
The Impact of Acceptance-Based Versus Avoidance-Based Protocols on Discomfort

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Carmen Luciano,¹
Francisco Molina,¹
Olga Gutiérrez-Martínez,²
Dermot Barnes-Holmes,³
Sonsoles Valdivia-Salas,⁴
Francisco Cabello,⁵
Yvonne Barnes-Holmes,³
Miguel Rodríguez-Valverde,⁶
and Kelly G. Wilson⁷

Abstract

This study aimed to isolate the conditions under which aversive stimulation is experienced as more or less discomforting/unpleasant. Discomfort was induced by playing loud noises through headphones while participants performed computer tasks. We employed 4 main conditions. Condition 1: the acceptance-based protocol (ACT), intended to integrate discomfort in a valued direction, was implemented before the Inclusion Task (task

¹Universidad de Almería

²Universidad de Barcelona

³National University of Ireland, Maynooth

⁴University at Albany, State University New York

⁵Universidad de Murcia

⁶Universidad de Jaén

⁷University of Mississippi, Oxford

Corresponding Author:

Carmen Luciano, Departamento Psicología, Universidad de Almería, 04120 Almería, Spain.
Email: mluciano@ual.es

performance could continue despite the presence of the noise). Subsequently, the experiential avoidance-based protocol (EA), intended to promote a relation of opposition between discomfort and valued actions, was implemented before the Opposition Task (task performance was suspended until the participants eliminated the sounds). Condition 2: this order was reversed. Conditions 3 and 4: the tasks were presented without any protocol. The ACT protocol produced the lowest level of discomfort, particularly when it was implemented before participants had experimental experience in trying to control discomfort. Two postcontrol conditions confirmed this result. Implications for prevention and treatment of psychological suffering are discussed.

Keywords

acceptance, values, avoidance, discomfort, prevention

The way we humans experience and, most importantly, react to discomfort is different across individuals because of different personal experiences. There is evidence that certain reactions to discomfort (or emotional regulation), may be healthier than others. Correlational and experimental literature on coping with pain, discomfort, and similar aversive experiences, shows the negative impact of emotional or experiential avoidance (see, for instance, Batten, Follette, & Aban, 2001; Dalrymple & Herbert, 2007; Karekla, Forsyth, & Kelly, 2004; Norberg, Wetterneck, Woods, & Conelea, 2007; Spira, Zvolensky, Eifert, & Feldner, 2004). For example, behaving literally in accordance with the rule “*if I have fear, distress, bad memories, bad thoughts, etc., then I can not live well. I have to do something to override, to be away from the discomfort*” may occasion discomfort to generalize across situations and have paradoxical effects (e.g., Purdon, 1999; Wenzlaff & Wegner, 2000). In addition, this control-based coping strategy facilitates the development of a rigid pattern of experiential/emotional avoidance regulation that will result in a reduced quality of life in the long run (Hayes, Wilson, Gifford, Follette, & Strosahl, 1996; Luciano & Hayes, 2001).

In contrast, evidence accumulated thus far shows the benefits of acceptance-based regulation over control-based regulation in coping with psychological suffering (i.e., aversive memories, thoughts, or sensations). Experimental studies conducted in the laboratory, for instance, have demonstrated that acceptance-based strategies increase *pain tolerance* as compared to avoidance coping strategies (Gutiérrez, Luciano, Rodríguez, & Fink, 2004; Hayes, Bissett et al., 1999; Masedo & Esteve, 2007; McMullen

