Coping With Pain in the Motivational Context of Values

Comparison Between an Acceptance-Based and a Cognitive Control–Based Protocol

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This study compares the effect of an acceptance-based protocol and a cognitive control–based (CONT) protocol on three measures of pain coping: tolerance, self-report, and believability. Specific methodological controls were employed to further isolate the role of the value of participating in a pain task compared to previous investigations on the alteration of the function of aversive stimulation. Twenty participants were randomly assigned to one of the conditions (acceptance and commitment therapy [ACT] vs. CONT), and a pre-post design was used. In the ACT condition, the protocol established a relation of coordination between the pain-related thoughts and the actions in the valued direction. In the CONT condition, the protocol established a relation of opposition between the same aspects. Results show an increase in pain tolerance.

Authors’ Note: This study was conducted as part of the first author’s doctoral dissertation under the supervision of Carmen Luciano at the University of Almería, Spain, in 2005. Portions of the research were presented at the Second World Conference on ACT, RFT, and Contextual Behavioral Science (London, July 2006). Correspondence concerning this article should be addressed to Marisa Páez-Blarrina, Departamento de Personalidad, Evaluación y Tratamiento Psicológicos, Universidad de Almería, Spain, 04120; e-mail: marisa.paez@aecc.es.
and a reduction of self-reported pain at posttest for both conditions. However, ACT participants showed significantly lower believability of pain than did CONT participants. Conceptual and clinical implications are discussed.

**Keywords:** pain; pain treatment; relational frame theory; acceptance and commitment therapy; experiential avoidance disorder

Acceptance and commitment therapy (ACT; Hayes, Strosahl, & Wilson, 1999) is the most complete of the third wave of behavior therapies or contextual therapies (Hayes, 2004). ACT is based on the experimental analysis of human language and cognition as proposed by the relational frame theory (RFT; Hayes, Barnes-Holmes, & Roche, 2001). The main characteristic of the contextual therapies is their focus on psychological acceptance of problematic private events whenever they function as psychological barriers for a flexible and effective repertoire toward valued actions. In contrast to the techniques within the second wave of behavior therapy, focused on changing the content of the private events, the heart of the clinical methods in ACT is the alteration of their function. A recent review of case studies and control randomized trials has evidenced the effectiveness of such rationale, particularly in follow-up measures and in highly distressing conditions (Hayes, Luoma, Bond, Masuda, & Lillis, 2006). However, there exists little evidence on the differential contribution of each of the multiple components ACT comprises and on the verbal processes involved in each of those components.

At the same time that the research about contextual therapies is being expanded, the evidence on the limited effectiveness and the ironic effects of cognitive control–based (CONT) strategies has emerged in different research areas. The experimental research on the effects of suppressing thoughts (e.g., Clark, Ball, & Pape, 1991; Wegner, Schneider, Carter, & White, 1987), mood states (e.g., Purdon, & Clark, 2001; Purdon, Rowa, & Anthony, 2005), interoceptive stimulation produced by anxiogenic stimuli (e.g., Eifert, & Heffner, 2003; Feldner, Zvolensky, Eifert, & Spira, 2003), and pain (e.g., Cioffi & Holloway, 1993; Sullivan, Rouse, Bishop, & Johnston, 1997) constitutes a good example. This literature shows that, under some conditions, attempts to minimize, control, or suppress the private events (anxiety, thoughts, pain, etc.) produce, as a paradoxical effect, an unintended maintenance, even increase, and extension of such private events, particularly when one looks beyond the immediate effects of the intervention. This fact has been regarded as the rebound effect (Wegner, 1994).
In addition, the experimental research comparing CONT-based protocols versus acceptance-based protocols to cope with laboratory-induced pain is very enlightening for understanding the process of suffering when it becomes a barrier between the person and his or her valued actions. Several studies (Gutiérrez, Luciano, Rodríguez, & Fink, 2004; Hayes, Bissett, et al., 1999; Masedo & Esteve, in press) have questioned the utility of the CONT-based strategies for managing intense or long-lasting pain and, alternatively, have shown that the acceptance-based strategies are more effective in these conditions. Hayes, Bissett, et al. (1999) compared a multicomponent CONT-based protocol (including positive self-talk, controlled breathing, positive imagery, and body focusing) to a multicomponent acceptance-based protocol (including creative hopelessness, undermining reasons as causes, awareness of the observing-self, and behavioural commitment) using a cold pressor task. The findings suggested that the acceptance-based protocol produced a larger increase of pain tolerance and a reduction of the believability of thoughts and feelings as reasons for actions than either the CONT-based protocol or a placebo condition. This happened even in the absence of differences in the subjective measures of sensation, pain, and unpleasantness across conditions. Using a similar cold pressor procedure, Masedo and Esteve (in press) replicated the superiority of a general acceptance protocol in increasing the pain tolerance compared with a suppression condition and a spontaneous coping condition. However, these authors also found that participants in the acceptance group reported less pain and distress during the immersion and the recovery periods than did the participants in the other experimental groups, contrarily to Hayes, Bissett, et al.’s findings. This important question about the relationship between tolerance and self-reported pain was partly clarified in the study by Gutiérrez et al. (2004). Here, specific methodological controls regarding the components of both the ACT and the CONT protocols were incorporated, along with an overall value-oriented context.

