PT ratio for Study II are presented in Table 28.

Discussion, Retrospective Duration Judgments, Study I and Study II

Only in Study II were differences observed between intervention conditions for the retrospective duration ratio variable. The most likely reason for the finding of no difference for condition in Study I may be the lack of intervention differentiation. The results for Study II were only partially consistent with hypotheses. As predicted there was greater normalization of retrospective duration estimates in the distraction condition relative to suppression. However, both the acceptance and suppression conditions showed equivalent degrees of duration distortion and both showed significantly higher distortion (i.e., greater duration under-estimation) than distraction.

Retrospective Temporal Speed Ratings (Hypothesis 1-E), Study I, Study II

The results for temporal speed ratings reported below represent a partial confirmation of hypotheses and the general pattern of the obtained results was replicated for both Study II and I. Temporal speed ratings were lowest overall in the suppression condition; however, the greatest degree of temporal normalization was not observed for the acceptance condition.

Retrospective Temporal Speed Ratings, Study I

The results for Study I revealed a significant main effect for condition, $F(2, 174) = 3.3$, $p < .037$; $\eta^2 = 0.028$ (small effect); see Table 30.

Table 30

Means and Standard Deviations for the Temporal Speed Estimates by Condition For Study I and Study II

	STUDY	
	Study I (N=180)	Study II (N=190)
Condition	Mean (SD)	Mean (SD)
Acceptance	3.93 (1.96)	3.86 (2.22)
Distraction	4.31 (1.97)	4.19 (2.34)
Suppression	3.38 (1.96)	3.24 (2.21)

Temporal speed was slower in the suppression condition than in the distraction condition ($p < .028$). Mean temporal speed for the acceptance condition was not significantly different from the distraction condition ($p = .625$). The difference in temporal speed between the acceptance and suppression conditions was also not significant (p = .296). These results indicate that in the distraction condition retrospective estimates of temporal speed were closer to a 'normal' (rating of 5) than were temporal speed ratings for suppression.

Retrospective Temporal Speed Ratings, Study II

For Study II there was a near significant main effect for condition, $F(2, 184) = 2.8$, $p = .065$) with the same pattern of results as in Study I, with the distraction condition showing the least slowing of temporal speed. The difference between distraction and suppression was significant ($p < .022$). While the differences between acceptance and distraction ($p = .402$) and between acceptance and suppression ($p = .122$) were not significant. The pattern of Study II results for temporal speed essentially replicate those for Study I (see Table 30).

Discussion, Temporal Speed Ratings, Study I and Study II

Taken together these results reflect a partial confirmation of hypotheses related to temporal speed. Suppression was hypothesized to result in more pronounced temporal slowing relative to the other interventions; however, it was expected that acceptance would reflect the

greatest degree of normalization of temporal speed. This was not observed. In fact distraction displayed the greatest temporal normalization.

The increased temporal slowing observed in the suppression condition is consistent with hypotheses, indicating that using a suppression strategy to cope with pain results in a relative slowing of subjective temporal speed. It is also interesting that replicable results were obtained for this particular dependent variable in both Study II and I. This suggests that this variable may be particularly sensitive to intervention effects as there was a clear difference in the power of intervention effects for Study I and Study II. This suggests that the temporal speed variable may be sensitive to the use of the suppression strategy regardless of whether strategy use has any effect on pain tolerance.

Acceptance, Control and Ego Depletion Effects,

Study II (Hypothesis II-A)

Prior to carrying out the multiplication persistence analysis, fatigue ratings collected after the first cold pressor were analyzed to insure that groups did not differ in propensity to experience fatigue prior to the interventions. One-way analysis of variance showed that the three groups did not differ on Fatigue Ratings taken after the baseline cold pressor, $F(2, 187) = .466$; $p = .628$.

For multiplication persistence the main effect for condition was not significant, $F(2,183) = 1.4$, $p = .246$. Although the main effect for condition

was not statistically significant the pattern of means for multiplication persistence was partially consistent with hypotheses with the longest persistence times in the acceptance condition (see Table 31).

To assess for group differences in reported fatigue after participants had completed the post-intervention cold pressor test a one-way analysis of variance was carried out on fatigue ratings taken after the second cold pressor. The main effect for condition was not significant, $F(2, 187) = 1.9$, $p = .150$. The finding of lack of differential fatigue is consistent with the null result for group differences observed for the multiplication task.

Table 31

Square Root Transformed and Untransformed Means and Standard Deviations for Multiplication persistence by Condition, Study II

	Multiplication persistence	
Condition	(Square Root) Transformed Mean (SD)	Untransformed (Seconds) Mean (SD)
Acceptance	22.9 (6.9)	587.1 (328.9)
Distraction	20.7 (7.1)	465.3 (317.6)
Suppression	21.8 (7.6)	519.0 (343.1)

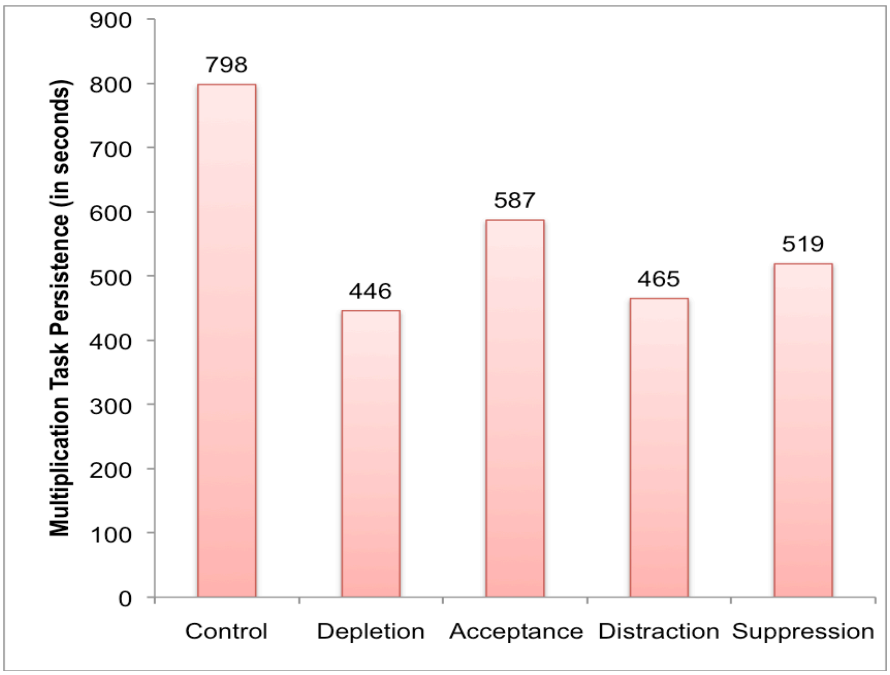
Discussion, Multiplication Persistence, Study II

The null results for multiplication persistence are surprising given previous studies showing suppression-based ego-depletion effects. Comparison of group means in the present study with non-depletion control and depletion conditions obtained in previous research (Tyler & Burns, 2008), indicated significant depletion in all intervention conditions (see Figure 6[13]). It is possible that this was due to the generally depletion effects of the cold pressor over-whelming any coping related differences or it may be due other factors (see general discussion).

[13] In Figure 6 the non-depletion "control" represents multiplication persistence after a 6-minute thought-listing task from Tyler and Burns (2008). The depletion condition represents multiplication persistence after a 6-minute thought suppression task from Tyler & Burns (2008). Also note: the variability in the current results appeared to somewhat larger than those in Tyler & Burns (2008): Control (M = 798, SD = 260); Depletion (M = 446, SD = 168) which may have effected the possibility of detecting differences in Study II.

Figure 6

Comparison of Multiplication Task Persistence for Control and Depletion Conditions (Tyler & Burns, 2008) and for Three Intervention Conditions (Acceptance, Distraction, Suppression) in Study II



Pain Coping Self-Efficacy (Hypothesis I-F)

For both Study II, and I hypotheses related to self-efficacy were assessed using analysis of covariance. Square root transformed baseline self-efficacy ratings were used as a covariate and post-intervention self-efficacy ratings the dependent variable. As will become apparent below self-efficacy results differed for Study II and I, consistent with results for previous dependent variables.

Pain Coping Self-Efficacy, Study I

For Study I the main effect for condition was not significant, $F(2,173) = 1.29$, $p = .277$ (see Table 32).

Table 32

Pain Coping Self-Efficacy Ratings (0-100) by Condition, Study I

		Pain Coping Self-Efficacy Assessment		
Condition	n	Baseline Mean (SD)	Post-Intervention Mean (SD)	Post-Intervention Marginal Mean (SD)
Acceptance	63	64.1 (23.4)	66.8 (22.2)	65.9 (22,4)
Distraction	54	63.7 (24.0)	63.8 (25.6)	64.0 (22.6)
Suppression	63	60.8 (23.6)	58.6 (26.7)	59.7 (22.4)

Pain Coping Self-Efficacy, Study II

For study II there was a main effect for condition, $F(1, 183) = 3.06$, $p < .049$; $\eta^2 = .027$ (small effect). The pattern of differences among means was entirely consistent with hypotheses. Self-efficacy for the acceptance group was higher than for the suppression group and the difference between acceptance and suppression was statistically significant ($p < .045$). The

difference between acceptance and distraction groups did not reach statistical significance (p = .792). The difference between distraction and suppression conditions was also not significant (p = .339). Means and marginal means for the analysis of covariance are presented in Table 33.

Table 33

Pain Coping Self-Efficacy Ratings (0-100) by Condition, Study II

		Pain Coping Self-Efficacy Assessment		
Condition	n	Baseline Mean (SD)	Post-Intervention Mean (SD)	Post-Intervention Marginal Means (SD)
Acceptance	67	63.7 (22.3)	65.1 (25.6)	66.7 (25.5)
Distraction	63	66.9 (26.1)	63.8 (25.0)	62.9 (27.2)
Suppression	60	66.2 (26.2)	55.6 (31.4)	55.7 (25.3)

Baseline to Post-Intervention Changes in Pain Coping Self-Efficacy, Study II

In order to more completely describe intervention effects for the self-efficacy variable, difference scores were computed by subtracting baseline from post-intervention self-efficacy ratings. In this scheme, a positive score reflected an increase in self-efficacy, a negative score a decrease in self-efficacy and a zero score, no change. The pattern of results in the

intervention condition by change-category table presented below illustrated the basic result showing a different pattern of change for the suppression group where fewer cases show an increase in self-efficacy and more cases showed no change in self-efficacy, $\chi^2(4, N = 190) = 13.97$, $p < .007$. As well, the number of cases showing an increase in self-efficacy in the acceptance condition was higher than in the distraction condition (see Table 34).

Table 34

Cell Counts and Percentages for Positive Negative and No-Change Baseline-Post-Intervention Self-Efficacy Ratings by Conditions, Study II

	Difference Score Category			
Condition	Negative	No Change	Positive	TOTAL
Acceptance	25 (37.3%)	6 (9.0%)	36 (53.7%)	100%
Distraction	30 (47.6%)	6 (9.5%)	27 42.9%)	100%
Suppression	31 (51.7%)	14 (23.3%)	15 (25.0%)	100%

Sources of Post-Intervention Self-Efficacy Variance

Within a social-cognitive framework (Bandura, 1997), self-efficacy beliefs are hypothesized to arise from four experiential sources: a) Mastery,

Modeling, c) Social Persuasion, and d) Physiological-Affective arousal. In the context of social cognitive theory, mastery experiences involve encountering and dealing effectively with challenges. Modeling experiences involve either explicit instruction or observational learning. Social Persuasion experiences involve explicit social support and encouragement of efficacy for target behaviours. Physiological and affective arousal refers to activation of emotional and physiological systems that may function to energize efficacy regarding the target behaviour or goal.

In the context of the research outlined here, Bandura's experiential self-efficacy sources were operationalized as follows:

Mastery. Baseline pain tolerance. Baseline pain tolerance was a measure of participant's mastery over the cold pressor challenge prior to exposure to intervention conditions.

Physiological and Affective Arousal. Pain Intensity Ratings. Ratings of baseline pain intensity were an indirect measure of physiological-affective arousal.

Modeling and Social Persuasion. The DVD-interventions were a form of education, intervention or social persuasion, focused on using verbal suasion, presentation of evidence, cultivation of skills, and exhortation to increase a sense of efficacy regarding the target behaviour of improved pain tolerance

Hierarchical regression was used to assess the validity of the Bandura (1997) model and the contribution of the putative experiential components in the context of coping with cold pressor pain. The regression incorporated the following variables, representing three models, each hypothesized to generate an additive increase in explained variance for the dependent variable: Post-Intervention Self-efficacy.

Dependent Variable. Post-intervention Self-Efficacy

Model 1. Baseline Self-Efficacy. With the first model containing only baseline self-efficacy, the remaining models would test contribution to the change residuals of baseline and post-intervention self-efficacy.

Model 2 Baseline pain Intensity and baseline pain tolerance: In this model three baseline pain intensity measures were used as indices of *physiological and affective arousal* and baseline pain tolerance as an index of *mastery*.

Model 3. For this model two dummy-coded (Cohen, Cohen, West & Aiken, 2003) variables representing the contribution of acceptance, distraction and suppression interventions were entered as variables assessing social modeling and persuasion. In the dummy coding scheme the acceptance and distraction conditions were coded as positive (1, 0; 0, 1, respectively) and compared against the suppression condition (0, 0). The results of the hierarchical regression analysis follow in Table 35.\

Table 35

Summary of Hierarchical Regression Analysis for Variables Predicting Post-Intervention Self-Efficacy, Study II (N = 190)

Variables	R^2	b
Step 1		
(sqrt)Baseline Self-Efficacy	.139	.372**
Step 2		
(sqrt)Baseline Self-Efficacy		.339**
VAS Pain Intensity		
Tolerance+0 seconds		.002
Tolerance+60 seconds		.141
Tolerance+120 seconds		.059
log Baseline Pain Tolerance	.162	.185*
Step 3		
(sqrt)Baseline Self-Efficacy		.341**
VAS Pain Intensity		
Tolerance+0 seconds		-.002
Tolerance+60 seconds		.132
Tolerance+120 seconds		-.030
log Baseline Pain Tolerance		.197*
Acceptance Dummy Variable	.187	.205**
Distraction Dummy Variable		.154*

Note. Step 1, $R^{2\text{-Change}} = .139$, $p < .001$; Step 2, $R^{2\text{-Change}} = .045$, $p < .040$; Step 3, $R^{2\text{-Change}} = .033$; $p < .033$.

*p < .05, **p < .0001.

The regression results are consistent with Bandura's (1997) predictions regarding the experiential sources of perceived self-efficacy. Significant increments of variance were explained with the addition of models containing measures of mastery and then of persuasion and modeling. In Model 2, examination of beta weights and amount of accounted variance revealed that physiological and affective arousal did not contribute to the predictive power of the regression. This may reflect the limited importance of physiological arousal in determining pain coping self-efficacy in this context or it may mean that pain intensity is not a reliable analogue of physiological and affective arousal.