et al., 2008; Páez-Blarrina et al., 2008a, 2008b). However, results regarding the level of discomfort experienced by participants have shown variability. More precisely, in some studies participants who received an acceptance-based protocol (ACT) reported higher level of discomfort than those who received a control-based protocol (Gutiérrez et al., 2004), whereas in others the reported discomfort was quite similar (Hayes, Bissett et al., 1999; Páez-Blarrina et al., 2008b) and in others was lower for participants who received an acceptance protocol (Healy et al., 2008; Masuda et al., 2009; Masuda, Hayes, Sackett, & Towhig, 2004; McMullen et al., 2008; Páez-Blarrina et al., 2008a). Reasons for such variability might be related with the differences in the content of the protocols implemented in each of these studies. For instance, whether the control-based and the acceptance-based protocol were explicitly based in a valued task (as in Gutiérrez et al., 2004; McMullen et al., 2008; Páez-Blarrina et al., 2008a, 2008b); the type of methods and the number of exemplars used to promote acceptance and defusing from pain; the type of method used to promote the escape/avoidance from discomfort (e.g., suppression or distraction); and the coherence between the experimental task and the protocols. Given that the main focus in all of these studies was to establish the differences between acceptance-based and control-based protocols in pain tolerance, the observed variability in experienced discomfort (as more or less disturbing) is still in need of further examination. Recent research on transformation of functions might be helpful in this regard.

Research in transformation of functions has yielded experimental evidence regarding the conditions under which the establishment, or alteration of behavioral functions (e.g., reinforcing and aversive functions), occurred without a direct history of conditioning, but by virtue of a relational history of framing events (Hayes, Barnes-Holmes, & Roche, 2001; Rehfeldt & Barnes-Holmes, 2009). For example, when a person has learned to frame events, if a particular event (say X) is contextually established to be in equivalence with another event (say Z), and if Z is evaluated as bad according to the person's history, then X becomes bad in such a context. Contrarily, if X is contextually established as the opposite of Z, then it becomes good. This kind of research may facilitate an analysis of the conditions under which discomfort is experienced as more or less disturbing. More specifically, it seems plausible to conceive the fluctuations in the experience of discomfort in terms of their role in the regulation of behavior, necessarily oriented to personal values. For instance, impact on the level of discomfort should be different if discomfort is treated as a possible part of a valued/chosen action than if discomfort is treated as something opposite and, consequently, something to be

eliminated to act in a valued direction (Gutiérrez et al., 2004; Luciano, Rodríguez-Valverde, & Gutiérrez, 2004; McMullen et al., 2008; Páez-Blarrina et al., 2008a, 2008b). Although providing a technical definition of values is beyond the scope of this article, we should mention here that behaving with meaning or valuing is understood, from a relational standpoint, as behaving under a contextualized and historically established verbal domain which forms or transforms the functions of relevant present conditions (Hayes, Strosahl, & Wilson, 1999; Luciano, Valdivia-Salas, Cabello, & Hernández, 2009; Wilson & Luciano, 2002). Applied implications are huge, considering the many circumstances where people stop doing something they matter just because they feel sad or anxious, or because they have unwanted memories.

To our knowledge, there is no published study isolating the impact of these different strategies on discomfort (i.e., contextualizing pain/discomfort as the first thing to get rid of to pursue valued directions vs. contextualizing pain/discomfort as part of valued actions and hence, as something to be present with while behaving meaningfully). The aim of the present study was to provide experimental evidence in this regard. We want to emphasize that the aim of the study was not to increase or decrease discomfort tolerance in the presence of painful experiences, as in previous studies, but to isolate whether the adoption of control-based versus acceptance-based strategies is somehow related to the level of experienced aversiveness or discomfort. With this purpose, the main question was to see the impact of two protocols (ACT and EA). These two protocols were implemented before performing two tasks, each task coherent with each protocol (Inclusion task, coherent to the ACT protocol, and Opposition task, coherent to the EA protocol). Discomfort was produced by loud noises played through headphones while a series of computer tasks were executed. The combination of task and protocol conformed two main experimental variables. That is, the experimentally induced discomfort was established as either in opposition with (EA protocol and Opposition Task) or as an integral part (ACT protocol and Inclusion Task) of values. Four experimental conditions (10 or 9 participants each), with two phases each, were conducted. In Condition 1 participants were presented, first, with ACT protocol/Inclusion Task, followed by EA protocol/Opposition Task. The order of these phases was reversed in Condition 2. In Control Conditions 3 and 4, participants performed the same tasks but no protocols were implemented.