Thus, Gutiérrez et al.’s (2004) study advanced from the previously mentioned pain laboratory studies in several respects. First, both the formal components (e.g., rhetoric elements) and the functional components (e.g., behavioral commitment to produce overt change during the pain procedure) of the protocols were equilibrated in the ACT and the CONT conditions, with the sole exception of the instructions concerning each specific pain-coping strategy. Second, discrete electric stimulation was used, which allowed a more systematic manipulation of stimulus intensity and duration and thus the analysis of the impact of both strategies in relation
to pain magnitude. Third, very important and contrarily to most studies on coping with pain (Eccleston, 1995), this study was conducted within an explicit motivational context that makes sense of the application of the coping strategies.

This motivational context involved a valuable goal (i.e., to help experimenters learn more about how people cope with chronic pain) being connected to the participants’ performance in the pain task. It was introduced before participants went through the pain task during the pretest and was identical for both experimental conditions (acceptance vs. cognitive control). It could be argued, thus, that this motivational manipulation altered the functions of the pain during the pretest and then contaminated the comparison between the pretest and the posttest (the latter run after implementing the ACT or the CONT protocols). More importantly, this motivational context was designed to turn continuing the task into a valuable goal to the participants in both conditions. However, although this verbal function was coherent with the ACT intervention, it could be inconsistent with the CONT-based strategy. Consequently, it was not possible to isolate the extent to which this motivational gap undermined the impact of the CONT-based protocol as compared to the acceptance-based protocol. The main purpose of the present study is to clarify this aspect.

With such a goal, in the current study all participants went through the pain task during the pretest after being presented with the sole consent form, shocker calibration, and voltage-level selection procedures. Afterward, half of the participants received an acceptance-based protocol, whereas the other half received a CONT-based protocol, both incorporating a motivational context that was coherent with the coping strategy in each case. Specifically, the acceptance-based motivational context established a relation of coordination between pain and important actions, whereas the CONT-based one established a relation of opposition (Luciano, Rodriguez, & Gutiérrez, 2004). As in Gutiérrez et al. (2004), both conditions involved a metaphor and an exercise. The difference is that in that study a distraction strategy (think about pleasant events) was used in the CONT condition, whereas in the present one a suppression strategy was employed. A significant interaction between experimental protocols and magnitude of pain was expected, with both protocols equally effective in coping with low painful shocks and the ACT protocol superior to the CONT protocol in coping with high painful shocks.
Method

Participants

A total of 24 undergraduate students volunteered to participate in the study. Two students were excluded on the basis of reported medical conditions, and two students refused to participate when experimental conditions were explained. The final sample consisted of 20 participants (16 women, 4 men) between 18 and 35 years old ($M = 22.30, SD = 2.26$).

Experimental Setting and Apparatus

Sessions were conducted in two rooms in the human operant behavior laboratory at the University of Almería. One room contained the apparatus for the pain task and the other room was used to implement the experimental protocols.

The pain task, controlled by software programmed in Visual Basic (6.0), required an electric shock stimulator and a personal computer. A Lafayette 824151S isolated square-wave stimulator was used to generate the electric shocks. The aversive stimulation consisted of a train of pulses delivered to the volar surface of the left forearm via two round electrodes (10 mm in diameter and 2 cm apart). A personal computer (Pentium 4–Compaq nx 9010 H.P.) was used to control the presentation of visual stimuli (nonsense syllables and a red asterisk) on the screen, the visual analogue scales (VASs), the application of electric shocks, and the delivery of points.