Discussion, Pain Coping Self-Efficacy Ratings, Study I and Study II

The finding of higher post-intervention self-efficacy ratings for acceptance relative to suppression conditions was consistent with hypotheses. This effect was not replicated in Study I (though examination of means for Study I indicated that the pattern for Study I was similar to Study II: (acceptance M = 65.0, SD = 22.4; distraction, M = 64.2, SD = 22.6; suppression, M = 59.0, SD = 22.4). One reason for the discrepancy between the results in Study II and I may lie in the relationship between self-efficacy ratings and pain tolerance. For both Study I and Study II post intervention self-efficacy ratings and pain tolerance were positively correlated, Study I was $r(180) = .480$, $p < .0001$; and Study II was $r(180) = .543$, $p < .0001$. The failure to detect differences between interventions for self-efficacy ratings in

Study I may simply reflect lack of reliable differences between the intervention conditions for pain tolerance. The result of hierarchical regression examining sources of self-efficacy variance was consistent with Bandura's (1997) social cognitive theory. The addition of pain tolerance (mastery) and acceptance and distraction interventions (persuasion-modeling) was associated with significant increments of self-efficacy variance.

Chapter Five

The general discussion is presented topically by hypotheses and variables assessing specific costs and benefits. Possible directions for future research are presented in each section. Final sections will focus on general implications of the findings, limitations, strengths and original contribution of this research

General Discussion

Hypothesis I-A: As predicted the suppression group showed the lowest pain tolerance. The prediction of higher pain tolerance for acceptance relative to *both* control-based strategies was not confirmed (actual results: acceptance = distraction; acceptance > suppression, only marginally significant).

Pain tolerance results for Study II and I were clear in showing large increases in pain tolerance from baseline to post-intervention. Just as clear were findings of a null between-subjects condition result for Study I, and significant between-subjects condition effects in Study II. The difference in between-subjects results for the two studies may have been due to multiple factors related to intervention construction and instructions. Both procedural and intervention changes were made for Study II. As such, it is difficult to isolate the sources of the difference in results, though it is possible that both clearer differentiation of

interventions and a clearer task focus due to changes in instructions may have been important.

In Study II, the distraction group showed higher pain tolerance than the suppression group. There was also a strong trend for higher pain tolerance for acceptance relative to suppression, though this result did not reach statistical significance. However, there was clearly no difference in pain tolerance for acceptance and distraction groups. Some aspects of these results are consistent with previous literature and with Study II hypotheses: specifically, the finding that the suppression group showed the *lowest* pain tolerance of the three intervention conditions. Comparing the pain tolerance results for this study to previous published studies, the absolute pain tolerance difference for suppression and distraction conditions was very similar to that observed in Masedo and Esteve (2007) for their suppression and spontaneous coping conditions. This is perhaps not surprising as it is clear from Masedo and Esteve's analysis of their spontaneous coping control and from examination of spontaneous baseline strategies in the research presented here, that controlled-based and distraction strategies are commonly-used spontaneous strategies. As such, the Masedo and Esteve (2007) spontaneous coping control and the distraction intervention used in Study II, may perhaps bear some similarities (i.e., use of distraction in both).

The finding of no difference between acceptance and distraction conditions is inconsistent with previous findings of large increases in pain tolerance for acceptance relative to control-based rationales (Hayes, Bisset, et al., 1999), acceptance versus spontaneous coping (Masedo and Esteve, 2007), and content-matched acceptance versus control-based interventions (Roche, Forsyth & Maher, 2007) for the cold pressor task. The only previous study showing a null result for acceptance and control-based coping for cold pressor pain tolerance used brief interventions relative to those used in the present study (Keogh et al., 2005). As such, possible reasons for this finding bear consideration.

First, this result may reflect reality: that with the short-term and acute pain of the cold pressor task, the distraction intervention as designed for this research may have been as effective as the acceptance intervention. One small piece of evidence in support of this is the finding that pain intensity and pain tolerance were quite highly correlated in the acceptance condition, suggesting that one important ACT process, so-called, “cognitive defusion” may not have been active, thus perhaps, decreasing the power of the acceptance intervention. Therefore, the pain tolerance effects observed in the acceptance condition might be due to the effects “willingness” and mindfulness aspects of the acceptance induction alone.

In examining both the structure of the interventions and the experimental procedure, as well as considering the requirements of acceptance interventions, a number of other possible reasons for the lack of difference between acceptance and distraction also emerge. Another possibility relates to the relative degree of experience and practice of participants in the distraction and acceptance conditions. While both interventions had an experiential component, the nature of the experience was somewhat different in each group. In the acceptance condition, participants were given the opportunity to listen to a description and explanation of the relationship between the Chinese Finger Trap Metaphor and the problem of struggling against aversive thoughts, feelings and sensations, and were then given an opportunity to physically experience the Chinese Finger Trap. In the distraction condition participants were asked to imagine a past pleasant experience, conjure and recall all of its sensory characteristics and then replay this event in a systematic fashion like a “movie in the mind.”

While both of these procedures were experiential, only distraction involved actual practice. In fact, both the distraction and suppression interventions involved opportunities for practice, while acceptance did not, leaving the interventions somewhat unbalanced in this regard. A better balance would, perhaps, have been to give individuals assigned to the acceptance condition the opportunity to

engage in a short acceptance-based exercise, where they were asked to notice and accept thoughts, feelings sensations as they occurred in awareness, or an experiential exercise such as that used in the acceptance intervention in Paez-Blarrina, Luciano et al. (2008) where participants were invited to project themselves back to a baseline pain experience and notice and accept aversive thoughts and feelings.

As such, and despite its experiential component, it is arguable that the acceptance intervention used in this study took the form of a rationale-plus-experience, while the distraction condition included a rationale-plus-experience and practice. It is noteworthy that where acceptance-based rationales have resulted in strong effects relative to control-based rationales they were a quite formidable ninety minutes in length (Hayes, Bisset et al., 1999) and delivered in an interactive format by a therapist, as opposed to the present study, which involved a twenty minute long rationale conveyed by non-interactive video presenter.

Given these factors, it is possible that using the methodology from this research with *multiple* cold pressor experiences and more in-vivo acceptance practice and experience of the acceptance intervention, between-subjects effects showing higher tolerance for acceptance over distraction might emerge over time. Korn (1997) has demonstrated the viability and usefulness of serial cold pressor tests in understanding the dynamics of intervention effects. Certainly,

investigation of the relative impact of practice and different levels of experience with acceptance and control-based interventions would be an appropriate target for future research.

This leads to another factor that may have influenced the observed lack of a difference for acceptance relative to distraction. This relates to the means and context of delivery of the interventions. Previous studies showing strong intervention effects for acceptance relative to control-based interventions have generally used live therapists to deliver interventions, as opposed to written or audio-based instructions that are passively utilized by participants. In an unpublished study, Stevens and Korn (1994; cited in Korn, 1997) have suggested that their failure to find pain tolerance differences between an acceptance and cognitive-behavioural intervention for cold pressor pain may have been due to the audio-taped non-interactive presentation of the acceptance-based material, which, they argued, was not salient enough to convey acceptance principles, ideas and metaphors. As mentioned, the video-DVD presentation format used in the present study incorporated an experiential component in order to engage participants more directly with the acceptance-based metaphors and was designed to come as close to a therapeutic intervention as possible by providing a visual therapist and all the attendant non-verbal behaviour of a live presentation. However, in no

way could the experience be termed interactive in terms of the give-and-take of a live session. It is possible, therefore, that this video presentation might have been selectively disadvantageous for the delivery of the acceptance intervention. Acceptance-based video interventions with a stronger experiential component than used in this research and a less continuous (and more controllable) pain induction method (electric shock) have shown reliable improvements in pain tolerance over matched distraction interventions (McMullen, Barnet-Holmes, Barnet-Holmes, Steward, Luciano & Cochrane, 2008), which, perhaps, underscores the importance of therapist-based and motivational factors in demonstrating acceptance effects.

One might speculate that a live and interactive or highly experiential presentation is critical for individuals to experience "cognitive defusion," and that the lack of an interactive format was the reason that this process may not have been active in the present study. This finding is consistent with the idea that "acceptance" within the context of the ACT model, is composed of several possibly distinct processes: a non-exhaustive list might include, mindful awareness, willingness, commitment and values-based action (Hayes, Strosahl & Wilson, 1999). As such, further investigation of components of ACT "acceptance" interventions using a dismantling approach is another possible focus of future research. For example, recent research has

shown that the addition or subtraction of the "values" component of ACT has a powerful influence on cold pressor tolerance times (Branstetter-Rost, Cushing & Douleh, 2009).

Recall as well, that one of the findings from the present study was that acceptance-based strategies were used spontaneously in the baseline cold pressor very infrequently. One implication of this is that acceptance may not have been a *familiar* strategy to participants in this sample. Being a novel and somewhat paradoxical approach, it may be that acceptance requires a greater degree of interaction and give-and-take in it's presentation than distraction, which in the Study II sample was a relatively frequently used and therefore perhaps quite familiar form of spontaneous coping.

Finally, both of the experiments reported here, were set up within a low demand environment where researchers minimized contact with participants during the cold pressor test. Having equivalent but high demand characteristics across conditions may have resulted in different results, as investigator demand has been shown to have strong effects on acceptance (Roche, Forsyth & Maher, 2007. However, it is difficult to clarify, based on the present results, whether demand characteristics or the format of intervention delivery (or both factors) may have impacted the pain tolerance results in the acceptance condition.

Hypothesis I-B: Pain Recovery. Partial confirmation. Acceptance displayed faster pain recovery than suppression and distraction. Contrary to predictions distraction did not display intermediate effects between suppression and distraction. Group differences were only observed in Study II.

Hypothesis I-C: Pain Recovery Effects. Partial Confirmation. Differences between acceptance and control-based interventions were detected to 120 seconds post-tolerance. Difference between acceptance and suppression at 120 seconds post-tolerance were not significant.

In Study I only very weak evidence of pain recovery effects was detected. These null results were likely due to two factors: First, interference from, or distraction by, intervening temporal measures during pain recovery; second over-similarity of the interventions used in Study I. After these factors were both addressed in Study II, clear intervention effects for pain recovery were detected. The pain recovery findings from Study II represent a replication and extension of previous findings regarding the suppression-based rebound effects upon pain recovery for the cold pressor test. In the present study acceptance was shown to generally display faster pain recovery than the two control-based strategies, distraction and suppression. Differential effects for condition were detected at 60 seconds and 120 seconds post-tolerance,

while at tolerance + 0 seconds, there was no indication of between-subjects condition effects. This latter result was consistent with previous studies that have failed to show differences in pain experience during the cold pressor (Hayes et al., 1999; Korn, 1997). Another study, with a somewhat similar design to that used in the present research (Masedo & Esteve, 2007) showed differences between acceptance and control-based interventions during the pre-tolerance cold pressor period for pooled distress and pooled pain ratings. Unfortunately, because of design considerations in the present research, pain experience was not assessed at regular intervals during the cold pressor. As such, it is difficult to make any direct comparisons to Masedo and Esteve's (2007) pre-tolerance results. The relationship between different aspects of pain experience and acceptance remains an important question, as more recent research has shown that acceptance-based interventions strongly mitigate the experience of some forms of discomfort relative to avoidance-based coping (Luciano, Molina, Gutierrez-Martinze, Barnet-Holmes, et al., 2010).

One finding from the recovery results that bears discussion is the lack of differential pain recovery effects for suppression and distraction. At one level, one could argue that such a difference would not be unexpected, as both suppression and distraction are avoidant control-based strategies. However, previous research, such as that of Cioffi

and Holloway (1993) detected very clear differences between recovery functions for distraction and suppression in the two-minute post-tolerance period. One possible explanation for the lack of difference between suppression and distraction in the current research, may relate to multiple strategy use and strategy overlap in these conditions.

One clear finding from analysis of retrospective ratings of strategy use was that multiple strategies were employed in all three intervention conditions but more so for the distraction strategy and even more clearly in the case of suppression. In fact, for the distraction condition it was clear that a suppression-based strategy was often ranked as the primary or secondary strategy. Further, in the distraction condition the amount of effort put into suppression was higher than in the acceptance condition. These results suggested that in the distraction condition, the assigned distraction strategy might have been complemented with unassigned suppression at times an assigned suppression with distraction

One possibility is that in the distraction condition a form of compound strategy was used (Wegner & Schneider, 1989; Wegner & Wentzlaff, 1997). In discussing possible forms of compound mental control strategies these authors described what they termed “primary concentration with auxiliary suppression” (page 475, 1997) where suppression is used to enable concentration on a specific mental locus.

In the case of the present study one might speculate that suppression of pain-related thoughts or sensations was invoked at times in order to facilitate focusing on the assigned distraction strategy of conjuring a "mental movie" of a positive event. Given the potentially high salience and aversive quality of pain-related thoughts and sensations it is not difficult to envision a scenario where ongoing distraction was repeatedly disrupted by urgent and aversive pain-related thoughts and intense and noxious sensations, and suppression was invoked to allow re-establishment of the primary assigned distraction task. This would also explain why the distraction group reported putting more effort into suppression than did the acceptance group.

It also seemed clear from manipulation check results that in the suppression condition, the assigned suppression strategy was strongly augmented or complemented with distraction. In the suppression condition, distraction was ranked as a primary strategy more often than suppression. Further, in the suppression condition, the ranked secondary strategy was about equally likely to be suppression or distraction. There are several possible reasons for this: First, although participants were given a specific therapeutic strategy (thought-stopping) to use to suppress distressing thoughts and sensations, they were not explicitly instructed to *refrain* from using any other strategies. Second, there was evidence from effectiveness ratings collected in both

Study II and I, that suppression was rated as less effective than the other two assigned strategies. It is important to note that construal and report of the suppression strategy as ineffective may not necessarily have been based on its *actual* effectiveness in decreasing the frequency of distressing thoughts or sensations during pain but could have been based on the discomfort associated with suppression. Especially, as it has been shown that suppression of obsession-like thoughts in normal participants is associated with increases in discomfort (Trinder & Salkovskis, 1994; Purdon & Cark, 2001). A strategy that potentially increases discomfort, particularly within the already uncomfortable context of the cold pressor seems a likely candidate to be complemented with other strategies, especially distraction, which could help draw attention away from such discomfort.

As such, one of the consequences of suppression being experienced as less effective may have been the implementation of alternate strategies such as distraction. It would also make sense that distraction might appear as a commonly used alternative or complement to suppression, as baseline spontaneous strategy use data showed that the most frequently used spontaneous strategy was distraction. Another possibility is that rather than using distraction as an alternative or complement, suppression and distraction were applied as a compound strategy. Although supplied with a specific technique for

suppression the explicit instruction to suppress pain-related thoughts and sensations could have been construed by participants in a way that invoked another kind of compound strategy “primary suppression with auxiliary concentration” (page 475, 1997), where the intention to suppress a thought or sensation is executed by focusing on something else, that is through distraction (Wegner & Schneider, 1989).

With these methodological considerations in mind future research might focus on the impact of systematic manipulation of distraction and suppression instructions on pain recovery functions. With respect to better understanding of differential pain recovery effects, examination of pain recovery in the context of factors associated with avoidance and exacerbation of pain such, as pain catastrophising (Sullivan et al., 1995) and experiential avoidance (Hayes, Strosahl et al., 2004) would also seem appropriate. High levels of experiential avoidance are associated with low cold pressor tolerance and the use of dysfunctional strategies (Zettle, Hocker et al., 2005), as well as slower recovery from cold pressor pain (Feldner, Hekman, et al., 2006). These findings open the door for investigation of experiential avoidance as a moderator of intervention effects on pain recovery. Further, given that the phenomena of pain rebound and recovery is now well quite well established in normal college populations it would seem an obvious step to examine pain recovery in clinical populations. For

example, one recent study found that distraction during a pain inducing activity resulted in higher post-activity pain with chronic pain patients (Goubert et al., 2004). As well, one could assess the length of pain episodes in matched groups of chronic pain patients divided in to high and low acceptance groups based on levels of experiential avoidance, in order to test for associations between episode length and frequency and levels of acceptance and control-based coping. One might predict that individuals high in experiential avoidance and matched for pain severity would report longer episodes of pain and greater tendency to interpret non-noxious stimuli as painful, due to slower recovery.