Method

Participants

The initial sample included 41 students, but one of them was excluded because of being accustomed to working in the presence of loud noise, which

was the aversive stimulation used in the present study. Two students refused to participate when the experimenter described the terms of their participation, but no student discontinued participation. The final sample included 38 volunteer undergraduate students (33 women, 5 men) aged 18-25 years ($M = 20.34$, $SD = 2.00$). Most of them were undergraduates from nursing, computer engineering, and language studies, the remaining were attending an introductory psychology course. All participants provided written informed consent before enrolment in the study. The study was approved by the Ethics Committee of the University of Almería.

Experimental Setting and Task

Sessions were conducted in a room containing a small covered bidirectional mirror in the Human Operant Behavior laboratory at Universidad de Almería. The room was equipped with a table, a chair, and a laptop computer. The laptop computer ran a Visual Basic program (available upon request to the authors) that controlled the experimental tasks, synchronized administration of the sounds, presentation of visual scales to measure the level of discomfort (Discomfort Scale), and recorded participants' responses.

The task included two series of three 4-min blocks (six blocks in total). In each block, participants played a different game (logical series, puzzles, and memory cards), using the mouse to respond. Participants could accumulate an unlimited amount of points based on their ability with each game. Specifically, 100 points were awarded upon solving each logical series, puzzle, and triplet of memory cards correctly. Within each block, once a game was completed (e.g., a logical series), points accumulated were added to a counter at the top center of the screen, and a new game started (e.g., a new logical series). This was repeated until the 4 min-block finished. A 1.5 inch diameter circle filled in red color and located in the upper left corner of the screen indicated the remaining time available to complete each block by turning green as the time went by. When the 4-min block was completed (i.e., the circle was completely filled in green), a different game started (e.g., puzzles), the circle turned red and the counter was set at zero, starting the 4-min countdown again.

Three types of noises were randomly played one at a time through headphones while participants performed the task. Each noise was a different result of combining a baby crying, a car honking, a phone and a fax ringing, and a pneumatic drill punching. We selected three different combinations to prevent habituation. Sounds were presented in four occasions per block with three intersound intervals intertwined as follows: 30 s (sounds), 15 s (no sounds), 45 s (sounds), 30 s (no sounds), 15 s (sounds), 45 s (no sounds), and 60 s (sounds).

We employed two types of tasks, differing only in the way the sounds were programmed. The *Inclusion Task* was designed to establish a relation of inclusion between the discomfort produced by the sounds and valued action. Here, the sounds were superimposed to the games so that participants could perform the task while the sounds were playing. The *Opposition Task* was designed to establish a relation of opposition between discomfort and valued action. Here, the mouse was blocked while the sounds were played so that participants could not continue performing the task. Instead, they had to press the space bar in a steady fashion to stop the sound and unblock the mouse. Participants were told that they could make the sound stop at some point through continuous bar pressing. However, unbeknownst to participants, duration of the sounds in the Opposition Task was the same as in the Inclusion Task, but the computer was programmed so that the sound stopped (and the mouse was unblocked) upon the first bar press after the sound interval was over.

Variables and Experimental Design

We employed two protocols. The ACT-based protocol was directed to integrate discomfort as part of valued action by using general and specific personal examples and exercises. Participants were encouraged to notice how the unpleasant sounds were experienced, while continuing to solve the problems. The experiential avoidance-based protocol (EA) was directed to establish discomfort as opposed to valued action through general and specific personal examples and exercises. Participants were encouraged to engage in space-bar pressing to suppress the sounds and, then, to continue performing the task. Precautions were taken to isolate the effects of the ACT versus EA protocols. Both were equal in: (a) formal components, (b) duration (approximately 10 min), (c) number of examples of both strategies, and (d) number of instructions given to make task continuation relevant for as long as possible. Both protocols are described in more detail in the Procedure section.

Level of discomfort produced by the sounds was measured at different points during the procedure. A 100 mm black horizontal line was displayed on the computer screen on a white background (Discomfort Scale), ranging from *not distressing at all* (left end) to *extremely distressing* (right end). Participants were asked to mark their level of experienced discomfort on the line with the mouse. Discomfort was measured twice during baseline, once after completing each of the six 4-min blocks, and once at the end of the task, after all six blocks were finished.