Design and Measures

All tasks were run individually. First, the participant went through the pain task (pretest) with minimal instructions: consent form, voltage-level selection, and apparatus calibration. Then, he or she was randomly assigned to either the ACT condition or the CONT condition. After implementing the correspondent protocols, the participant was again exposed to the pain task (posttest). A brief description of the pain task and the experimental protocols follows.

Pain task. A matching to sample (MTS) task identical to that in Gutiérrez et al. (2004) was used. For each trial, four stimuli (nonsense syllables) were simultaneously presented on the computer screen. The sample appeared at the top center of the screen, and the three comparison stimuli appeared at the bottom of the screen. Participants were instructed to “look
at the nonsense syllable at the top and then choose the identical nonsense syllable from the bottom.” If participants performed correctly across trials, they received points (according to a variable ratio 9 schedule) that could be exchanged for a reward at the end of the session (a ticket for a snack or something similar). At different times throughout the task, a red asterisk appeared on the screen, which signaled the opportunity to choose whether to continue or finish with the task. That is, the participants could avoid being shocked and stop performing the task by choosing the *FINISH* option on the computer screen, or they could choose the *CONTINUE* option, which meant being willing to be shocked and earn more points. The task was, thus, designed to be an analogue of pain experiences that involve a conflict situation. After receiving the shocks, participants rated how painful the shock had been on a VAS. Then, the participants could continue with the task. The red asterisk was presented after a variable number of MTS trials (an average of 11). In each subsequent shock presentation, the shock duration and the frequency (number of pulses per second) were increased linearly so that pain magnitude increased throughout the scheduled range of stimulation. The maximum number of shocks that would be delivered was 15, but participants had no knowledge of this limit.

Two measures were collected before and after the protocols were implemented: (a) tolerance to pain, defined as the maximum number of shocks that a participant chose to receive during the task, and (b) self-report of experienced pain after each shock, measured with a VAS, which consisted of a 100 mm line displayed in the computer screen with *no pain* at 0 and *very much pain* at the end.

*Protocol interventions.* Both experimental conditions (ACT and CONT) involved the presentation of a protocol with examples, a metaphor, and an experiential exercise aimed at establishing a particular motivational context, which was coherent with the correspondent coping strategy (i.e., acceptance based or control based). The ACT protocol was aimed at establishing a motivational context of coordination between pain and valued actions and disconnecting pain-related thoughts and feelings from literal actions. The goal in this condition was to show the participants that in some circumstances in which pain is present, the best way to get important outcomes is just noticing and observing the pain-related thoughts and feelings, that is, being willing to experience these private events while doing valued actions. The CONT-based protocol was aimed at setting up a motivational context of opposition between pain and valued actions by linking various pain-related private events to literal actions. The goal of this protocol was to show the participant that the best way to cope with pain and to get
important outcomes is moving all the pain thoughts or feelings away from
the mind as a means of controlling or suppressing the experience of pain.

Precautions were taken to isolate the effects of the two experimental
interventions. Both interventions were equal in (a) rhetoric components (both
involved the initial examples, one metaphor, and one experiential exercise),
(b) duration (near 20 minutes), (c) number of instructions concerning the
acceptance-versus control-based strategies, (d) number of opportunities to
practice the strategies, (e) number of connections between participant’s
pain-related thoughts in the first pain task and the components of the pro-
tocols, and (f) the number of instructions given to encourage continuation
in the second pain task for as long as possible. In an effort to avoid inad-
vertent experimenter contamination, two different experimenters partici-
pated. Experimenter 2 conducted both phases of the pain task, and
Experimenter 1 conducted the protocol intervention. Experimenter 2 was
kept blind to the protocol assigned to each participant, and Experimenter 1
was kept blind to participant achievement in the pain task. The protocols
were scripted word for word, and the intervention with each participant was
videotaped during the protocol application. Two observers rated experi-
menter adherence by means of a 0 to 10 scale. Interobserver percentage of
agreement was 95% ($\kappa[w] = .91$), and the mean of the ratings given by the
two observers was 9.5 ($SD = 0.51$) for the ACT protocol and 9.2 ($SD = 0.62$)
for the CONT protocol.