Hypothesis I-D: Retrospective Duration Judgments. It was hypothesized that the acceptance group would display the greatest degree of normalization of retrospective duration distortion. This was disconfirmed. In Study I, no between-group differences for temporal duration effects were detected. In Study II distraction showed the highest degree of duration normalization. No difference was detected between suppression and acceptance, which both showed equivalent and high degrees of retrospective duration distortion in the form of time under-estimation.

The basic pattern of the retrospective duration judgment results was clear in showing that the distraction group's retrospective judgments of duration were accurate relative to the other two groups

which showed much more considerable distortion in the form of duration under-estimation. These results seem to make the most sense within a contextual-change model of retrospective timing (Block, 1990; Block & Reed, 1978), which argues that the amount of context encoded within a given time period determines the retrospective estimate for that period. Context, in this case is defined relatively broadly in terms of factors such as changes in environmental context, mood, and type of processing, where more complex stimuli or sequences with many shifts in processing, are remembered as being longer (Zakay & Block, 1997). Within this model it is possible to explain the similarities between suppression and acceptance and also the relative normalization of the distraction group, if several assumptions are made concerning the effects of the interventions.

First, it was predicted that acceptance would result in increases in information processing, due to increased encoding of the ebb and flow of pain as information and of remembered context which would result in normalization of time duration estimation. One possibility is that the exact opposite occurred. By inducing an attitude of acceptance it is possible that participants were brought, at least in the short-term experience of a single cold pressor, more *deeply into* the sensory and emotional experience of pain. In some sense the intervention instructions promoted this, by suggesting that participants *notice* and

allow pain experience (as opposed to distracting or suppressing pain experience). The net result of this may have been deeper immersion in the sensory experience of pain to the exclusion of the external environment (and decreased encoding of external context)[14].

Similarly, it is possible that suppression also had the net effect of taking individuals deeper into the sensory experience of pain to the detriment of external context. In order to suppress either pain-related thoughts or feelings, one has to notice and allocate attention to them as they arise, so that suppression involves both the act of suppression and a search for to-be–suppressed stimuli, although, this may involve increased information processing (relative to acceptance) it also might function to bring about a more direct focus on the internal pain-environment to the detriment of external stimuli.

The relative normalization of the distraction condition makes clear sense in this context, as distraction both involves concerted information processing, and the creation of an alternative internal imaginal environment; in fact one might speculate that the contrasting shifts between the imaginal environment of a remembered pleasant experience and the sensory experience of pain, provided a great deal of contextual change, and thus duration normalization.

[14] Another possible explanation for time under-estimation in the acceptance condition relates to possible changes in awareness due to the mindfulness components of acceptance inductions akin to the immersive and attention narrowing effects of hypnosis which result in slowing of a putative internal timer (Naish, 2003).

Hypothesis I-E: Temporal Speed Estimates. Partial Confirmation. Suppression showed the greatest temporal slowing. Contrary to prediction acceptance was equivalent to distraction.

The pattern of results for the temporal speed variable, observed for both Study II and I, revealed that suppression showed the greatest slowing of estimated temporal speed during the cold pressor. Changes in temporal speed and the subjective experience that time has slowed have potentially important consequences for individuals suffering from acute or chronic pain. For example, if some control-based or avoidant coping strategies have the effect of making the in-vivo experience of pain feel like it is lasting longer due to temporal slowing, than suffering and distress may increase, resulting in increased medication use or increased disability.

One prediction that follows from these results is that individuals prone to using avoidant forms of coping may be more susceptible to temporal slowing effects. For example individuals who display a repressive coping style (Weinberger, Davidson, Schwartz & Davidson, 1979) show increased sensitivity to long term and persistent pain (Myers, 1998). Repressors also display evidence of *habitual* suppression, in that even when *not* given suppression instructions, they show both slower pain recovery after the cold pressor test and increased sensitivity to interpret a non-noxious stimulus as unpleasant

after recovery is complete (Elfant, Burns, Zeichner, 2008). One might speculate that such individuals, being particularly prone to suppression would tend to experience pain of all types as lasting longer due to suppression-based temporal slowing, resulting in an increase in psychological suffering and perhaps chronic changes in temporal orientation. As such, future research might involve assessment of the relationship between temporal speed estimates, indices of suffering and distress due to pain and personality styles and dispositions such as repression or behavioural tendencies such as experiential avoidance.

Hypothesis I-F: Self-Efficacy Ratings. Partial Confirmation. Self-efficacy ratings for acceptance were higher than suppression (but not distraction). *Pattern* of results consistent with hypotheses, tests of significance support the finding of a difference between acceptance and suppression.

In Study II post-intervention self-efficacy ratings for acceptance were clearly higher than for suppression though distraction ratings were not significantly different from either group. The difference between suppression and acceptance was predicted and supports the hypothesis that acceptance is associated with increases in pain coping self-efficacy. Further, more subjects in the acceptance condition appeared to show baseline to post-intervention increases in self-efficacy ratings. Finally, within a hierarchical model for prediction of

post-intervention self-efficacy, acceptance and distraction, as variables representative of Bandura's constructs of modeling and social persuasion added to the predictive power of models based on baseline self-efficacy and pain tolerance (mastery).

Given these results, it is useful to consider what factors could mediate the relationship between acceptance and self-efficacy. There are several possible candidates for variables that could function as mediators but three will be considered here: cognitive defusion, mindful awareness and response expectancies. Cognitive defusion as measured by indices of "believability of reasons" is a key ACT construct that has been shown to display concomitant decreases with acceptance-based improvement in pain tolerance (Hayes et al. 1999). In the current study, self-efficacy was strongly correlated with pain tolerance and there was also some evidence that the cognitive defusion process was not active (i.e., significant correlations between pain tolerance and pain experience in the acceptance condition). This may mean simply that in the *absence* of cognitive defusion, self-efficacy was strongly associated with pain tolerance. However, if cognitive defusion is a primary mechanism mediating acceptance-based pain tolerance than it would be expected that "believability" of reasons should account for some part of the observed variance in self-efficacy ratings. Similarly, acceptance-based measures of change in mindful awareness should

account for variance in self-efficacy if they mediate the effects of acceptance on pain tolerance. Future research could focus on assessing changes in these three variables (mindful awareness, "believability of reasons" and pain coping self-efficacy) before and after acceptance induction and prior to an aversive experience to allow for assessment of mediating relationships.

Another possibility is that the impact of acceptance on pain tolerance is not a function of changes in self-efficacy alone but is mediated by acceptance-based changes in expectancies. Kirsch (1990) has defined "response expectancy" as a sub-type of outcome expectancy, where outcome expectancies refer to individual's expectations about the outcomes of behavior, and response expectancies are beliefs about a person's *non-volitional* responses to events. *Non-volitional* refers to responses over which the individual perceives little immediate control, such as, for example, fear or pain. Kirsch (1991) has argued and presented strong evidence that in aversive situations, response expectancies and self-efficacy judgments are tightly correlated and that in such situations response expectancies *determine* self-efficacy ratings. This is the opposite of the relationship between self-efficacy and expectancies in a non-aversive context: "…when outcomes are…dependent upon skill…the distinction between outcome expectancies and efficacy expectancies are

often trivial. In aversive situations in which skill is not a salient component of the task…self-efficacy is a product of outcome expectancies," (page 3, 1991).

Response expectancies are particularly relevant to the differences between acceptance and control-based coping, as they are hypothesized to have strong motivational properties impelling people behave in ways that minimize negatively valued responses (Kirsch, 1990). One of the oft-cited differences between acceptance and control-based coping is that acceptance does not focus on decreasing pain but on experiencing the sensations and thoughts of which pain is composed and also provides the means to do so (mindful awareness; cognitive defusion). Thus, it may be the case that acceptance functions in part by altering response expectancies such that the importance of non-volitional aversive responses to the cold pressor stimulus are mitigated and self-efficacy is then determined by other factors (e.g., mastery experiences).

Hypothesis II-A. Ego Depletion. Disconfirmed. No group differences detected for self-regulatory strength depletion.

The finding of a null result for the between-subjects effects of ego depletion represents a disconfirmation of the hypothesis that acceptance would mitigate ego-depletion effects relative to distraction and suppression. One possibility for the lack of finding may lie in the

somewhat higher levels of variability in the intervention conditions relative to previous research using the multiplication persistence task. This may have been due to differences in the general level of physiological arousal or simply the aversiveness of the ego depleting pre-task used in the present research (the cold pressor) versus, for example, the 6-minute thought suppression task used in Tyler and Burns (2008). While perhaps equally likely to cause ego depletion, the physiological and psychological and emotional impact of dealing with pain was perhaps more challenging and the physiological sequelae of the cold pressor may have obscured differences between conditions. It is also possible that higher levels of arousal caused by pain may have resulted in increased persistence in the putative ego depletion conditions of suppression and distraction; however, the similarity of the means for these two conditions and the acceptance condition to the depletion condition reported in Tyler & Burns (2008; see ego depletion results) militates against this explanation.

Another consideration is whether the present experiment and experimental conditions had the necessary power to detect the hypothesized effects. It is possible that acceptance only partially mitigates ego depletion because it does not incur coping-based costs (as would be incurred in suppression and distraction). This would still leave costs due to the task of tolerating the cold pressor. While it was

predicted that acceptance would assist in this, it is possible that significant ego depletion was caused by the cold pressor alone, enough to obscure differences in self-regulatory costs of the interventions. This created a condition where the experiment was actually trying to detect smaller *relative* differences in self-regulatory strength depletion, as opposed to what is usually assessed in ego depletion experiments: differences between depletion and non-depletion. As such, the experiment might not have had sufficient power to detect these smaller differences, especially given the relatively high variability observed in the data. Given this, is noteworthy that there was a trend for acceptance to show longer persistence than the other two conditions; but it may have taken a larger sample, or different experimental conditions to detect this difference.

Another factor that needs to be considered is the possibility that in the experimental conditions, as set up in the present studies, the acceptance intervention may have had ego-depletion effects in and of itself. There are at least two possible mechanisms by which this could have occurred: First, one of the assumptions of this research was that successful acceptance interventions bring about a clear disengagement or release from avoidance-based coping and control-based strategies. It may be the case that there is a more dynamic process involved, where, in the process of acquiring acceptance individuals first have to restrain

themselves from engaging in well-worn behavioural coping pathways. This restraint *against* the pull of old coping approaches, or in ACT terms learned verbal-action linkages, may be depleting in and of itself, in the early stages of application of acceptance-based interventions.

Another possibility relates to the possible counter-attitudinal nature of acceptance for individuals raised in a linear, Western, outcome-based culture. Baumeister, Bratslavsky and Tice (1998) have shown that under some circumstances the act of making an important choice in a situation where free choice is assumed can result in ego-depletion effects. Specifically they showed that when participants were asked to give a counter-attitudinal speech under high choice conditions the act of making the choice was associated with ego depletion. Recall that acceptance was not a strategy that was often invoked spontaneously in baseline conditions. As such it might be inferred that it was also a low familiarity approach for most participants. Therefore, at the outset of the post-intervention cold pressor, and perhaps during the post-intervention cold pressor, participants may have been engaged in repeated decisions to continue with the unfamiliar strategy or fall back on a strategy they had applied in the baseline period. One might speculate, that the depleting effects of having to *choose* to use the novel and unfamiliar acceptance strategy within the highly aversive environment of the cold pressor, could have been the cause of the lack

of difference between acceptance and control-based coping conditions. Given this, one might also predict that with additional cold pressor trials and increased experience with acceptance, or with a more powerful acceptance intervention, perhaps utilizing multiple opportunities for practice, the need for such choice would gradually diminish; as a result, ego depletion effects for acceptance would show a decrease across training experiences or across in-vivo practice opportunities, and between-group differences would emerge.

These possibilities represent avenues for further research. For example, one way to avoid the possible confound of acceptance-based depletion due to counter-attitudinal choice would be to explore self-regulatory strength depletion and pain using dispositional indices of acceptance or avoidance. It might be predicted that individuals with high scores on, for example, measures of experiential avoidance and who tend to use avoidant coping strategies, would be more likely to display ego-depletion effects after the cold pressor, or other ego-depletion tasks than individuals low on experiential avoidance.

Summary

With respect to the stated aim of these studies, to better understand the differences between acceptance and control-based forms coping in the context of self-regulatory costs and benefits, the research described above can claim partial success. Perhaps the

clearest results were the replication and extension of pain recovery effects observed in several previous studies and the finding of suppression-based slowing of temporal speed and time under-estimation. In the present study, it was demonstrated that both suppression and distraction displayed slower recovery relative to acceptance over a two minute post-cold pressor interval. This was the only clear finding of a consistent difference between acceptance and the two control-based interventions and generally supports the hypothesis that pain recovery costs may follow attempts to either distract the self from, or suppress pain. The only caveat to this was the finding that there was some effort put into suppression in the distraction condition. It may be the case that "pure" distraction would not result in such pain recovery effects.

The repeated finding in different studies under somewhat different conditions of pain recovery and rebound effects in normal college populations has established this phenomenon as replicable (Cioffi & Holloway, 1993; Masedo & Esteve, 2007; the present study). However, in all these studies, the recovery effects were relatively short-lived. It may be the case that the effect of somatic suppression and thought suppression on pain recovery has clinical relevance for patients suffering from acute or chronic pain: this remains to be investigated.

With respect to the investigation of the relative impacts of acceptance and control-based interventions on temporal variables the results obtained in the present studies showed that temporal distortion appears to be a significant cost of at least some types of control-based coping. This was very clear for suppression, which was associated with a relatively high degree of retrospective duration distortion and the greatest degree of temporal slowing. As discussed above, the results for acceptance and distraction conditions were different than predicted and underscore some of the complexity involved in interpreting the effects of multi-faceted interventions upon temporal variables. However, the empirical results for suppression seem clear and underscore concerns about the negative effects of reflexive suppression and perhaps the clinical use of thought stopping.

One of the rationales presented for the adoption of Third Wave therapeutic approaches is the argument that some forms of control-based coping—thought suppression being the canonical example--are counter-productive or iatrogenic (Hayes et al., 1999; Hannan & Tolin, 2005). This assumption has been criticized on the basis that many of the studies showing relationships between suppression and pathological symptoms are correlational and that the clinical technique and therapeutic application of thought stopping differs in substantive ways from pure suppression as a mental control strategy (Bakker,

2009). The literature on the use of thought stopping with pain is limited; however, thought stopping has been used effectively in combination with self-talk for clinical pain (Schonfeld, 1992). As mentioned, the present research is the second experimental study in which a variant of the clinical thought-stopping procedure has been associated with pain rebound effects. This indicates that more systematic study of the use of thought stopping may be warranted in order to assess whether rebound effects are measurable and important in determining clinical outcomes.