Participants were randomly assigned to one of four conditions (two experimental and two control conditions), according to a computer-generated

randomization list. Participants in Condition 1 ($N = 10$) went first through the ACT protocol followed by the Inclusion Task, and then through the EA protocol followed by the Opposition Task. Participants in Condition 2 ($N = 10$) went through the same protocols followed by the same tasks, but the order of presentation was reversed from Condition 1. Condition 3 served as control for Condition 1. Participants ($N = 9$) went through the tasks without any protocol, first Inclusion and then Opposition. Likewise, Condition 4 served as control for Condition 2. Participants ($N = 9$) went through Opposition Task first, and then through Inclusion Task, and no protocol was implemented. The first two authors served as experimenters and ran participants randomly based on their availability. The same experimenter implemented both protocols with each participant. The protocols were scripted word-by-word and the experimenters wrote the participants' answers to the protocols (e.g., examples that participants gave about their daily life). In addition, 25% of the protocol applications were audiotaped.

Procedure

Prescreening. Participants were recruited through in-class announcements to participate in research on health psychology. Once in the lab, the experimenter interviewed each participant about her/his medical history in order to exclude persons with hearing problems who might be placed at risk by participating. Each participant completed a Statement of Informed Consent and the tasks commenced.

Phase 1: Preparation and baseline discomfort ratings. Participants were escorted to the experimental room and seated in a chair. The experimenter gave introductory instructions stating that the study was *not intended to assess either their intelligence or their personality, but the goal was to analyze how humans behave in different circumstances in the presence of discomfort*. Participants were told that *there were no right or wrong performances or answers and that they were free to terminate the experiment whenever they wanted*. Then, the experimenter informed participants that the study included *several phases*. In the first one, *a series of sounds would be presented*, and the next ones would involve *working in different tasks* using the computer. There would also be moments when *experimenter and participant would talk about the experimental tasks*. The experimenter *asked the participant to put the headphones on* and listen to the sounds, and *taught him/her how to respond to the Discomfort Scale*. When the participant was ready, the experimenter left the room and the task commenced.

Two 4-min blocks of sound were presented, where the sounds appeared in the same sequence as in subsequent phases, where these would be superimposed with the games (see the sequence of the sounds in the preceding Task description section). After each block of sounds, the Discomfort Scale

appeared on the screen, and participants rated their level of discomfort produced by the sound. These served as discomfort baseline ratings.

Phase 2: Tasks training. The experimenter came into the room, asked the participant to take the headphones off, and presented the instructions on how to perform the tasks during the next phases. The participant was told that the *current phase was thought as something similar to when one needs to learn a new job that will later allow getting an income.* Then, the participant was asked to *imagine s/he was in the role of a person who is learning to become familiar with the new job. S/he would have to solve some tasks (that would be presented in the screen) within a limited interval which would be timed by a clock-like icon in the upper left corner of the screen.* The participant was also told that, *depending on her/his performance, points would appear in the upper right corner of the screen, in a similar way to the money that one receives for doing the job.* The participant was told that *the tasks might be boring and monotonous, or perhaps fun, similarly to a real job.* S/he was told that, *as in real life, we are successful sometimes but not always, that sometimes we win and sometimes we lose, that sometimes we win a lot and some other times we just win a little, but the point is having a job and doing the best.* The experimenter continued stating that *this part is similar to the training periods in real jobs, when you learn how to do your best to win the most.* However, the participant was told that *the points s/he might win would only serve as an indication of the amount of money that s/he might win if it was a real job.* The experimenter then left the room and the task commenced. It included three 4-min blocks of games similar to those that would be performed in subsequent phases. No sound was played during this training period. When this phase finished, a message on the screen prompted the participant to call the experimenter.