**Procedure**

**Prescreening**

Participants were recruited through in-class announcements for partici-
pation in research concerning health psychology. An individual appoint-
ment was made, and Experimenter 1 briefly interviewed each participant
about his or her medical history to exclude persons who might be placed at
risk by participating. Each participant completed a statement of informed
consent for the 1.5-hr session that contained the appropriate information for
participation in a pain investigation (Casarett, Karlawish, Sankar, Hirschmam,
& Asch, 2001).

**Pain Task: Pretest**

On agreeing to participate, Experimenter 1 explained to the participant
that he or she would go through an initial test to calibrate the apparatus and
determine the voltage level of the shocks that would be delivered during the
task afterwards. It was emphasized that the stimulation would be unpleasant but not dangerous. After that, each participant was escorted to the experimental room, where Experimenter 2 was waiting. He placed the electrodes on the participant’s forearm and informed once again that he or she would be receiving a series of shocks in increasing intensity to determine the voltage level of the shocks that would be delivered during the pain task. After each shock, the participant was asked to rate how painful it had been on the VAS. The voltage was set at 0 and gradually increased for each shock until the participant first marked beyond the last fourth of the scale. The voltage corresponding to this rating was set as the stimulation voltage level that would be used during the pain task for that participant.

The experimenter then gave the participant the specific written instructions about the pain task, which included information about (a) the matching to sample trials, (b) the choices that participant could make when the red asterisk was presented, (c) the duration and frequency of electric shocks, and (d) points and rewards that the participant would receive for continued participation (a complete transcript of instructions can be obtained on request from the authors). Once the experimenter checked that the participant had properly understood the instructions (through a short questionnaire), the pain task commenced, and the experimenter left the room. When the participant chose the finish option on the screen, Experimenter 2 got into the room, removed the electrodes, and invited the participant to go to another room, where Experimenter 1 was waiting.

Acceptance-Based and CONT-Based Interventions

Experimenter 1 then explained to the participant that she was going to teach him or her some strategies for coping with the pain during the second pain task. Each protocol had four components, which are described below (a complete transcript of both experimental protocols is available on request).

**ACT-Based Protocol**

*The aims of the study and its practical implications.* The experimenter explained to the participants that the aims of the study were to help people who really suffer from pain. The experimenter then followed by saying,

You know, there are a lot of people whose life is very hard because of the pain, but they persist and keep working even with very severe discomfort. They do it, perhaps, because it is the way to feed their family or to go on with their life. This experiment is about that. We know that your participation
might be uncomfortable and that the shocks might be painful, but we need to do this kind of work in order to understand how people do keep their life even feeling pain. We thank you for your collaboration.

The relation between private events and actions. Then, the experimenter asked the participant for the unpleasant thoughts and feelings that he or she was having when decided to finish the first pain task. After the participant responded with one or two thoughts or feelings, the experimenter said to the participant (using the specific thoughts given by the participant), “So when you have felt ‘too much pain,’ ‘heat in your arm,’ or you have noticed the thought ‘this has no sense,’ ‘this is too much for me,’ you have decided to terminate the task, haven’t you?” After that, she said, “Let me ask you something, have you ever really wanted to do something and finally have not done it? Have you ever thought that you would do something and finally never did it?” The experimenter asked the participant to give examples that might correspond with such experiences. When the participant gave one or two examples (if the participant did not respond, the experimenter prompted one example and asked for another one), the experimenter continued,

So it seems that we can act as we choose even when our thoughts and sensations say the opposite. . . . The point is that this is possible and perhaps it might be possible that you could keep doing the pain task and win more points just watching the thoughts and sensations that come.

The Swamp metaphor. Then, the experimenter asked the participant to describe the very important goal that he or she wanted to achieve during his or her life (Hayes, Strosahl, et al., 1999, pp. 247-248). The participant was asked to imagine that the only way to reach such an important goal was to cross a muddy swamp. Several examples of distressing thoughts regarding crossing the swamp were presented by the experimenter (“It is all smelly”; “It is too hard”; “I cannot do it”; “Something dangerous might happen.”). The participant was then told, “The best way of crossing the swamp and working toward the goal that you value is just noticing the occurrence of the distressing thoughts and sensations . . . making room for them . . . and holding them very close to you.” The participant was then told, “This might be similar to the experimental task where continuing matching syllables might have the meaning of helping people who suffer from pain but who keep in the adversity because doing that is important for them.”