Limitations of This Research

With respect to limitations, the generalizability of the results of the research presented here is somewhat limited by several factors. First, the studies were carried out using college samples, generally younger than populations suffering from chronic pain. Second, these studies utilized an analogue form of pain, the cold pressor test. Cold pressor pain is finite, acute and the experience and absolute termination of pain is essentially under the control of the participant. This is quite different than the unpredictable and persistent pain suffered by chronic pain patients. Another limitation is the reliance on self-report measures for assessing a number of dependent variables.

Strengths of This Research

The research presented here has a number of strengths, foremost the use of an experimental design that allowed the opportunity to

directly compare the effects of interventions on dependent variables measuring self-regulatory costs and afforded a high degree of experimental control. The study also utilized pre-recorded video-based interventions, so that all participants in each condition were exposed to the same interventions, which controlled for random variation due to differences in intervention presentation. As well, the studies incorporated an extensive series of manipulation checks assessing both assigned and unassigned strategy use and strategy effort that aided in interpretation of intervention effects and dependent variables.

Original Contribution of This Research

The original contribution of this research arises from the multi-variable and comprehensive assessment of potential coping costs for pain. The study involved the replication and extension of previously observed pain rebound and recovery effects and also attempted to simultaneously assess the importance of two other kinds of costs in the context of an ACT-based acceptance intervention and control-based coping, neither of which have previously been investigated in this context. The first cost related to self-regulatory energy depletion and the second cost related to temporal distortion as reflected in retrospective duration judgments and temporal speed during a painful episode. Finally, this research showed that acceptance interventions appear to be associated with increases in self-efficacy relative to control-based

coping in normal participants. Further research will be required to explore the relationships between different pain management approaches and the coping costs and benefits outlined here, assess the clinical importance of coping costs, and elucidate the inter-relationships among temporal processing, self-efficacy, pain experience, and pain tolerance in general.

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Appendix A

Consent Forms and Screening Measures

PARTICIPANT NAME:_____

STUDENT NUMBER:_____

AGE:_____(years and months)

1) Have you ever had a serious physical injury? YES/NO
If the answer is "yes," please briefly describe the injury:
_____
_____
_____
_____

2) Have you ever experienced severe acute pain? This would involve intense pain from an injury, surgery or a medical condition. YES/NO
If the answer is "yes" please briefly describe_____
_____
_____
_____

3) Do you suffer from chronic pain? YES/NO

4) Do you suffer from any of the following conditions?
Reynaud's disease YES/NO
High Blood Pressure YES/NO
Arthritis YES/NO

STUDY I: CONSENT FORM FOR EXPERIMENTAL SESSION

CONSENT FORM

Research Project Title: **A Study of Stress and Coping Styles**
Researcher(s): **Matthew Decter, MSc., PhD. (cand.), Dr. E.A. Johnson, PhD (Advisor, Associate Professor)**

The purpose of this research, which is being conducted as the doctoral thesis of the first researcher listed above, is to better understand the basic processes underlying the ways people cope with the experiences associated with a brief physical stressor in a laboratory setting. The stressor is immersion of the non-dominant hand and forearm in cold water. It is expected that the information gleaned from this research will assist psychologists in helping people who suffer from discomfort due to physical stressors (e.g., pain).

In this experiment you will be asked to learn some simple pain rating procedures, then you will immerse your non-dominant hand and forearm in icy water. After the first immersion you will be taught a clinical method to help you cope with the discomfort caused by the ice water immersion, then you will undergo a second immersion. After both of these immersions you will be asked to give a number of different ratings, which will assist us in understanding your response to the ice water immersion task and the efficacy of coping method you have been taught. In total the experiment will likely take between 40 to 60 minutes to complete.

This study entails no more risk than you might be exposed to in your everyday life. There **would** be some increased risk to you if you suffer from chronic pain, arthritis, Reynaud's disease, have had a recent injury to your non-dominant arm, or suffer from heart disease or high blood pressure. If you suffer from any of these problems you should excuse yourself from the study now.

Some of your verbal responses will be recorded (in writing) by the experimenter at different phases of the study. You will also be asked to give verbal reports and ratings, which will be recorded by the experimenter; as well, you will be required fill out some brief rating scales and descriptions of your experience.

Complete confidentiality will be maintained in this experiment in the following fashion. Individual participant data will be identified by a numeric participant code, so that no individual participants name can be attached directly to **any** of the data collected.

Because this study will take place over a number of weeks, participants will not receive debriefing regarding the **specific hypotheses** of the experiment. Instead they will undergo an immediate post-experimental debriefing in which they will be informed of the general aims of the experiment, given an opportunity to give feedback about the experiment. Once the experiment is completed participants may pick up a summary of results in the psychology department office at the end of August 2008.

All participants in this study will receive 2 experimental credits in the psychology department participant pool for participation in this study.

Your signature on this form indicates that you have understood to your satisfaction the information regarding participation in the research project and agree to participate as a subject. In no way does this waive your legal rights nor release the researchers, sponsors, or involved institutions from their legal and professional responsibilities. You are free to withdraw from the study at any time, and /or refrain from answering any questions you prefer to omit, without prejudice or consequence. Your continued participation should be as informed as your initial consent, so you should feel free to ask for clarification or new information throughout your participation.

Matthew Decter, 487-0016, and
Dr. E.A. Johnson telephone 474-9222

This research has been approved by the Psychology/Sociology Research Ethics Board. If you have any concerns or complaints about this project you may contact any of the above-named persons or the Human Ethics Secretariat at 474-7122 or e-mail Margaret Bowman@umanitoba.ca.

_____
Participant's Signature Date

_____
Researcher and/or Delegate's Signature Date

STUDY II
CONSENT FORM For On-Line Survey

Research Project Title: **A Study of Stress and Coping Styles**
Researcher(s): **Matthew Decter, MSc., PhD. (cand.), Dr. E.A. Johnson, PhD (Advisor, Associate Professor)**

The purpose of this research, which is being conducted as the doctoral thesis of the first researcher listed above, is to better understand the basic processes underlying the ways people cope with a brief physical stressor in a laboratory setting. The stressor is immersion of the non-dominant hand and forearm in cold water. It is expected that the information gleaned from this research will assist psychologists in helping people who suffer from discomfort due to physical stressors (e.g., pain).

In the Experiment Name 1 you will be asked to complete four on-line questionnaires and attend a 15-20 minute individual testing session. In the part of Experiment Name 1 which you are completing today you will complete four questionnaires via an on-line survey website to which you have currently logged on. In these questionnaires you will be asked to answer questions and rate statements regarding your own thoughts, emotions, actions and behaviors. Completion of the questionnaires is worth one credit in the psychology department participant pool.
In the individual testing session for Experiment Name 1 you will be asked to learn some rating procedures, then you will to immerse your non-dominant forearm in cold water. Most participants find this to be uncomfortable. It is important to note that while this task is uncomfortable it has been shown to have absolutely no lasting ill effects. Immersing your arm in the cold water entails no more risk than you might be exposed to in your everyday life. There would be some increased risk to you if you suffer from: chronic pain, arthritis, Reynaud's disease, arthritis in your hands or arms, have had a recent injury to your upper non-dominant arm, or suffer from heart disease or high blood pressure. If you suffer from any of these problems you should excuse yourself from the study now.
Some of your verbal responses will be recorded (in writing) by the experimenter at different phases of the study. You will also be asked to give verbal reports and ratings, which will be recorded by the experimenter; as well, you will be required fill out some brief rating scales and descriptions of your experience.

Complete confidentiality will be maintained in this experiment in the following fashion. Individual participant data will be identified by a numeric participant code, so that no individual participants name can be attached directly to **any** of the data collected.
Complete confidentiality will be maintained in Experiment Name 1 in the following fashion. Individual participant data will be identified by a numeric participant code, so that no participants name can be attached directly to **any** of the data collected. Also, questionnaire data collected via the on-line survey web-site will be encrypted via to data transfer to prevent the possibility of violations of participant confidentiality

Because this study will take place over a number of weeks, participants will not receive debriefing regarding the **specific hypotheses** of the experiment. Instead they will undergo an immediate post-experimental debriefing in which they will be informed of the general aims of the experiment, given an opportunity to give feedback about the experiment Once the experiment is completed, a brief but complete description of the study, hypotheses and a summary of basic results will be posted outside the psychology Department Office under "Experiment Name" be in August of 2010.
Please note that you **must** sign up for an individual testing session on the participant pool web-site and complete the on-line survey to receive credit for Experiment Name 1. Also, you must complete the questionnaires **prior** ∫attending the individual session. If you do not complete the questionnaires prior to the individual session your individual session may have to be rescheduled.

You may indicate below whether you accept terms outlined above. In no way does this acceptance waive your legal rights nor release the researchers, sponsors, or involved institutions from their legal and professional responsibilities. You are free to withdraw from the study at any time, and /or refrain from answering any questions you prefer to omit, without prejudice or consequence. Your continued participation should be as informed as your initial consent, so you should feel free to ask for clarification or new information throughout your participation.

Matthew Decter, 487-0016, and
Dr. E.A. Johnson telephone 474-9222

This research has been approved by the Psychology/Sociology Research Ethics Board. If you have any concerns or complaints about this project you may contact any of the above-named persons or the Human Ethics Secretariat at 474-7122 or e-mail Margaret Bowman@umanitoba.ca.

PLEASE INDICATE WHETHER YOU ACCEPT THE TERMS OF THIS AGREEMENT BY MOVING THE CIURSOR AND CLICKING ON THE BUTTON 'ACCEPT' BELOW. THIS WILL AUTOMATICALLY MOVE YOU ON TO THE FIRST QUESTIONNAIRE. IF YOU DO NOT ACCEPT PLEASE CLICK ON THE APPROPRIATE BUTTON AND THIS WILL EXIT THE SURVEY PROCEDURE. THANK YOU VERY MUCH FOR YOUR INTEREST/PARTICIPATION.

STUDY II, CONSENT FORM FOR SESSION 1 (BASELINE)

Research Project Title: **A Study of Stress and Coping Styles**
Researcher(s): **Matthew Decter, MSc., PhD. (cand.), Dr. E.A. Johnson, PhD (Advisor, Associate Professor)**

The purpose of this research, which is being conducted as the doctoral thesis of the first researcher listed above, is to better understand the basic processes underlying the ways people cope with a brief physical stressor in a laboratory setting. The stressor is immersion of the non-dominant hand and forearm in cold water. It is expected that the information gleaned from this research will assist psychologists in helping people who suffer from discomfort due to physical stressors (e.g., pain).

In this part of Experiment Name 1 which you are completing today you will be asked to learn some rating procedures, then you will immerse your non-dominant forearm in cold water. Most participants find this to be uncomfortable. It is important to note that while this task is uncomfortable it has been shown to have absolutely no lasting ill effects. Immersing your arm in the cold water entails no more risk than you might be exposed to in your everyday life. There would be some increased risk to you if you suffer from: chronic pain, arthritis, Reynaud's disease, arthritis in your hands or arms, have had a recent injury to your upper non-dominant arm, or suffer from heart disease or high blood pressure. If you suffer from any of these problems you should excuse yourself from the study now.

Some of your verbal responses will be recorded (in writing) by the experimenter at different phases of the study. You will also be asked to give verbal reports and ratings, which will be recorded by the experimenter; as well, you will be required fill out some brief rating scales and descriptions of your experience.

Participants who complete the individual testing session for Experiment Name 1 and meet the requirements will be invited to participate in Experiment Name 2. In Experiment Name 2 you will be taught a coping method and will complete a second cold water immersion test. You will also be asked to make ratings regarding your thoughts feelings and experiences during the experiment and to complete some math problems. Experiment Name 2 will involve a single individual testing session, which will be 45-60 minutes in length.

Complete confidentiality will be maintained in Experiment Name 1 in the following fashion. Individual participant data will be identified by a numeric participant code, so that no participants name can be attached directly to **any** of the data collected.

Because this study will take place over a number of weeks, participants will not receive debriefing regarding the **specific hypotheses** of the experiment. Instead they will undergo an immediate post-experimental debriefing in which they will be informed of the general aims of the experiment, given an opportunity to give feedback about the experiment Once the experiment is completed, a brief but complete description of the study, hypotheses and a summary of basic results will be posted outside the psychology Department Office under "Experiment Name" be in August of 2010.

You may indicate below whether you accept terms outlined above. In no way does this acceptance waive your legal rights nor release the researchers, sponsors, or involved institutions from their legal and professional responsibilities. You are free to withdraw from the study at any time, and /or refrain from answering any questions you prefer to omit, without prejudice or consequence. Your continued participation should be as informed as your initial consent, so you should feel free to ask for clarification or new information throughout your participation.

Matthew Decter, 487-0016, and
Dr. E.A. Johnson telephone 474-9222

This research has been approved by the Psychology/Sociology Research Ethics Board. If you have any concerns or complaints about this project you may contact any of the above-named persons or the Human Ethics Secretariat at 474-7122 or e-mail Margaret Bowman@umanitoba.ca.

_____
Participant's Signature Date

_____
Researcher and/or Delegate's Signature Date

STUDY II, CONSENT FORM FOR SESSION 2 (EXPERIMENTAL)

Research Project Title: **A Study of Stress and Coping Styles**
Researcher(s): **Matthew Decter, MSc., PhD. (cand.), Dr. E.A. Johnson, PhD (Advisor, Associate Professor)**
The purpose of this research, which is being conducted as the doctoral thesis of the first researcher listed above, is to better understand the basic processes underlying the ways people cope with a brief physical stressor in a laboratory setting. The stressor is immersion of the non-dominant hand and forearm in cold water. It is expected that the information gleaned from this research will assist psychologists in helping people who suffer from discomfort due to physical stressors (e.g., pain).

In the part of the experiment which you are participating in today (Experiment Name 2) you will learn a some rating procedures, then you will be asked to immerse your non-dominant forearm in cold water. Most participants find this to be uncomfortable. It is important to note that while this task is uncomfortable it has been shown to have absolutely no lasting ill effects. Prior to putting your arm in the cold water you will learn a method to help you cope with the stress and discomfort caused by the cold water. Afterwards, you will be asked to give perform a simple math task and make a number of ratings, which will assist us in understanding your response to the ice water immersion task and the efficacy of coping method you have been taught. In total, Experiment Name 2 will likely take 45-60 minutes to complete and is worth 2 experimental credits.

This study entails no more risk than you might be exposed to in your everyday life. There **would** be some increased risk to you if you suffer from chronic pain, arthritis, Reynaud's disease, have had a recent injury to your non-dominant arm, or suffer from heart disease or high blood pressure. If you suffer from any of these problems you should excuse yourself from the study now.

Some of your verbal responses will be recorded (in writing) by the experimenter at different phases of the study. You will also be asked to give verbal reports and ratings, which will be recorded by the experimenter; as well, you will be required fill out some brief rating scales and descriptions of your experience.

Complete confidentiality will be maintained in Experiment Name 2 in the following fashion. Individual participant data will be identified by a numeric participant code, so that no participants name can be attached directly to **any** of the data collected.
Because this study will take place over a number of weeks, participants will not receive debriefing regarding the **specific hypotheses** of the experiment. Instead they will undergo an immediate post-experimental debriefing in which they will be informed of the general aims of the experiment, given an opportunity to give feedback about the experiment Once the experiment is completed, a brief but complete description of the study, hypotheses and a summary of basic results will be posted outside the psychology Department Office under "Experiment Name" be in August of 2010.