Phase 3: Task performance and protocol implementation. The experimenter came into the room and informed the participant that *the next phase would last about 1 hr and that the tasks would now be presented along with sounds.* As well, the participant was told that *s/he might step down from the experiment at any time, and was invited to have a break, if needed, before the new phase started.* Participants in Conditions 1 and 2 were taught how to keep in task. Participants in Conditions 3 and 4 were invited to do the task after a 10 min break during which they abandoned the lab. The 10 min break was the approximate time the protocol implementation lasted in Conditions 1 and 2.

Participants in Condition 1 were first presented with the ACT protocol followed by the Inclusion Task, as follows:

ACT protocol. The participant was asked to *imagine being in the role of a person whose job might be boring, but still is the only way to cover the expenses related to what s/he values (traveling, education, etc.)*. S/he was also told to *imagine that this person has to work while having constant headaches, or feeling distressed, or sharing an office with people s/he does not like*. The experimenter proceeded by saying that *this person is free to quit, the problem being that this job is the only means to get paid, thus if s/he quits s/he won't be able to get what s/he values*. The experimenter then asked the participant for one or two similar examples in his/her daily life. When the participant responded, then s/he was asked *for reasons why s/he keeps in task even in the presence of the adverse circumstances s/he reported*. The participant was asked to *think about the person in the example, and also about his/her personal experiences during the upcoming task*. In addition, the experimenter reminded the participant that *as in daily life, some tasks would be easier than others, and that s/he is free to stop participation anytime*. In the case s/he stayed in task, *the point would be what to do with the sounds when they appeared while performing the task*. The participant was told to *do nothing, meaning to notice or to be conscious of being hearing the sounds while s/he was back to the task*. The experimenter clarified that *realizing the presence of the sounds and doing nothing is similar to noticing the pants touching your legs while seating or walking, similar to noticing the watch touching your wrist and doing nothing with that feeling, to noticing the glasses leaning on your nose and doing nothing with it, or to noticing your heart beating and doing nothing with it*. The experimenter asked the participant to *mention a couple of similar examples* and then, invited him to respond to *who is noticing (example provided), to realize that it is you who is having the sensation or feeling, and to notice that you choose not to do nothing with that feeling*. The experimenter warned the participant that *as in previous phases, the computer will ask you about the sounds, and highlighted that the participant should respond keeping in mind that despite the sounds, you are completing the task similarly to what you do in the examples you provided, and similarly to our worker*. In order to guarantee the understanding of the command, the participant was asked to *say aloud what would be kept in mind while responding to the questions about the sounds*. The experimenter then invited the participant to start performing the tasks.

As indicated above, the participant performed the Inclusion Task during six 4-min blocks in the presence of the sounds. Right at the end of each block, the screen went blank for 1 s and then showed the question “How much discomfort did you feel as a result of the sounds considering that in spite of them, you have completed the task?” and the Discomfort Scale. When the six blocks finished, the screen showed a question inviting the participant to rate the discomfort, in this case considering the whole task: “How much discomfort have you felt considering all the sounds in the previous phase, taking into account that in spite of them, you have completed the task, like the person in his work and like you in your personal experiences.” Subsequently, the experimenter entered the experimental room, asked the participant to take the headphones off, and informed him or her that during the next phase things would be different. Then, the EA protocol was implemented.

EA Protocol. The critical difference with the ACT protocol is that the EA protocol was intended to establish the sounds as opposite to continue performing the task (see italics below). The participant was again asked to imagine being in the role of a person whose job might be boring, but still is the only way to cover the expenses related to what s/he values (traveling, education, etc.). S/he was also told to imagine that this person has to work while having constant headaches, or feeling distressed, or sharing an office with people s/he does not like. The experimenter proceeded by saying that this person is free to quit, the problem being that this job is the only means to get paid, thus if s/he quits s/he won't be able to get what s/he values. This person wants to work *but s/he can not stand the pain, the distress, the discomfort, and starts doing something for the pain or distress to go away. When the pain is gone, then s/he comes back to work.* The experimenter then asked the participant for one or two similar examples in his/her daily life, for the reasons *why s/he could not keep doing something and what s/he did for the discomfort to disappear.* The participant was asked to think about the person in the example, and also about his/her personal experiences while performing the upcoming task. In addition, the experimenter reminded the participant that as in daily life, some tasks would be easier than others, and that the participant was free to stop participation anytime. In the case s/he stayed in task, *the point is what to do for the sounds to disappear so that you could go back to the task. What you can do to stop*