Experiential exercise. Finally, the experimenter invited the participant to do an exercise to practice the ability of “watching the thoughts and noticing the feelings.” She asked the participant to close his or her eyes and to
think on the moment he or she was seated in the chair in the experimental
room in front of the computer. Then, she asked the participant to see him-
self or herself in four different moments of the pain task (when the red
asterisk appeared on the screen, signaling an opportunity of choose whether
or not to receive a painful electric shock; when he or she decided to con-
tinue with the task; when he or she received a shock; when he or she
decided to terminate) and to notice in the present moment the thoughts and
feelings that showed up regarding those moments during the pain task.
Then, the participant was invited to look at them and let them go without
defense.

*CONT-Based Protocol*

*The aims of the study and its practical implications.* The experimenter
explained to the participants that the aims of the study were to help people
who really suffer from pain. The experimenter then proceeded by saying,

> You know, there are a lot of people whose life is very hard because of the
> pain, and even when they wanted to do things, sometimes they cannot
> because the severe discomfort, or the pain, is like a barrier for doing what
> they would like to do. This experiment is about that. We know that your par-
> ticipation might be uncomfortable and that shocks might be painful, but we
> need to do this kind of work in order to understand why people have to give
> up some activities when they feel pain. We thank you for your collaboration.

*The relation between private events and actions.* Then, the experimenter
asked the participant for the unpleasant thoughts and feelings that he or she
was having when he or she decided to finish the first pain task. After the
participant gave one or two of them, the experimenter said to the partici-
> ant, “So when you have felt ‘too much pain,’ ‘heat in your arm,’ have
> noticed the thought ‘this has no sense,’ ‘it is too much for me’ . . . you
> have decided to terminate the task, haven’t you?” After that, the exper-
> imenter asked the participant to give examples that might correspond with
> such experiences. When the participant responded with one or two exam-
> ples, the experimenter continued,

> So when you thought “this is very hard to me,” when you noticed these neg-
> ative sensations in your arm, you decided to stop with the task, didn’t you?
> So it seems that if you had not had such thoughts and sensations you would
> have been able to continue with the task. . . . Perhaps you might keep
doing the pain task and win more points if the painful thoughts and sensa-
tions would not be experienced.
The Swamp metaphor. The metaphor was introduced as described in the ACT protocol, except for emphasis on the usefulness of suppressing pain-related thoughts instead of contacting and noticing them. Participants were told, “The best way of crossing the swamp is not having those unpleasant thoughts.” The participant was then told,

This might be similar to the experimental task where suppressing discomforting thoughts and sensations is necessary to continue matching syllables, and it might be equivalent to the people who feel pain and need to suppress the pain in order to do the things that are important for them.

Experiential exercise. Finally, the experimenter invited the participant to do an exercise to practice the suppression ability. She asked the participant to close his or her eyes and to think on himself or herself while being seated in the chair in the experimental room in front of the computer. She asked the participant to see himself or herself in four different moments of the pain task (when the red asterisk appeared on the screen, signaling an opportunity of choose whether or not to receive a painful electric shock; when he or she decided to continue the task; when he or she received a shock; when he or she decided to terminate the task) and to suppress (by not thinking on them and by putting them away), in the present moment, the thoughts and feelings that showed up regarding those moments during the pain task.

After finishing the protocol implementation, the participant was escorted to the experimental room to perform the second pain task.

Pain Task: Posttest

The pain task during this posttest was procedurally identical to the first one.

Final Measures and Debriefing of the Experiment

When participants terminated the second pain task or achieved the maximum criterion of 15 shocks, they were asked to answer the following questions regarding the usefulness, difficulty, and frequency of use of the strategies contained in the protocols: (a) “How useful was the intervention for you in continuing with the second pain task?” (participants had to answer with a 0 to 10 scale), (b) “How difficult was it to use the trained strategies during the second pain task?” (0 to 10 scale), and (c) “How often did you practice the trained strategies during the second pain task?” (qualitative scale). Participants also answered four multiple-choice questions regarding their understanding of the protocols. Participants were then invited
to exchange the points obtained during both pain tasks for the corresponding rewards (one, two, or three breakfast or snacks coupons). Finally, the experimenter thanked the participants for their cooperation, and the experiment was finished.