All participants in Experiment Name 2 will receive 2 experimental credit in the psychology department participant pool for participation in this study.
Your signature on this form indicates that you have understood to your satisfaction the information regarding participation in the research project and agree to participate as a subject. In no way does this waive your legal rights nor release the researchers, sponsors, or involved institutions from their legal and professional responsibilities. You are free to withdraw from the study at any time, and /or refrain from answering any questions you prefer to omit, without prejudice or consequence. Your continued participation should be as informed as your initial consent, so you should feel free to ask for clarification or new information throughout your participation.

Matthew Decter, 487-0016, and
Dr. E.A. Johnson telephone 474-9222
This research has been approved by the Psychology/Sociology Research Ethics Board. If you have any concerns or complaints about this project you may contact any of the above-named persons or the Human Ethics Secretariat at 474-7122 or e-mail Margaret Bowman@umanitoba.ca.

_____
Participant's Signature Date

_____
Researcher and/or Delegate's Signature Date

Self Control Scale

Using the scale provided, please indicate how much each of the following statements reflects how you typically are (circle one of the numbers at the right for each of the statements.

1	I am good at resisting temptation.	*1—2—3—4—5*
2	I have a hard time breaking bad habits.	*1—2—3—4—5*
3	I am lazy.	*1—2—3—4—5*
4	I say inappropriate things.	*1—2—3—4—5*
5	I never allow myself to lose control.	*1—2—3—4—5*
6	I do certain things that are bad for me, if they are fun.	*1—2—3—4—5*
7	People can count on me to keep on schedule.	*1—2—3—4—5*
8	Getting up in the morning is hard for me.	*1—2—3—4—5*
9	I have trouble saying no.	*1—2—3—4—5*
10	I change my mind fairly often.	*1—2—3—4—5*
11	I blurt out whatever is on my mind.	*1—2—3—4—5*
12	People would describe me as impulsive.	*1—2—3—4—5*
13	I refuse things that are bad for me.	*1—2—3—4—5*
14	I spend too much money.	*1—2—3—4—5*
15	I keep everything neat.	*1—2—3—4—5*
16	I am self-indulgent at times.	*1—2—3—4—5*
17	I wish I had more self discipline.	*1—2—3—4—5*
18	I am reliable.	*1—2—3—4—5*
19	I get carried away by my feelings.	*1—2—3—4—5*
20	I do many things on the spur of the moment.	*1—2—3—4—5*
21	I don't keep secrets very well.	*1—2—3—4—5*
22	People would say that I have iron self-discipline.	*1—2—3—4—5*
23	I have worked or studied at night at the last minute.	*1—2—3—4—5*
24	I am not easily discouraged.	*1—2—3—4—5*
25	I'd be better off if I stop to think before acting.	*1—2—3—4—5*
26	I engage in healthy practices.	*1—2—3—4—5*
27	I eat healthy foods.	*1—2—3—4—5*
28	Pleasure and fun sometimes keep me from getting work done.	*1—2—3—4—5*
29	I have trouble concentrating.	*1—2—3—4—5*
30	I am able to work effectively toward long-term goals.	*1—2—3—4—5*
31	Sometimes I can stop myself from doing something, even if I know it's wrong.	*1—2—3—4—5*
32	I often act without thinking through all the alternatives.	*1—2—3—4—5*
33	I lose my temper too easily.	*1—2—3—4—5*
34	I often interrupt people.	*1—2—3—4—5*
35	I sometimes drink or use drugs to excess.	*1—2—3—4—5*
36	I am always on time	*1—2—3—4—5*

Mindful Attention Awareness Scale

INSTRUCTIONS: Below is a collection of statements about you everyday experience. Using the 1-6 point scale below, please indicate how frequently or infrequently you currently have each experience. Please answer according to what really reflects your experience rather than what you think your experience should be.

1= *almost always;* 2=*very frequently;* 3=*somewhat frequently;*
4=*somewhat infrequently;* 5= *very infrequently*; 6=*almost never.*

1) I could be experiencing some emotion and not be conscious of it until some time later____.

2) I break or spill things because of carelessness, not paying attention, or thinking of something else___.

3) I find it difficult to stay focused on what's happening in the present____.

4) I tend to walk quickly to get where I'm going without paying attention to the experiences along the way___.

5) I tend not to notice physical tension or discomfort until they really grab my attention____.

6) I forget a person's name almost as soon as I've been told it for the first time____.

7) It seems I am "running on automatic" without much awareness of what I am doing___.

8) I rush through activities without being really attentive to them____.

9) I get so focused on the goal I want to achieve that I lose touch with what I am doing right now to get there___

10) I do jobs or tasks automatically, without being aware of what I'm doing____.

11) I find myself listening to someone with one ear, doing something else at the same time____.

12) I drive places on "automatic pilot" and then wonder why I went there____.

13) I find myself preoccupied with the future or the past____.

14) I find myself doing things without paying attention____.

15) I snack without being aware that I'm eating____.

TOTAL (OFFICE USE ONLY)_____

Anxiety Sensitivity Index

INSTRUCTIONS: Please rate each if the items below, indicating the degree to which each statement refers to you. Choose the appropriate number and indicate in the space provided after each statement

Very little=0
A little=1
Some=2
Much=3
Very much=4

1) It is important for me not to appear nervous ____
2) When I cannot keep my mind on a task, I worry that I might be going crazy ____
3) It scares me when I feel “shaky” ____
4) It scares me when I feel faint ____
5) It is important for me to stay in control of my emotions ____
6) It scares me when my heart beats rapidly ____
7) It embarrasses me when my stomach growls ____
8) It scares me when I am nauseous ____
9) When I notice my hear beating rapidly, I worry that I might have a heart attack____
10) It scares me when I become short of breath ____
11) When my stomach is upset, I worry that I might become seriously ill ____
12) It scares me when I am unable to keep my mind on a task ____
13) Other people notice when I feel shaky ____
14) Unusual body sensations scare me ____
15) When I am nervous I worry that I might be mentally ill ____
16) It scares me when I am nervous ____

TOTAL (OFFICE USE ONLY): _____

Pain Catastrophising Scale

Everyone experiences painful situations at some point in their lives. Such experiences may include headaches, tooth pain, joint or muscle pain. People are often exposed to situations that may cause pain such as illness, injury, dental procedures or surgery.

Instructions:

We are interested in the types of thoughts and feelings that you have when you are in pain. Listed below are thirteen statements describing different thoughts and feelings that may be associated with pain. Using the following scale, please indicate the degree to which you have these thoughts and feelings when you are experiencing pain.

RATING	**0**	**1**	**2**	**3**	**4**
MEANING	Not at all	To a slight degree	To a moderate degree	To a great degree	All the time

When I'm in pain …

Number	**Statement**	**Rating**	**Office Use**
1	I worry all the time about whether the pain will end.		
2	I feel I can't go on.		
3	It's terrible and I think it's never going to get any better		
4	It's awful and I feel that it overwhelms me.		
5	I feel I can't stand it anymore		
6	I become afraid that the pain will get worse.		**R=_____**
7	I keep thinking of other painful events		**M=_____**
8	I anxiously want the pain to go away		**H=_____**
9	I can't seem to keep it our of my mind		
10	I keep thinking about how much it hurts.		
11	I keep thinking about how badly I want the pain to stop		
12	There's nothing I can do to reduce the intensity of the pain		
13	I wonder whether something serious may happen.		

Appendix B

Self-Report measures

Visual Analogue Pain Rating Scale Used in Study I

VAS

PAIN INTENSITY

No pain at all _____ **Extremely Intense pain**

UNPLEASANTNESS

Not unpleasant at all _____ **Extremely unpleasant pain**

DISTRESS

Not at all distressed _____ **Extremely distressed by the pain**

Visual Analogue Pain Rating Scale Used in Study II

SUBJECT #: _____

VAS

INSTRUCTIONS: Below are three lines on which you will indicate the intensity of the pain you are experiencing at three different times. The research assistant will tell you when to make a mark to indicate the intensity of the pain you are experiencing, where the extreme right end of the line indicates extremely intense pain, and the left hand end of the line indicates no pain at all. Make a mark to indicate the intensity of the pain you are experiencing at the moment you make the mark.

PAIN INTENSITY 1

No pain at all _____ **Extremely intense pain**

PAIN INTENSITY 2

No pain at all _____ **Extremely intense pain**

PAIN INTENSITY 3

No pain at all _____ **Extremely intense pain**

Pain Tolerance Self-Efficacy Rating, Study I

Please rate how confident you are that you could withstand a future immersion of your forearm in ice-cold water for a longer period of time than you have previously.

Rate your confidence on a scale of **0-100**, where:

0=Not confident at all that I would be able to withstand a future immersion in ice cold water for a longer period of time than I have previously.

100=Extremely confident that I would be able to withstand a future immersion in ice cold water for a longer period of time than I have previously.

PLEASE CIRCLE ONE OF THE NUMBERS BELOW TO INDICATE YOUR RATING

0 10 20 30 40 50 60 70 80 90 100

Not confident at all that I would be able to withstand a future immersion in the ice cold water for a longer period of time than I have previously.

Extremely confident that I would be able to withstand a future immersion in ice cold water for a longer period of time than I have previously.

Pain Tolerance Self-Efficacy Rating, Study II

SUBJECT #:_____

SE2

Please rate how confident you are that you could withstand a future immersion of your forearm in ice-cold water for a longer period of time than you have previously.

Rate your confidence by choosing a number anywhere on a scale of

0 to 100, where:

0=Not confident at all *that I would be able to withstand a future immersion in ice cold water for a longer period of time than I have previously.*

100=Extremely confident *that I would be able to withstand a future immersion in ice cold water for a longer period of time than I have previously.*

Confidence Rating:_____

Temporal Speed and Retrospective Duration Ratings

PLEASE COMPLETE THE FOLLOWING, PARTS 1 and 2.

1) INSTRUCTIONS:

PLEASE WRITE DOWN YOUR BEST ESTIMATE OF HOW LONG YOU KEPT YOUR FOREARM IN THE COLD WATER (after you watched the video). PLEASE USE MINUTES AND/OR SECONDS TO COMMUNICATE YOUR ESTIMATE.

ESTIMATED TIME IN COLD WATER_____(minutes/seconds)

2) Please use the following statements and rating scale to rate the speed at which time seemed to pass while your arm was immersed in the cold water, circling the appropriate number, where":

0="TIME SEEMED TO SLOW TO A STANDSTILL"

5="TIME SEEMED TO MOVE ALONG AT ITS USUAL SPEED"

10=TIME SEEMED TO FLY BY VERY QUICKLY"

"While my arm was in the cold water, TIME seemed to…"
*(*circle one of the numbers below*).*

0 1 2 3 4 5 6 7 8 9 10

_____

"...slow to a standstill"

"...move along at its usual speed"

"...fly by very quickly"

Fatigue Rating, Study II

PLEASE RATE THE DEGREE OF FATIGUE YOU ARE EXPERIENCEING **RIGHT NOW** BY **CIRCLING** ONE OF THE NUMBERS BELOW.

Where:

1=Not Fatigued at all, full of energy
7=Extremely Fatigued

1 2 3 4 5 6 7

Spontaneous Strategy Use, Study II

Note: After the participant had made their fatigue rating for the baseline cold pressor session, they read and filled out the following:

While your arm was in the cold water did you use any type of strategy to cope with the discomfort?

_____

If you responded “yes” to the question above, could you describe the strategy that you used in as much detail as possible, below:

_____
_____
_____
_____
_____
_____
_____
_____
_____

APPENDIX C

INTERVENTON TRANSCRIPTS

Interventions Used in Study I, II

NOTE: Below, the Study I Swamp Metaphor is in bold face for each intervention, the Study II Swamp Metaphor is in italics. The goal admonition in the Study I swamp metaphor is underlined.

Acceptance Intervention

FADE TO:
TITLE: "COPING WITH PAIN THROUGH ACCEPTANCE, WILLINGNESS AND CHOICE"
FADE TO:

VIDEO INSTRUCTOR: You've now had your arm in the icy water once. In a little while we'll have you do this again. But first I'd like to tell you about three new ideas that will help you cope more effectively, and enable you to keep your arm in the water longer than before.

FADE TO:
TITLE: "IDEA # 1:
ESCAPE IS NOT THE ANSWER"
FADE TO:

VIDEO INSTRUCTOR: The first idea is that trying to mentally escape from distressing thoughts, feelings and sensations, actually makes them more intense and more distressing.

FADE TO:
TITLE: "IDEA # 2:
WILLINGNESS IS AN ALTERNATIVE TO ESCAPE"
FADE TO:

The second idea is that being willing to experience theses thoughts, feelings and sensations, makes them easier to cope with and provides an effective alternative to escape.

FADE TO:
TITLE: "IDEA # 3:
"THE CHOICE IS ALWAYS YOURS"
FADE TO:

The third idea is that the actions that we take are primarily a function of choices that we make. Now these choices may be influenced by thoughts

and feelings that we experience at any given moment but we always have the final say, in terms of what we choose to do.

Now it's inevitable that you would have experienced some unpleasant thoughts, feelings, and sensations while your arm was immersed in the icy water.
The thoughts might have been very insistent and urgent, like: "I can't stand this!" or "I can't take this anymore!"
The sensations might have been of an icy burning in your skin or an aching in your arm, wrist or fingers.
The feelings might have been of panic or distress at the discomfort you were experiencing.

Now, I think it is clear that it is these kinds of experiences that make the ice water task so unpleasant itself. The question is: how best to cope with them?
I'll get to that in just a couple of minutes, but first I want to be very clear about a way of coping that is *not* effective.

FADE TO:
TITLE: IDEA 1:
Trying to AVOID or ESCAPE
Unpleasant Mental
Experiences Makes Them
MORE INTENSE and
MORE DISTRESSING
FADE TO:

VIDEO INSTRUCTOR: One common way that people cope with distressing thoughts and sensations, is by trying to mentally escape from them.
They do this by not thinking about them, actively suppressing them, or trying to think about something else.
But there's a big problem with these strategies. Because the harder we work to escape from distressing mental events, the more intense and the more distressing they become. It's kind of a built- a vicious cycle.

Now this is kind of a new idea for most people. But it's a scientific fact supported by much research evidence. The harder we struggle to get rid of upsetting thoughts, feelings or sensations the more intense and the more distressing they become

Let me give you a kind of analogy to illustrate what I mean by this…

VIDEO INSTRUCTOR: On the table in front of you is a box…
Inside the box is an object that looks like this (displays Chinese Finger Trap)

It is called a Chinese Finger Trap.
Please open your box but you don't have to pick up the Finger Trap up yet. Just look at me.
Now the Chinese Finger Trap works like this:
I put one finger in one end and the other finger in the other end.
Now you can do the same. Pick up your Chinese Finger Trap. Put one finger in one end and another finger in the other.
Once your fingers are in the trap please don't do anything else yet.
Just look at me
Now: here is the interesting part. Once my fingers are in this trap if I try to release them, even by pulling gently on the trap, the trap just gets tighter.
Now you try this: just pull gently on your Chinese Finger Trap and you should feeling it getting tighter as well. Now, this trapped feeling that sensation of tightness creates, usually makes people want to pull even harder, which of course, makes the trap tighten even more.
You see instinct says: "Pull against what has trapped me." But in order to free yourself you have to let go of this...
Let me show you what I mean.
If I pull on the trap, to release my fingers; it just gets tighter.
However, if I relax, despite the feelings of trappedness, let my fingers move towards each other, against what the trap is "telling" me to do…then I can easily release myself.
Now you try this as well. Just allow your fingers to move toward each other, and you should find that you can easily free yourself.