the sounds is pressing the space bar in a steady fashion until they disappear. Then, you can go back to the task. Regarding the assessment of the discomfort, the participant was encouraged to respond to the questions keeping in mind *that the sounds do not allow you to keep in task, the same as in the examples you reported before.* In order to guarantee that s/he had understood the command, the participant was inquired to say aloud what would be kept in mind while responding to the questions about the sounds. The experimenter then invited the participant to start performing the tasks.

The Opposition Task was then presented, including six 4-min blocks of games and sounds. Discomfort was measured as in the Inclusion Task, but in this case the question was: “How much discomfort did you feel considering that the sound has prevented you from continuing with the task?” The overall question at the end of the sixth block was: “How much discomfort did you feel as a result of all the sounds played during this phase, considering that they have not allowed you to continue with the task, the same as our worker in the example, and the same as you in your personal experiences?”

When the task finished, the experimenter thanked the participant for his or her cooperation, gave him or her breakfast coupon and the experiment finished.

Participants in Condition 2 went through the same protocols followed by the same tasks, but reversing the order of presentation from that in Condition 1 (i.e., first EA-Opposition, second ACT-Inclusion). Participants in Condition 3 and Condition 4 went through the same order of task presentation as in Condition 1 and Condition 2, respectively, but no protocol preceded the tasks. Figure 1 summarizes the experimental conditions.

Integrity of Protocols

Interobserver agreement for the integrity of the experimental protocol implementation was calculated for 55% of sessions (randomly selected among all of the experimenters’ written records) and for all the audiotaped sessions. Each rater checked the occurrence of four elements of each protocol (the metaphor of the worker adapted either to the ACT-based or the EA-based strategy, request to participant of personal examples related to the worker metaphor, request to participant of personal examples related to the coping strategy, and request to participant of saying aloud what would be kept in mind while responding to the questions about the sounds).