Results

First, pretest differences across a number of variables are analyzed. Then, we present the differences from the pretest to the posttest with regard to pain tolerance, self-reported pain, and pain believability in both conditions. Finally, protocol implementation is analyzed.

Pretest Differences

ANOVAs revealed that the groups formed did not significantly differ in age of participants, $F(1, 18) = 0.29, p = .60$, selected shock voltage, $F(1, 18) = 0.39, p = .54$, pretest pain tolerance, $F(1, 18) = 0.77, p = .39$, or pretest pain self-reports, $F(1, 18) = 0.09, p = .77$. The ratio of female to male participants was 8 to 2 for both groups. All of the variables on which the ANOVA was conducted met the assumption of homoscedasticity (equality of variances), as revealed by the Levene test.

Pain tolerance. In both conditions, 9 participants out of 10 (90%) increased pain tolerance, and 1 participant (10%) maintained the same tolerance level. No participant in either condition decreased pain tolerance during the second test.

Table 1 shows the means and standard deviations for the number of shocks delivered during the pretest and the posttest for both the ACT and CONT conditions. The increases in pain tolerance under both the ACT and the CONT conditions were statistically significant—in ACT condition, $t(9) = −5.01, p < .005$; in the CONT condition, $t(9) = −4.22, p < .005$.

A repeated-measures ANOVA explored the impact of the ACT and CONT protocols on increasing the tolerance to pain. Effects involving the interaction between the protocol condition (between groups factor) and occasion of testing (within-groups factor) did not reach statistical significance, $F(1, 18) = 0.01, p = .91$.

Self-reported pain. Each participant in both experimental conditions and in both occasions of testing (pre-post tests) rated the pain experienced in accordance with the increasing duration and frequency of shocks. A high
positive correlation between the magnitude of the electric shocks and the magnitude of reported pain (as measured with the VAS) was found (for ACT pretest, $r = .97, p < .01$; for ACT posttest, $r = .95, p < .01$; for CONT pretest, $r = .87, p < .01$; for CONT posttest, $r = .75, p < .01$). Pretest and posttest individual VAS ratings were compared. Because of increasing magnitude of shocks, these analyses were done by comparing only shocks with identical magnitude (e.g., if a participant tolerated three shocks at pretest and seven shocks at posttest, only the first three shocks were compared).

Table 1 shows the means and the standard deviations and VAS ratings for both experimental conditions. This analysis show that 3 out of 10 participants in the ACT condition (30% of participants) reported less pain during the second pain task, whereas 6 participants out of 10 (60%) in the CONT condition did. The decrease in VAS ratings under both conditions is statistically significant—for the CONT condition, $t(8) = 2.69, p < .05$; for the ACT condition, $t(9) = 2.48, p < .05$. Although a clear tendency of the participants in the CONT condition to report higher decreases in VAS ratings was found when compared to the ACT condition, a repeated-measures ANOVA showed that the effects involving the interaction between the protocol condition (between-groups factor) and occasion of reporting (within-groups factor) did not reach statistical significance, $F(1, 18) = 2.17, p = .16$.

Pain believability. According to previous studies (Gutiérrez et al., 2004; Hayes, Bissett, et al., 1999), believability of pain is the most differential variable between ACT and CONT protocols. Believability is defined as the
degree to which the experienced pain functions as a barrier to continuing the pain task. Using the strict measure taken in Gutiérrez et al., believability of pain was directly measured as the tolerance behaviours showed by the participants when they reported the maximum rating of very much pain on the VAS scale (rated beyond 90 mm on the 100 mm VAS scale). Two additional analyses were done. The first analysis corresponds to the changes in the believability of pain that occurred between participants in each experimental condition (see Figure 1, left). In the ACT condition, the number of participants who continued performing the pain task even when they reached a rating of very much pain increased significantly from the pretest (5 participants) to the posttest (9 participants; $Z = -2.00, p < .05$). However, no significant changes were found on the pain believability for participants in the CONT condition ($Z = -1.00, p = .32$).