Take a couple of minutes now to explore the Chinese finger Trap. Explore the sensations of trappedness and tightness created when you pull, even gently, on the trap, and explore the feelings o*f freedom*, when you are able to able to release yourself. I will be back in just a couple of minutes…

FADE TO BLACK (60 seconds)

FADE TO:

Title: PLEASE TAKE SOME TIME

TO EXPLORE THE CHINESE

FINGER TRAP

FADE TO:

VIDEO INSTRUCTOR: You've now had a couple of minutes to explore the Chinese Finger Trap. I've given you this time because I think The Chinese Finger Trap is a such good illustration for what happens when we try to escape from distressing thoughts, feelings or sensations. Now,

we can attempt to escape by not thinking about them, but this only makes them more intense, and like the Chinese Finger Trap, tightening around our fingers, just traps us more deeply.

The only way to way to avoid this vicious cycle is to let go of the impulse to escape. But you might ask: how do I do this? And what do I do instead of trying to escape from these unpleasant thoughts, feelings and sensations?

Well, with the Chinese Finger Trap I had to stop struggling against being trapped in order to free myself. We might call this non-struggling attitude something like *acceptance* or *willingness*.

Instead of struggling to escape I choose to willingly accept *things as they are*. And then I am open to discover how to free myself.

Now, this is a relatively new kind of idea. And some people might think it goes against common sense.

Now, common sense might say that if accept things as they are, then I can't do anything about them.

But in reality, acceptance…or what we'll call *willingness* is what makes freedom possible.

So that's our second idea, willingness is the key to coping with the distressing thoughts, feelings and sensations that you might encounter during the ice water task.

FADE TO:
TITLE: IDEA 2: "WILLINGNESS IS THE KEY TO

COPING WITH DISTRESSING

THOUGHTS, FEELINGS, AND

SENSATIONS"

FADE TO:
TITLE : "Willingness means…
Being willing to experience
what you experience when
you experience it...
Even if what you experience
Is distressing.
FADE TO:
TITLE:
Cultivating Willingness:
The 'Two Scales Metaphor'
FADE TO:
VIDEO INSTRUCTOR: So how might you cultivate "willingness while your arm is in the ice water, during the ice water task?

Well think about it this way….
Imagine that there are two scales inside of you.
Like the volume and balance knobs on a stereo.
One scale we'll call the distress and discomfort scale.
It goes from 0-10.
While your arm is immersed in the icy water this scale goes way, way up.
Now you can cope more effectively if you focus your attention on *another* scale.
Now, when distress and discomfort are high, this other scale is usually hidden.
But it's the more important of the two scales, because it is the only we can really influence.
We'll call this scale the *Willingness Scale*.
And it also goes from 0-10.
Now as you'll recall, *willingness* refers to the degree to which you are open to experience your own experience when you experience it—the degree to which you are willing to accept "things as they are" moment-to-moment…
So how do you cultivate *willingness?*
Well, the desire to escape from distress and discomfort can be thought of as a *re-action*.
Willingness is not a re-action.
Willingness is a *choice*.
Now, you will cope more effectively during the ice water task if you make a conscious choice to set your Willingness scale *high*.
Now, if you set your Willingness scale low, the distress and discomfort scale will be high and it <u>stay</u> high.
But: If you set your Willingness scale High… distress and discomfort scale may be high or low, or it may go from low to high and back again. It will be what it will be, because you are willing to allow whatever happens to happen.
Most importantly: if you set your Willingness scale High, you will not get pulled into a useless struggle to *escape* from distress and discomfort.
Willingness stops that vicious cycle right in its tracks. That is why it is so effective.

FADE TO:

<u>Choosing</u> to Cultivate
<u>Willingness</u> Will Help You
Cope With Distressing
Thoughts, Feelings and
Sensations During the
Ice Water Task

FADE TO:

VIDEO INSTRUCTOR: The third and final idea I want to tell you about focuses on the relationship between thoughts, feelings and sensations we experience and the actions we take.
Now, people often believe that thoughts and feelings *necessarily* dictate what we do. This is such a common and seemingly sensible idea that we sometimes forget that we virtually *always* have a choice about our actions. Sure, our thoughts and feelings can play a role but we, not our thoughts, are in the driver's seat.
Let me give you an analogy for what I mean by this.
Imagine there is a bus and you're a driver.
On the bus are a bunch of passengers.
These passengers are thoughts, feelings, sensations, bodily states, memories and other aspects of experience.
Now, some of the passengers are *mean looking*. They're all dressed up in black leather jackets and they are carrying switchblade knives. They are nasty. Now these are kind of like the unpleasant thoughts, feelings and sensations that you might have experienced during the ice-water task.
Now, what happens on the bus is this: you're driving along and one day these mean-looking passenger's start threatening you, telling you what to do, where to go.
The threat they hold over you is this: if you don't do what they say, they're going to come up front from the back of the bus. And you don't want this. Because they're so scary-looking. So you make a deal with them, you say: "You guys go to the back of the bus and scrunch down, and I'll do pretty much what you ask. In other words: You try to ignore them.
Now, maybe after a few days of this you get fed up. You say, "I don't like this. I'm want these mean passengers off the bus!" So you're driving down the road, you slam on the brakes and you go stomping down the isle to throw them off…
But notice this: you're not driving the bus anymore you had to stop.
Notice this: you've stopped by the side of the road. All you're doing is spending your time trying to get those mean passengers off the bus. And they aren't going anywhere. In other words: in order to g et control

In other words, by trying to get control of the bus, you've actually given up control! Not only that, those mean passengers might *look* dangerous…they might *look* like they could harm you…but it has never actually happened…

Now, the thoughts, feelings and sensations you experienced during the ice water task are kind of like these mean passengers on the bus. They are shouting at you: "take your arm out of the water!" They are yelling: "Get this bus off the road right now!" They are very convincing too. But

the reality is that the cold water is not harmful in any way and neither are the unpleasant thoughts or uncomfortable sensations.

Now, here's the thing: if you viewed these unpleasant thoughts, feelings and sensations as *reasons* for behaviour…as *reasons for action,* you might take your arm out of the water sooner than if they were viewed, instead, simply as what they are: thoughts and sensations that are passing through your mind but have no special power over what you choose to do.

So that's idea number three in a nutshell: thoughts and feelings are *not* reasons for behaviour. They are *not* reasons for action. They are simply transitory events passing through your mind. And they have no special power over what you choose to do. You *always* have the final say.

FADE TO:
TITLE:
IDEA#3:
THOGUHTS, FEELINGS
AND SENSATIONS ARE NOT
REASONS FOR ACTION

YOU ALWAYS HAVE THE
FINAL SAY
FADE TO:
TITLE:
Summing up…
And a few words about
crossing a smelly swamp
FADE TO:

VIDEO INSTRUCTOR: ***I've presented three new ideas: 1) Trying to escape from distressing thoughts, feelings and sensations just makes them worse. 2) You can prevent this and make things better by being willing to experience them as they are. 3) Thoughts and feelings aren't reasons for behaviour; you always have a the final say in terms of what you choose to do, regardless of what your thoughts may be "telling" you.***

Now, in a little while you will put your arm in the ice water again. So how do you put these three ideas together to help you cope more effectively?

Well, imagine that in order to reach something that's really important to you, you have to cross a swamp full of dirt, rubbish, and leftovers. The swamp smells so bad, it *really* stinks. Now, what

kind of thoughts do you think are going to arise in this type of situation? Well, thoughts like "This is disgusting," "I can't stand this," "This is unbearable," are likely to arise.

Now the best and most effective way you could possibly cross the swamp is be to let your goal--which is to reach something important on the other side of the swamp, be your guide. You will experience unpleasant thoughts, and uncomfortable sensations as you move toward your goal. But the more willing you are to accept them as they are, the easier it will be for you.

So you can accept them as they arise and let them be. Allow them to pass, as you keep moving toward your goal. It's all about being open and accepting to all the thoughts, feelings and sensations that might come up, about welcoming them and letting them pass by, as you keep doing what's important to you: crossing the swamp to reach the other side to obtain something that really important to you.

Now, you could approach the ice water task a similar way. Your goal is to keep your arm in the water for as possible. <u>Now, this is important because the longer you can keep your arm in the water, the likelier it will be that the data we get from this experiment will be of help to us in assisting people with real clinical problems. So you can let that be your goal during the task</u> (Note: for the acceptance condition in Study II these underlined portions were omitted, otherwise the Swamp Metaphor was the same.

While your arm in the water you can cope more effectively by turning up your Willingness scale. Choosing to experience what you experience when you experience it. Secure in the knowledge that any thoughts, feelings or sensation that come up are simply going to pass by, to be replaced by new ones. Knowing that you can experience all these thoughts, feelings and sensations, without having them effect your behaviour in any way if you choose.

So when the time comes and your arm is in the ice water, that is what you do: turn up your Willingness scale, accept changing thoughts, feelings and sensations as they are and let your goal be your guide, as you keep your arm in the ice water for as long as possible...

<u>STUDY II SWAMP METAPHOR: VIDEO INSTRUCTOR:</u> I've presented three new ideas: 1) Trying to escape from distressing thoughts, feelings

and sensations just makes them worse. 2) You can prevent this and make things better by being willing to experience them as they are. 3) Thoughts and feelings aren't reasons for behaviour; you always have a the final say in terms of what you choose to do, regardless of what your thoughts may be "telling" you.

Now, in a little while you will put your arm in the ice water again. So how do you put these three ideas together to help you cope more effectively?

Well, imagine that in order to reach something that's really important to you, you have to cross a swamp full of dirt, rubbish, and leftovers. The swamp smells so bad, it really stinks. Now, what kind of thoughts do you think are going to arise in this type of situation? Well, thoughts like "This is disgusting," "I can't stand this," "This is unbearable," are likely to arise.

Now the best and most effective way you could possibly cross the swamp is be to let your goal--which is to reach something important on the other side of the swamp, be your guide. You will experience unpleasant thoughts, and uncomfortable sensations as you move toward your goal. But the more willing you are to accept them as they are, the easier it will be for you.

So you can accept them as they arise and let them be. Allow them to pass by, as you keep moving toward your goal. It's all about being open and accepting to all of the thoughts, feelings and sensations that might come up, about welcoming them and letting them pass by, as you keep doing what's important to you: crossing the swamp to reach the other side to obtain something that really important to you.

Now, you can approach the ice water task a similar way. While your arm in the water you can cope more effectively by turning up your Willingness scale. Choosing to experience what you experience when you experience it. Secure in the knowledge that any thoughts, and feelings or sensation that come up are simply going to pass by, to be replaced by new ones. Knowing that you can experience all of these thoughts, feelings and sensations, without having them effect your behaviour in any way if you choose.

So when the time comes and your arm is in the ice water that is what you do: turn your Willingness scale up. Accept changing thoughts, feelings and sensations as they are and let your goal be your guide, as you keep your arm in the ice water for as long as possible...

Thank you.

FADE TO:
TITLES: When your arm is in the ice water again…
Choose to turn your Willingness Scale up…
Accept transient distressing thoughts,
feelings and sensations as they arise
and let them to pass by….
And focus on your goal of
Keeping your arm in the water
For as long as possible…

Thank you for your attention
You may call the research assistant now.

FADE TO BLACK

Distraction Intervention Script

TITLE: COPING WITH PAIN USING DISTRACTION
FADE TO:

VIDEO INTRUCTOR: You've now had arm immersed in the icy water. In a little while you will do this again. Before you put your arm in the icy water again I'd like to tell you about a very useful, very old, and very effective method that will help you cope more effectively and enable you to keep your arm in the water even longer than you did the first time.
Now it's almost inevitable that you would have some unpleasant thoughts, feelings, and sensations while your arm was in the icy water.
The thoughts might have been very insistent and urgent, like: "I can't stand this anymore!" or "I can't take this!"
The sensations might have been of an icy burning in your skin or an aching in your arm and wrist.
The feelings might have been of panic or distress at the discomfort you were experiencing.
I think it is clear that such thoughts, feelings and sensations are what make the experience of having your arm immersed in ice water unpleasant. That is straightforward. But how best to cope with them?

FADE TO:
TITLE:
"How you focus your attention is a key factor
in coping with distressing thoughts,
feelings or sensations"
FADE TO:

Probably the most effective coping tool you have has to do with how you focus your attention.
When the unpleasant thoughts, feelings and sensations start, they are almost like fireworks going off in a night sky. They are saying: "Look at me! Do something about me!" They *demand* our attention.
Focusing attention on something unpleasant is a lot like throwing gasoline on a fire. If you put all your attention into some distressing thought or feeling it just makes that thought or feeling grow and intensify; and then you suffer.
On the bright side, if you move your attention away from distressing thoughts or feelings they become less noticeable and less distressing, and suffering decreases radically or even completely.
So one of the things you can do during the ice water task is to move your attention away from unpleasant thoughts and feelings and sensations.
Now you might say: "How am I going to do this?" Because those unpleasant thoughts, feelings and sensations are pretty powerful; pretty noticeable; as we have said; they're a lot like fireworks going off. They

demand your attention. So what can you do keep your attention away from them.

FADE TO:

TITLE:

To stop yourself from focusing on something unpleasant, you can focus your attention elsewhere. This is called DISTRACTION.

FADE TO:

One extremely effective way to keep yourself from focusing attention on distressing thoughts feelings and sensations is by learning to keep your attention on something else that is interesting and engaging and memorable.

This is one of the oldest and most effective approaches to coping with distressing experiences, especially coping with pain: distraction

Basically, it amounts to using something interesting to distract yourself from distressing thoughts feelings or sensations. People do this all the time almost without thinking about it. Distraction is a natural, simple and straightforward coping strategy. And it works.

So what we are going to do now is to come up with a really effective, really simple and straightforward method you can use to keep your mind occupied and your attention focused away from the unpleasant experience of the ice-water task. This method is tried and true and very effective.

There are three steps in this method:

1) You select a vivid, pleasant and memorable event

2) You practice recalling this event in all its richness

3) When your hand is in the ice water you play this memorable event in your mind like a movie, focusing all your attention on it in all its richness and detail.

FADE TO:

TITLE:

STEP 1: Choosing a memory of a personal experience to use for distraction

FADE TO:

The first step in using this method is to think of an experience you've had that was pleasant, and fun, and also that was also very memorable for you. The main thing is that it should be memorable and vivid and should contain enough detail so that thinking about it could occupy you for as long as your arm is in the water.

It could be a surprise birthday party that you've had recently; it could be a pleasant afternoon that you spent playing soccer, or baseball or Ultimate, or a time that you went out to a dinner with friends or family. It could be an afternoon you spent at the mall window-shopping, an exciting

mountain bike ride you have taken, a half marathon you ran, or acting in a play for the first time.
It doesn't really matter what it is, only that it is an experience that was really memorable, that took place over a period of time, say an hour or a couple of hours so that you can really get into remembering it in detail.
So for the next couple of minutes I want you to choose an experience. Remember; it could be anything--As long as it is pleasant, vivid and memorable. So take some time now, search your memory, and choose a memorable and interesting event or experience. You will have two minutes to think about this.

FADE TO:
TITLE:
When you have thought of a memorable
event please write it down in the
form provided (120 seconds elapse)
FADE TO:

The two minutes are up. You should have a pretty clear idea in your mind of the event that you are going to conjure up in your mind. So that is what we are going to do now. Imagine the event in detail.