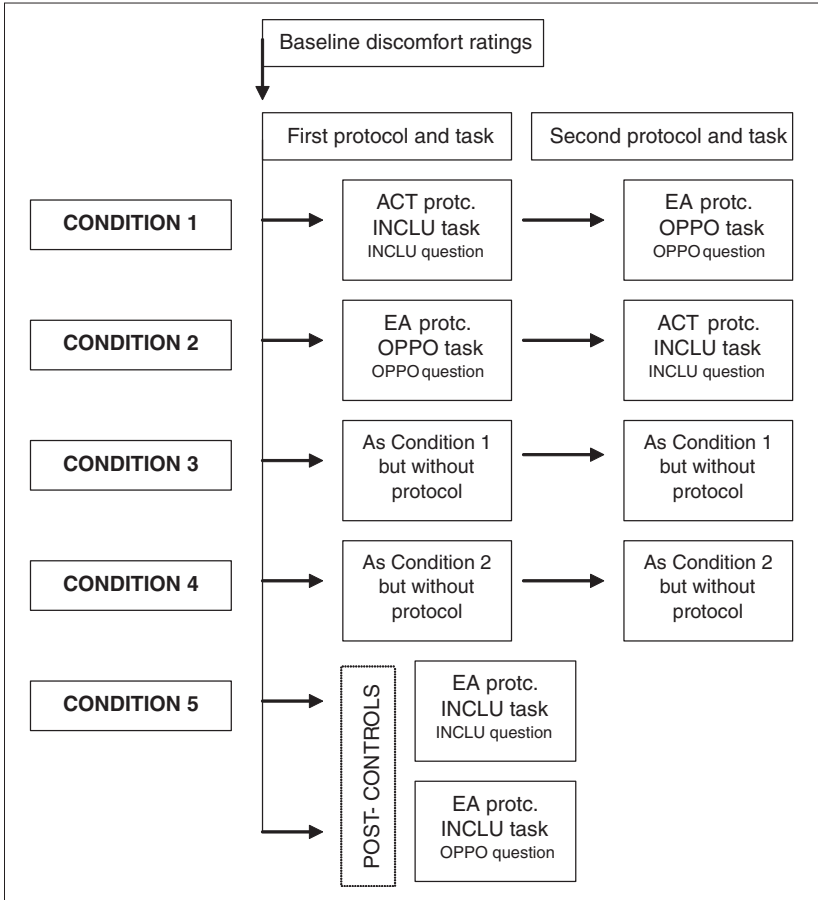


Figure 1. Schematic overview of the experimental conditions

Interobserver agreement was high for both the ACT and the EA protocols ($\kappa > .80$).

Results

Preliminary Analyses

Baseline discomfort scores ranged from 60 to 100 in all conditions (except for three participants), with an overall mean of 81.71 ($SD = 11.80$). ANOVAs revealed no significant differences between conditions in participants' age

($F(3, 34) = .19, p = .90$) and baseline discomfort scores ($F(3, 34) = .50, p = .69$). The ratio of female to male participants for the four conditions was (C1, 9:1; C2, 8:2; C3, 8:1; and C4, 8:1). All of the variables on which the ANOVA was conducted met the assumption of normality, as revealed by Kolmogorov-Smirnov Tests.

Main Results

Figure 2 (upper graph) shows individual discomfort ratings for participants in Condition 1. An overall visual analysis reflects that the lowest ratings were reported during the Inclusion Task with 80% of participants rating discomfort lower than 60. In fact, for all participants, both baseline ratings were higher than any of the six ratings obtained during the Inclusion Task. As well, all participants rated their discomfort during the Opposition Task higher than during the Inclusion Task (all participants rated it higher than 60). Besides individual analyses, we used dependent *t*-tests to compare discomfort mean ratings between pairs of consecutive assessments (baseline vs. first task, first task vs. second task). The difference between the mean discomfort during baseline ($M = 78.10, SD = 13.69$) and during Inclusion Task ($M = 47.53, SD = 14.82$) was statistically significant, $t(9) = 8.01, p < .000$. Increase of the discomfort during Opposition Task ($M = 82.65, SD = 7.92$) also reached statistical significance, $t(8) = -8.80, p < .000$. Regarding the overall rating collected at the end of each task, all participants (except for P10 who discontinued her participation after Part 1) reported that their level of discomfort during the Opposition Task ($M = 81.33, SD = 9.41$) was higher than during the Inclusion Task ($M = 42.78, SD = 16.22$), $t(8) = -8.45, p < .000$. Table 1 summarizes the average rating of discomfort level during Baseline, Inclusion, and Opposition tasks, including the overall rating assessed at the end of each task, for all conditions.

Figure 2 (bottom graph) shows individual discomfort ratings for participants in Condition 2. A visual analysis of the figure reflects that the highest ratings were reported during Opposition Task, with 100% of participants rating discomfort higher than 80. The difference between the mean rating during Baseline ($M = 81.50, SD = 11.18$) and during Opposition Task ($M = 96.17, SD = 4.26$) was statistically significant, $t(9) = -5.50, p < .000$. The decrease in the level of discomfort during the subsequent Inclusion Task ($M = 77.92, SD = 17.76$) also reached statistical significance, $t(9) = 3.39, p < .01$. Regarding the overall rating of discomfort, 9 out of 10 participants reported that the discomfort they felt as a result of the sounds during the Opposition Task was higher than during Inclusion Task, and one participant reported similar discomfort in both tasks. The mean overall ratings during