The second analysis corresponds to the changes in the believability of pain that occurred within participants. This was done according to the changes in

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**Figure 1**

Number of Participants in the Acceptance and Commitment Therapy (ACT) and the Cognitive Control-Based (CONT) Conditions Who Continued Performing the Pain Task When They Reached the Maximal Rating of Very Much Pain on the VAS During the Pretest and Posttest

<table>
<thead>
<tr>
<th>Number of participants</th>
<th>ACT</th>
<th>CONT</th>
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<tbody>
<tr>
<td>PRE</td>
<td></td>
<td></td>
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<td>POST</td>
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<tr>
<td>ACT</td>
<td>10</td>
<td></td>
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<tr>
<td>CONT</td>
<td>10</td>
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</tr>
</tbody>
</table>

Note: On the left side, between-subjects data analysis is shown. On the right side, within-subject data analysis can be observed.
tolerance from the pretest to the posttest when at least one of three circumstances occurred: (a) when a participant who did not reach any rating of very much pain during the pretest did reach it during the posttest and continued performing the task even with such level of pain, (b) when a participant who ended the pain task after the first very much pain rating during pretest during the posttest continued performing the task after a very much pain rating, or (c) when a participant who during the pretest continue with the task after rating very much pain increased the tolerance to the shocks rated as very much pain during the posttest. Figure 1 (right) shows that 8 participants in the ACT condition presented a within-subject change in the believability of pain, whereas only 2 participants in the CONT condition showed such change. A Kruskal Wallis test revealed that this difference in the number of participants in the CONT and the ACT conditions who changed the believability of pain was significant $\chi^2(1) = 4.23, p < .05$.

### Protocol Measures

Table 2 shows the means and standard deviations of scores regarding the questions about the usefulness, difficulty, frequency of use, and understanding of the protocols. The protocols did not differ significantly in their usefulness, $F(1, 18) = 2.61, p = .12$, difficulty, $F(1, 18) = 0.22, p = .64$, frequency of use $F(1, 18) = 0.36, p = .56$, or understanding, $F(1, 18) = 1.16, p = .30$.

### Discussion

The present experiment showed a very low tolerance to pain when no specific values were given to the pain task during the pretest. After the experimental protocols were implemented, an increase in tolerance to pain and a reduction in the self-reported measures of pain (VAS ratings) were
found in both experimental conditions. The measure that better distin-
guished the effect of both protocols was the believability of pain. ACT par-
ticipants showed significantly lower believability of experienced pain
compared to CONT participants. Next, these results are discussed.

One of the targets of the present study was to explore the impact of an
acceptance-based intervention and a CONT-based intervention introducing
methodological controls to avoid that an overall value-oriented context
might contaminate the initial pretest measures. Pretest data obtained under
these conditions differed from data found in Gutiérrez et al. (2004), in spite
of using the same pain task in both studies. In Gutiérrez et al., information
provided before pretest set the occasion for the participants to connect their
performance in the pain task to certain valuable goals. Preintervention tol-
erance data showed that most participants were willing to tolerate more
than half of the maximum number of scheduled shocks of increasing mag-
nitude (tolerance $M = 7.3$, $SD = 2.84$). In the present study, most partici-
pants tolerated fewer shocks of a low magnitude ($M = 5.7$, $SD = 2.79$) in the
pretest. Similarly, participants reported higher initial levels of pain ($M = 79.00$, $SD = 14.36$) than in Gutiérrez et al. ($M = 68.00$, $SD = 24.81$), even
when shocks were of lower magnitude because of the lower tolerance. The
difference in the pretest measures across studies suggests that providing the
pain task with a value context specifying the importance of continuing in
the task is a central component to encourage high levels of tolerance, even
when a high level of pain is experienced. That is, a different transformation
of functions of the painful experience occurs depending on whether or not
the pain task is framed in a value-oriented context.