FADE TO:
TITLE:
"STEP 2: IMAGINE THE EVENT IN ALL ITS
RICHNESS AND DETAIL"
FADE TO:

What I'd like you to do for the next few minutes is to simply close your eyes and imagine that event from start to finish, to conjure it up, like a movie in your mind.
Try and really create a powerful and vivid movie of the event starting with the beginning and going through the middle and all the way to the end. And when you're creating this movie, details are really important. What kind of details?

FADE TO:
TITLE: "VISUAL DETAILS
ARE IMPORTANT"
FADE TO:

First, visual details: What did you see from your perspective during the event. If you were outside, what was the day like? Was there sun or clouds? If there were clouds remember them if you can. Were they puffy, white, grey, dark, thin, and high in the sky or low overhead?
If you were inside at some restaurant or a movie theatre or an apartment or wherever, try and conjure up the scene in your mind, the colours, the kind of lighting; was the place busy, with lots of visual movement to notice, or was it quiet and still and empty.

If there were people, what did they look like? How were they dressed and how did they move? Act? What did they say? What were their faces like? Do you remember some people with great clarity and others less so? How was the place decorated? Does anything else stand out? Just try and remember what you saw and experienced visually. As much as you can.

FADE TO:

TITLE: SOUNDS ARE IMPORTANT

FADE TO:

Sounds are also important. Maybe your experience involved talking to people, listening to music or experiencing natural sounds, like the sounds of wind or waves or the creaking of trees in the wind, or the dripping of rain. Maybe there were sounds outside the place. Maybe you were playing soccer and you can remember the thudding of running feet on the field and the shouts of the players and onlookers. Maybe at a restaurant you remembered the clinking of glasses and of cutlery and the low murmuring of conversation. Maybe you were at a football game and you can remember the calls of the quarterback and the roar of the crowd. Maybe you were going for a long walk in the country and you could hear the buzzing of bees and the chirping of crickets. Maybe your experience was of going to an arcade to play games and you remember all the electronic sounds, the buzzes and beeps.

FADE TO:

TTILE: SMELLS MIGHT BE IMPORTANT

FADE TO:

At the same time you should also be remembering if there were any odours specific to your experience. Maybe you were at a restaurant, and you can remember steaks grilling on a fire and the smell of roasting meat. Maybe at a party there were fireworks and you can remember the smell of the fireworks as the smoked and exploded in the sky. Maybe you were sitting at a bonfire on a beach and you can remember the smell of wood smoke and hotdogs. Maybe you were at a beach with friends and you can smell the sun block and the malt smell of a beer you were drinking.

These are just hints as to how to go about picturing your experience. All you have to do is imagine the event as vividly as possible, imagining as many details as you can. The main thing though is to concentrate on creating the best picture you can for as long as you can.

So you may start making your movie inside your head now. You will do this for two minutes. If you finish imagining the event before the three minutes is up just start over again and see if you can remember and imagine even more details. You may close your eyes if you like.

FADE TO BLACK
Two minutes elapse
FADE TO:
Now you can stop and open your eyes if you had them closed.

STUDY I SWAMP METAPHOR: Before I sign off I'd like to address a question that you may have been thinking about and even if you haven't been thinking about it, its important for you to know. The question is: when it comes time to put your arm in the water again how are you going to apply this distraction strategy? Well think of it this way:
Imagine that the only way to reach something that's really important for you is to go across a swamp full of dirt, rubbish, and leftovers. Now the swamp smells so bad it really stinks. What kind of thoughts do you think are going to arise in such a situation? Thoughts like "I can't stand this," "This is unbearable," "This is disgusting, are likely to arise. Now the best way you could possibly cross the swamp is to distract yourself from these unpleasant thoughts and any unpleasant feelings and sensations, while you let your goal, to get to something important to you on the other side, be your guide. It's all about moving your attention away from upsetting thoughts, feelings, and sensation, and focusing on something pleasant, like the memorable event that you practiced recalling, while you keep doing what's important in that moment: crossing the swamp and reaching the other side.

You could approach the ice water task a similar way. Your goal is to keep your arm in the water for as long as you can. <u>This is important because the longer you can keep your arm in the water, the likelier it will be that the data we get from this experiment will be of use in helping people with real clinical problems.</u> While you do this you can cope by distracting yourself. You can imagine your vivid, engaging, and memorable experience; make a movie of it in your mind and focus all your attention on it, while you ignore unpleasant thoughts feelings and sensations.

So when the time comes, and your arm is in the water, that is what you do: distract yourself focus from unpleasant thoughts, feelings and sensations by focusing all of your attention on the movie in your mind of your memorable experience, and let your goal be your guide as you keep your arm in the water for as long as possible.

STUDY II SWAMP METAPHOR: We're almost done but before I sign off I'd like to address a question that you may have been thinking about and

the question is: when it comes time to put your arm in the water again how am I going to apply this distraction strategy? Well think of it this way:
Imagine that the only way for you to reach something that's really important for you is to cross a swamp full of dirt, rubbish, and leftovers. Now this swamp smells so bad it really stinks. Imagine the kinds of thoughts you might have in that situation. Thoughts like: "This is disgusting," "This is unpleasant," I can't stand this," "This is unbearable," are likely to occur. Now the best way you could cross the swamp in that kind of situation is to focus on what's important to you, getting to the other side, and you can facilitate this by thinking of something more pleasant, thinking, for example of a vivid, engaging and memorable event and focusing on it. Pulling your attention away from distressing thoughts feelings and sensations so you can focus on your goal of getting to the other side.

Now, you can approach the cold-water task in a similar way. Your goal for this task is to keep your arm in the water for as long as you possibly can. And you can facilitate this by focusing on the vivid, engaging and memorable event that you conjured up, distracting yourself from distressing thoughts, feelings and sensations caused by the cold water, while you keep focusing on your goal, which is to keep your arm in the water for as long as possible.

So when the time comes and your arm is in the cold water that is what you do: distract yourself, focus on the movie in your mind, pull your attention away from distressing thoughts feelings and sensations so that you can keep your arm in the water for as long as possible. Thank you.

FADE TO:
TITLE: Remember…When your arm is in the
ice water…
Distract yourself using the
mental movie of your
memorable event…
And let your goal be your guide…
As you keep your arm in the water
For as long as possible…
You may call the research assistant now.
FADE TO BLACK

Suppression Intervention Script

FADE TO:
TITLE: "COPING WITH PAIN THROUGH SUPPRESSION AND THOUGHT STOPPING"

VIDEO INSTRUCTOR: You've now had the your arm in the icy water once. In a little while you will do this again. But before you do I'd like to tell you about method that will help you cope more effectively and enable you to keep your arm in the water longer than before.
Now it's almost inevitable that you would have experienced some unpleasant thoughts, feelings, and sensations while your arm was in the icy water.
The thoughts might have been very insistent and urgent, like: "I can't stand this!" or "I can't take this anymore!"
The sensations might have been of an icy burning in your skin or an ache in your wrist or fingers.
The feelings might have been of panic or distress at the level of discomfort you were experiencing.
Now I think it is clear that it is these kinds of experiences are what make the ice water task so unpleasant. The question is: But how best to cope with them?
Well, one very effective method that has been in clinical use for many years is called suppression. Suppression means blocking distressing thoughts and feelings and pushing them out of awareness.
People often spontaneously and naturally use this method to cope with distressing thoughts, feelings, and sensations.
You are going to learn how to do this in a systematic fashion to help you cope more effectively.
To do this you will learn a simple technique that will help you block upsetting thoughts, feelings or sensations, quickly and efficiently.

FADE TO:
TITLE: "THOUGHT STOPPING IS THE KEY"
FADE TO:

This technique that you will use is called 'thought stopping'.

Thought stopping works like this: whenever you have an unpleasant thought, you silently shout, "STOP," to suppress it. And you can also silently shout, "STOP" to suppress distressing feelings or sensations.
Now, you are going to learn thought-stopping in two steps.

Step one: when an unpleasant thought enters your mind you are going to shout "Stop!," out loud.

Step two: whenever an unpleasant thought enters your mind you are going to shout “STOP!” silently.

So let’s start with step one. And what we are going to do first is practice with thoughts that are not particularly unpleasant.

What I’m going to do first is demonstrate for you. What I am going to do first is to imagine myself going for a walk with a friend. Now while I am imaging this if I have thought: “it was rainy” or any other thoughts related to rain or bad weather I am going to raise my left hand and shout stop out loud.
Okay I am going to start this now. Remember: I am just imagining myself going for a walk with a friend and when any of those thoughts about rain or bad weather enter my mind I am going to raise my left hand and shout “STOP.” So I am going to start this, now.

FADE TO

VIDEO INSTRUCTOR practices seven times

FADE TO

VIDEO INSTRUCTOR: Okay, so you’ve just observed me doing step one of thought stopping.
Now, for the next few minutes what I would like you to do is to practice thought stopping as well.
So remember what your instructions are: What I would like you to do is to imagine yourself going for a walk with a friend. And if while you are imagining this, you happen to have the thought “it was rainy,” or you have any other thoughts related to rain or bad weather, I just want you raise your left arm and shout “STOP.” Now, while you are doing this you don’t have to worry about making loud sounds because the rooms are pretty well soundproofed
The other thing though I would like you to do is that you’ll notice there is a form on the table in front of you and a pencil. And what I would like you to do is that every time you raise your arm and shout “Stop!” I would like you to make a make a tick on one of the horizontal lines on the form. Now if you make lots of tick marks and your run out of horizontal lines don’t worry, just continue making marks wherever you can on the paper. You also might not make many tick marks, you might not shout stop very often, which is just fine. So you might have a lot of tick marks or not very many.
So remember your instructions, you are supposed to imagine going for a walk with a friend. And if while you are imaging this you happen to have the thought, “it was rainy,” or you have any other thoughts related to rain or bad weather you raise your left hand, shout “STOP,” make a tick mark on the paper, and then just go back to the task, until I tell you to stop.

FADE TO:

Title:
Imagine yourself walking with a friend…
if you think of the phrase “it was rainy”…or anything
else related to rain….
Shout “stop”
And make a mark on the form provided
FADE TO NEW TITLE
Please start NOW
Time Interval: 60 seconds
FADE TO:

VIDEO INSTRUCTOR: Okay. You may can stop now and put your pencil down and look at me. You’ve had a chance to practice the first step of thought stopping: that is shouting “STOP” out loud in response to unwanted thoughts.

Now we’ll move to on to step two: which is shouting “STOP” but silently. Again this step in learning thought stopping is the same as part one, with one small difference: So that is what I am going to have you do now, for the next few minutes.

I want you to imagine yourself going for a walk with a friend. And if while you are imaging this if you happen to have thought, thoughts related to rain or bad weather I want you to shout shout, “STOP” but silently, inside your mind.

You don’t have to raise your arm this time but I would like you to make tick mark on the next page of the form every time you shout “STOP” silently.

So you have your instructions now: again, very simple: imagine yourself walking with a friend; if you have thoughts about “rain” or bad weather, you just shout “STOP” silently inside your mind to block and suppress that thought and make a tick mark on the form in front of you. I will have you do this for a few minutes of practice and then we’ll be back to move on to the next part of learning thought-stopping.

FADE TO:
Title:
Imagine yourself walking with a friend…
if you think of the phrase “it was rainy”…or anything
else related to rain….
Shout “stop”
And make a mark on the form provided
FADE TO
NEW TITLE:
Please start NOW
FADE TO BLACK
Time Interval of 60 seconds
FADE TO:

VIDEO INSTRUCTOR: So now you've had a chance to practice thought-stopping both out loud and silently using thoughts that are not particularly unpleasant.
What I'd like to do now is to have you practice silent thought-stopping with thoughts more like those you might experience during the ice-water task
What I am I am going to do is read you some words and phrases that represent thoughts that you might actually experience during the ice-water. Now, interspersed with some thoughts that are not particularly unpleasant. Your job is to silently shout, whenever you hear words and phrases that might belike thoughts you might experience during the ice water task.
So I am going to read the list now. Remember your instructions, you silently shout "STOP" to block and suppress thoughts that sound like those you might experience during that ice-water task. And the other thoughts you can just let pass by. So here we go…
It's a nice day today.
I am uncomfortable.
My arm feels like it's burning.
I like ice cream.
Clouds shapes are interesting.
My wrist aches.
This is unbearable.
June is my favorite month
Canada is a large country
The game of checkers takes skill
I can't bear this pain.
It hurts a lot.
Many objects are made of plastic
This is agonizing
It feels like my fingers are swelling and burning.
Apples are crunchy and sweet.
I can't bear this any more

FADE TO:
TITLE
Summary: Using thought-Stopping to block
Distressing Thoughts feelings and sensations
FADE TO:

VIDEO INSTRUCTOR: So now you've had a little practice with stopping unpleasant thoughts that you might actually experience during the ice water task.

TITLE: Summing up…
Thought stopping…
The ice water task…

And a few words on how to cross
A smelly swamp…
FADE TO:

VIDEO INSTRUCTOR: We're almost done. But before I sign off I'd like to address a question that may have occurred to you. And the question is: when you put your arm in the ice water how do you exactly go about applying this thought-stopping technique under actual conditions.

Well think about it this way

VIDEO INSTRUCTOR: We're almost done. But before I sign off I'd like to address a question that you may have been thinking about and even if you haven't been thinking its important for you to know. The question is: when it comes time to put your arm in the water again how are you going to go about applying this suppression strategy? Well think of it this way:

Imagine that the only way to reach something that's really important for you is to go across a swamp full of dirt, rubbish, and leftovers. The swamp smells so bad it really stinks. What kind of thoughts do you think are going to appear in such a situation? It is likely that thoughts like "I can't stand this," "This is unbearable," "I can't do anything so unpleasant and disgusting," "It's not worth the effort, it nonsense" will appear.

The best way you could possibly cross the swamp would be to *block* all of those thoughts and the distress they carry with them, so that every time you have such a thought, block it from your mind while you keep crossing the swamp. It's about blocking all the thoughts that may show up and the distress associated to them, about eliminating them while you keep doing what's important: crossing the swamp and reaching the other side.

You could approach the ice water task a similar way. Your goal is to keep your arm in the water for as long as you can. This is important because the longer you can keep your arm in the water, the likelier it will be that the information we get from this experiment will be of use in helping people with real clinical problems. So you can let that be your goal during the task. So you can let that be your overall goal during the task if you like.

While you are focusing on your goal you will block the painful sensations, upsetting thoughts and distress. You will block them from your mind so that they don't bother you. So be aware of all the

thoughts, feelings and sensation that show up while you perform the pain task and make sure they are blocked completely and totally from your mind so that you are able to keep your arm in the water for as long as possible.

STUDY II SWAMP METAPHOR: We're almost done but before I sign off I'd like to address a question that may have occurred to you. And the question is: when my arm is actually in the cold water, how do I go about applying this thought-stopping technique?

Imagine that the only way to reach something that's really important for you is to go across a swamp full of dirt, rubbish, and leftovers. Now, this swamp smells so bad it really stinks.

What kind of thoughts do you think are going to occur in such a situation. Well, thoughts like: " this is disgusting, "I can't stand this," "This is unbearable," "I can't take this," are likely to occur.

Now the best way you could cross the swamp is to block all of the distressing thoughts, feelings and sensations, while you keep focused on your goal, which is to cross the swamp and reach the other side.

Now you can approach the cold-water task in a similar way. Your goal is to keep your arm in the water for as long as possible. To achieve this goal you can use the thought suppression technique to block and suppress distressing thoughts, feelings and sensations.