In the present study, the first time the value context was introduced was
during the protocol implementation, which in addition involved either an
acceptance or a suppression strategy for coping with pain. In such circum-
stances, the posttest data were a conjoint result of the different verbal func-
tions introduced by the several components. The posttest data showed an
increase in pain tolerance and a decrease in the pain ratings for most of par-
ticipants in both conditions (although the decrease in the pain ratings was
higher in the CONT than in the ACT condition). The finding of an increased
pain tolerance in both conditions contrasts with preceding studies, in which
only the ACT condition produced such an effect. Our finding probably
relates to the low tolerance showed in the pretest, in which the pain task was
not connected to any valuable goal, easy to overcome with either an ACT
or a CONT protocol. And this is probably why the protocols, besides
another difference we will comment on later, have affected the posttest
tolerance measures differently in both studies.
Another important finding was the alteration of the believability of pain as a barrier to continue with the pain task. In the ACT condition, the number of participants who continued performing the pain task while rating *very much pain* significantly increased from the pretest to the posttest. This did not happen in the CONT condition. In that sense, the present study is consistent with the findings from both clinical (Hayes, 2004) and experimental (Gutiérrez et al., 2004; Hayes, Bissett, et al., 1999; Masedo, & Esteve, in press) studies about the impact of ACT to reduce the believability of pain. Believability data in the current study replicate the consistent effect of ACT in promoting functional disconnection between private events with aversive functions and acting literally. This is a key process that differentiates the so-called third wave of behavior therapies from the second wave (Hayes, 2004; Hayes, Masuda, Bissett, Luoma, & Guerrero, 2004). The ACT aims are centered in generating the conditions for the participants to act in personal values domains while being willing to notice the aversive private events that show up in such domains. Contrarily, cognitive therapies are usually focused on acting to minimize or control the aversive private events (either by means of suppression, by distraction, or by any other control strategy) as a previous step to act in a valued direction. Consequently, participants who were assigned to the CONT protocol were able to behave in accordance with a valued direction when low or mildly distressing pain was experienced, as controlled clinical trials and experimental analogues have shown (Flor & Turk, 1988; Gutiérrez et al., 2004; Hayes, Bissett, et al., 1999; Masedo & Esteve, in press). However, they stopped acting toward the valued directions when experienced highly distressing pain, as believability data consistently show across available studies.

Taken together, and when coupled with previous research in this area, our data on tolerance, perceived pain, and believability show the transformation of the functions of the painful private experiences underlying each component composing the interventions (Luciano et al., 2004). One corresponds to the transformation of the painful experience according to the overall value context given to the pain task. Pretest data have isolated the impact of this single component. The absence of a value frame for the pain task transformed it into more aversive experience, as the high pain ratings on the VAS and the low levels of tolerance during pretest suggest. The second one involves the differential function given to the painful experience according to the specific motivational context defined by the relation between pain and valued actions. The ACT protocol established, in certain conditions, a coordinated relation between pain and valued actions so that pain became discriminative for approaching valued actions. On the contrary,
the CONT protocol established a relation of opposition between pain and continuing in task, which meant the necessity of having the pain under control to act in a valued direction (i.e., pain became discriminative for avoidance). The third one concerns the differential transformation of the painful experiences according to the strategy offered to cope with the pain in each condition, acceptance of the painful experience in the ACT protocol, and suppression of such painful experience in the CONT protocol. That is, the use of a suppression strategy in this study (“do not think on pain,” “put the painful thoughts or sensations away from mind”), instead of the distraction strategy (“think on pleasant events”) employed in Gutiérrez et al. (2004), might have also influenced the different VAS ratings found across studies in the area.

Summarizing, this study has isolated the impact of performing a pain task when no specific value is given to the task and when an acceptance versus a control strategy is promoted. However, further research is needed to isolate the relative effect of each of these components on the processes of change, the result of the differential transformation of functions occurred when differently framing the painful experiences and when pain is coped with using different strategies. All these methodological controls have been ignored in the majority of studies on pain coping, which could explain, in part, the lack of consistency found in many review and meta-analysis studies on the effectiveness of the pain-coping strategies (Ahles, Banchard, & Leventhal, 1983; McCaul & Malott, 1984; Suls & Fletcher, 1985). Finally, the clinical implications of the present study relate to the effectiveness of framing the act in the presence of pain within a valuable direction (Dahl, Wilson, Luciano, & Hayes, 2005; Hayes, Strosahl, et al., 1999; Wilson & Luciano, 2002). Within such a frame, both acceptance and control strategies seem to work, but only the former allows the pursuit of goals deemed valuable despite levels of distressing pain. Consequently, and according to the change in believability in this and preceding studies, acceptance protocols are especially designed to allow the person to contact the contingencies of the valued work instead of restricting his or her life to situations free of pain or reduced in pain.

References


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