So when the time comes and your arm is in that cold water that is what you do: use the thought-stopping technique to suppress distressing thoughts, feelings and sensations, while you keep focused on your goal, which is to keep your arm in the water for as long as possible.
Thank you.

FADE TO:
TITLES: Remember…
When your arm is in the
ice water…
Suppress distressing thoughts and
feelings using thought stopping…
And let your goal be your guide…
As you keep your arm in the water
Remember
For as long as possible…
You may call the research assistant now.

Form Used For Recording of Thoughts During
Thought Stopping Practice

THOUGHT STOPPING RECORD (ALOUD)

Instructions:

On the lines below please make a tick mark whenever you yell "stop" out loud.

THOUGHT STOPPING RECORD (SILENT)

Instructions:

On the lines below please make a tick mark whenever you yell "stop" silently.

Form Used for Recording of Distraction Scenario During Distraction Exercise

DISTRACTION EVENT RECORD

Instructions:

In the space provided below please name and describe the engaging, pleasant, memorable event that you will use to distract yourself during the ice-water task. Use as much or as little of the space provided as you need to in order to accurately convey the event.

Name of Event (e.g., 18th birthday party):_____

Description of Event:

APPENDIX D

Instruction Scripts

INSTRUCTIONS: VISUAL ANALOGUE PAIN SCALES, STUDY I

After you remove your forearm from the water I will ask you to make ratings regarding the pain you are experiencing in your forearm.

Specifically I will ask you to rate the intensity, unpleasantness and distress of the pain you are experiencing

The ratings will focus on what you are experiencing at the moment you give the ratings; not to how you felt before, when your arm was in the ice-water.

To give you some practice making these ratings you will immerse your arm in some room temperature water for a short period of time. When I tell you to you will remove your arm from the water and let it rest on the edge of the cooler.

Then I will give you this sheet with the rating scales on it. Your job will be to make a mark through the horizontal lines (show lines) to indicate how you feel right at the moment you are making the marks.

So for example, if you felt there was no pain at all you would make a mark here (indicate lower anchor) if you felt you were experiencing extremely intense pain you would make a mark here (indicate upper anchor) and if you were experiencing pain of an intensity that was in somewhere in between you would make a mark somewhere in between these two endpoints.

Do you have any questions?

[If participant has questions, answer them. If they are at all confused about the rating procedure go through it again]

Now I would like you to immerse your forearm in this water. It is at room temperature. When I tell you to take your arm out of the water, please do so and rest it on the edge of the cooler. I will give you this clipboard and a pen and you can make your ratings. Any time during the experiment

that I give you the clipboard it will mean that it is time to make a rating or fill out a form of some sort.

[Any questions? If no questions, proceed to…]

You may now immerse your arm in the water. When I tell you to remove your arm please do so and then I will give you the clipboard to make your ratings.

[Allow the person's arm to be in the water for about 60 seconds, then say…]

Please remove your arm from the water and rest it on the edge of the cooler.

Time 60 seconds…

[Hand them the clipboard and pen and allow them to make their ratings]

Time 60 seconds…

INSTRUCTIONS: VISUAL ANALOGUE PAIN SCALES, STUDY II

After you remove your forearm from the water I will ask you to make ratings regarding the pain you are experiencing in your forearm.

Specifically I will ask you to rate the **intensity** of the pain you are experiencing

The ratings will focus on what you are experiencing at the moment you give the ratings; not to how you felt before, when your arm was in the ice-water.

To give you some practice making these ratings you will immerse your arm in some room temperature water for a short period of time. When I tell you to you will remove your arm from the water and let it rest on the edge of the cooler.

Then I will give you this sheet with the rating scales on it. Your job will be to make a mark through the horizontal lines (show lines) to indicate how you feel right at the moment you are making the marks.

So for example, if you felt there was no pain at all you would make a mark here (indicate lower anchor) if you felt you were experiencing extremely intense pain you would make a mark here (indicate upper anchor) and if you were experiencing pain of an intensity that was in somewhere in between you would make a mark somewhere in between these two endpoints.

Do you have any questions?

[If participant has questions, answer them. If they are at all confused about the rating procedure go through it again]

Now I would like you to immerse your forearm in this water. It is at room temperature. When I tell you to take your arm out of the water, please do so and rest it on the edge of the cooler. I will give you this clipboard and a pen and you can make your ratings. Any time during the experiment that I give you the clipboard it will mean that it is time to make a rating or fill out a form of some sort.

[Any questions? If no questions, proceed to…]

You may now immerse your arm in the water. When I tell you to remove your arm please do so and then I will give you the clipboard to make your ratings.
[Allow the person's arm to be in the water for about 60 seconds, then say…]

Please remove your arm from the water and rest it on the edge of the cooler.

[Hand them the clipboard and pen and allow them to make their ratings]

Verbatim Instructions for Watching DVD-Videos

"In a few moments I will turn on this DVD player and you will watch a short video that will describe a method for coping with the distressing thoughts feelings and sensations you might experience when you put your forearm in the cold water. Please pay close attention to the video so that you can use the method when your arm is in the ice water later on. On the table in front of you are some materials that you will need when you are watching the video. The video will explain how to use these materials. The video will also tell you when to call me back into the room so that we can continue with the next part of the experiment. The video will last about twenty minutes. Do you have any questions?"

Verbatim Instructions Used for Baseline and Post-Intervention Cold Pressor Tests

NOTE: The portions of the instructions that are in boldface were **removed for Study II.** The portions of the instructions below that are underlined were added for Study II.

Baseline Cold Pressor

"In a moment I will ask you to put your forearm, up to your elbow, in the cold water. We would like you to try and keep your forearm in the water *for as long as possible*. **The longer you can keep your arm in the water, the likelier it is that the data from this experiment will be useful to us in helping people with real pain problems, so please try your best.** Remember as well, that you are completely free to remove your arm from the water during the experiment.

"Do you have any questions?"

"In a moment , I will say "start" when I do you may immerse your forearm."

"Ready…start."

Post-Intervention Cold Pressor

"In a moment I will ask you to put your forearm, up to your elbow, in the cold water again. As before, we would like you to try and keep your forearm in the water *for as long as possible*. The longer you can keep your arm in the water, the likelier it is that the data from this experiment will be useful to us, so please try your best. Remember as well, that you are completely free to remove your arm from the water during the experiment. Finally, and most importantly, while your arm is in the water please remember to use the methods that you have just learned on the video to cope with any discomfort or distressing thoughts, feelings or sensations you experience so that you can keep your arm in the water for as long as possible. Take a few moments now and recall what you have learned on the video and think about how you are going to apply it when your arm is in the cold water. Please let me know when you are ready to start"

"Do you have any questions?"

"In a moment I will say "start" when I do you may immerse your forearm."

"Ready…start."

MULTIPLICATION TASK INSTRUCTIONS

“Please work on the following task, consisting of a series of multiplication questions for as long as you wish to. “

“When you want to stop simply *open the door of the lab room and let the me know that you are finished.”*

Multiplication persistence Task Stimuli

(First page of multiplication persistence task)

Name:_____
Date:_____

549 x 673	987 x 328	864 x 769	979 x 487
346 x 871	548 x 293	678 x 958	937 x 388
587 x 185	710 x 783	891 x 458	787 x 686
889 x 506	728 x 947	194 x 789	837 x 284
345 x 568	879 x 123	757 x 741	753 x 159

Turn Over Page

DEBRIEFING SCRIPT

“First, I would like to thank you very much for participating in this research. We understand and are mindful of the fact that your participation necessitated that you experience considerable discomfort. This is a considerable sacrifice in the service of our research enterprise, and, as I have said, we are grateful to you.

“As mentioned in the consent form the ice water task is unpleasant but has been shown to result in absolutely no lasting ill effects. However, if you are still feeling uncomfortable ill in any way you should tell me now and I will assist you in any way your require.

“Because we are still running the experiment I cannot divulge the specific hypotheses, however, I can tell you a little about the purpose of the experiment. The purpose of the experiment is to better understand differences in effectiveness between several different methods for coping with pain. We hope that by better understanding the underlying mechanisms for different coping strategies we may be better able to design psychological interventions for people who have chronic pain. This is very important, as chronic pain is a very significant problem; it effects people in all walks of life; and can result from a wide variety of causes.

“If you do wish to find out more about the specific hypotheses and result of this experiment a one-page summary will be posted on this door in August 2010.”

“In conclusion thank you once again for giving us your time your attention and for undergoing the discomfort required of you for this study. We really appreciate it. Do you have any questions?”

EXPERIMENTER ANSWERS ANY QUESTIONS THE PARTICIPANT POSES TO THE BEST OF HIS/HER ABILITY.

Appendix E

Manipulation and Compliance Checks

A) *In the following space please write down as much as you can recall of the videotaped coping instructions you watched prior to the second time you immersed your arm in the cold water.*

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B) *Below we describe three very different strategies that can be used to cope with pain. We would like to know to what extent you used each of these strategies to cope with the pain that you while you completed the ice water task. Please review them now and then proceed to the instructions for rating these strategies.*

Coping Strategies

1) ACCEPTANCE STRATEGY: You made a choice to **willingly accept** the pain and discomfort and distress as it happened and allowed yourself to pay attention to the sensations in your arm while your arm was immersed in the ice water.

2) DISTRACTION STRATEGY: You tried to completely **distract** yourself from the sensations of discomfort and pain during the ice-water task by thinking about or focusing on something entirely different while your arm was immersed in the ice water.

3) SUPPRESSION STRATEGY: You tried to **block or suppress** unpleasant or distressing thoughts, feelings and sensations of pain and discomfort from your mind (stop them) while your arm was immersed in the ice water.

Rating instructions. Please indicate below the degree that you used each of the three strategies just described to cope with the ice water task. Rate how much you used each strategy while your arm was immersed in the ice water, on a scale of 0-10, as in:.

Where: 0="I **never** used this strategy"
10="I **constantly** used this strategy"

1) ACCEPTANCE STRATEGY): You made a choice to **willingly accept** the pain and discomfort and distress as it happened and allowed yourself to pay attention to the sensations in your arm while your arm was immersed in the ice water.

0 1 2 3 4 5 6 7 8 9 10

*"I **never** used an acceptance strategy"*

*"I **constantly** used an acceptance strategy"*

2) DISTRACTION STRATEGY): You tried to completely **distract** yourself from the sensations of discomfort and pain during the ice-water task by thinking about or focusing on something entirely different while your arm was immersed in the ice water.

0 1 2 3 4 5 6 7 8 9 10

*"I **never** used a distraction strategy"*

*"I **constantly** used a distraction strategy"*

3) SUPPRESSION STRATEGY: You simply tried to **block or suppress** unpleasant or distressing thoughts, feelings and sensations of pain and discomfort from your mind (that is, **stop** them) while your arm was immersed in the ice water.

0 1 2 3 4 5 6 7 8 9 10

*I **never** used a suppression strategy*

*I **constantly** used a suppression strategy*

C) *For the three coping strategies described above, please indicate below the order that reflects which strategy you used most (#1), second most (#2), and least (#3) while your arm was in the ice water.*

Strategies: Acceptance, Distraction, Suppression
Strategy I used most (circle one): Acceptance, Distraction, Suppression
Strategy I used second-most (circle one): Acceptance, Distraction, Suppression
Strategy I used least (circle one): Acceptance, Distraction, Suppression

D)

1) *Please indicate the extent to which the pain coping strategy you learned from the video was effective in helping you cope (circle one number on the scale below where…)*

0="Not at all effective"
10="Extremely effective"

0 1 2 3 4 5 6 7 8 9 10

Not at all effective in helping me cope — **Extremely Effective In helping me cope**

2) *Please indicate the extent that you were able to* ***apply*** *the pain coping strategy you learned, from the video (circle one number on the scale below, where…)*

1="I was never able to apply the strategy I learned "
5="I was able to apply the strategy I learned about 50% of the time"
10="I was constantly able to apply the strategy I learned"

0 1 2 3 4 5 6 7 8 9 10

I was ***never*** *able* to apply the coping *strategy I learned*

I was *able* to apply the coping *strategy I learned* ***about 50% of the time***

I was able to ***constantly*** apply the coping strategy I learned

USED ONLY IN STUDY II

E) Please indicate below how much ***effort*** you put into any or all of the three strategies while your arm was immersed in the ice water.

1) ACCEPTANCE STRATEGY): You made a choice to **willingly accept** the pain and discomfort and distress as it happened and allowed yourself to pay attention to the sensations in your arm while your arm was immersed in the ice water.

0 1 2 3 4 5 6 7 8 9 10

"I put no effort at all into this strategy" *"I exerted maximum effort*

2) DISTRACTION STRATEGY): You tried to completely **distract** yourself from the sensations of discomfort and pain during the ice-water task by thinking about or focusing on something entirely different while your arm was immersed in the ice water.

0 1 2 3 4 5 6 7 8 9 10

"I put no effort at all into this strategy" *"I exerted maximum effort*

3) SUPPRESSION STRATEGY: You simply tried to **block or suppress** unpleasant or distressing thoughts, feelings and sensations of pain and discomfort from your mind (that is, **stop** them) while your arm was immersed in the ice water.

0 1 2 3 4 5 6 7 8 9 10

"I put no effort at all into this strategy" *"I exerted maximum effort*

1) ACCEPTANCE STRATEGY): You made a choice to **willingly accept** the pain and discomfort and distress as it happened and allowed yourself to pay attention to the sensations in your arm while your arm was immersed in the ice water.

0 1 2 3 4 5 6 7 8 9 10

_____

"I put no effort at all into this strategy"

"I exerted maximum effort

2) DISTRACTION STRATEGY): You tried to completely **distract** yourself from the sensations of discomfort and pain during the ice-water task by thinking about or focusing on something entirely different while your arm was immersed in the ice water.

0 1 2 3 4 5 6 7 8 9 10

_____

"I put no effort at all into this strategy"

"I exerted maximum effort

Appendix F

Results for Ranking of Secondary and Tertiary Strategies, Study I and Study II

Table 1

Forced-Choice Secondary Strategy Ranking Expressed as Percentage of Participants Using Each Strategy in Each Condition, Study I

	Strategy		
Condition	Acceptance	Distraction	Suppression
Acceptance	29.2	41.7	29.2%
Distraction	61.1%	16.7%	22.2%
Suppression	16.4%	34.4%	49.2%

Table 3

Forced-Choice Secondary Strategy Ranking Expressed as Percentage of Participants Using Each Strategy in Each Condition, Study II

	Strategy		
Condition	Acceptance	Distraction	Suppression
Acceptance	20.0%	57.1%	22.9%
Distraction	50.7%	19.4%	29.9%
Suppression	29.6%	33.3%	37.0%

Table 3

Forced-Choice Tertiary Strategy Ranking Expressed as Percentage of Participants Using Each Strategy in Each Condition, Study I

	Strategy		
Condition	Acceptance	Distraction	Suppression
Acceptance	3.6%	38.2%	58.2%
Distraction	55.0%	20.0%	25.0%
Suppression	56.5%	26.1%	17.4%

Table 4

Forced-Choice Tertiary Strategy Use Expressed as Percentage of Participants Using Each Strategy in Each Condition, Study II

	Strategy		
Condition	Acceptance	Distraction	Suppression
Acceptance	7.5%	36.3%	56.3%
Distraction	65.8%	23.7%	10.5%
Suppression	52.3%	33.8%	13.8%