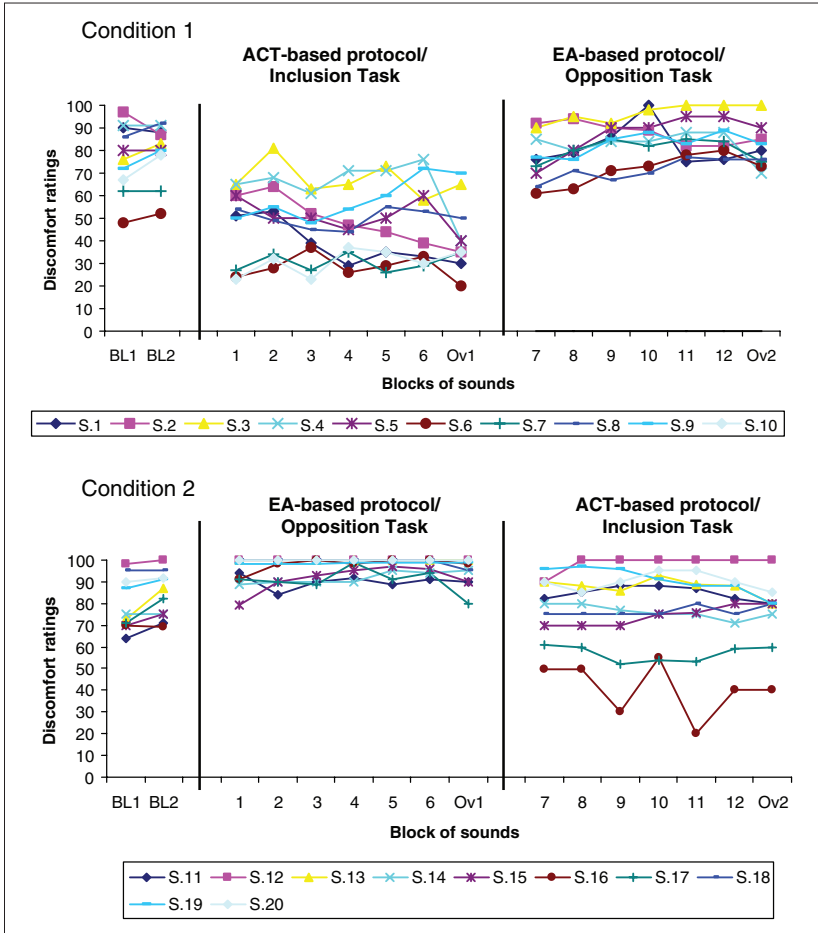


Figure 2. Individual discomfort ratings for participants in Condition 1 (S.1-S.10)—upper graph- and Condition 2 (S.11-S.20)—bottom graph- across assessments Note: Baseline (BL1, BL2), Inclusion task/ACT protocol (blocks 1-6) including the final overall rating (Ov1), and Opposition task/EA protocol (blocks 7-12) including the final overall rating (Ov2). In Condition 2, the order of the tasks and protocols was reversed.

Opposition Task and Inclusion Task were 94.77 and 76.00, respectively, $t(9) = 3.89, p < .005$ (see Table 1, row 2).

Results in Condition 3 are displayed in Figure 3 (upper graph). There were neither differences between the mean rating during baseline ($M = 84.39, SD = 8.36$) and during Inclusion EA Task ($M = 81.31, SD = 10.64$), $t(8) = .61, p = .56$,

Table 1. Means (and Standard Deviations) of Discomfort Ratings During Baseline, the Six Blocks of Sounds During the First and the Second Implementation of the Experimental Task, and Overall Assessments (Ov1 & Ov2) for Participants of Conditions 1, 2, 3, 4, 5, and 6

	Baseline	Task 1		Task 2	
		6 blocks	Overall OVI	6 blocks	Overall OV2
Condition 1	78.10 (13.69)	47.53 (14.82)	42.78 (16.22)	82.65 (7.92)	81.33 (9.41)
Condition 2	81.50 (11.18)	96.17 (4.26)	94.77 (6.45)	77.92 (17.76)	76.00 (15.95)
Condition 3	84.39 (8.36)	81.31 (10.64)	80.56 (12.61)	87.63 (15.85)	86.33 (15.24)
Condition 4	83.28 (13.98)	86.91 (15.63)	82.78 (18.07)	81.54 (18.88)	75.44 (25.30)
Condition 5	74.44 (12.52)	68.22 (22.84)	70.78 (13.80)		
Condition 6	76.85 (12.49)	76.27 (21.61)	74.90 (22.85)		

nor differences between this and the subsequent Opposition Task ($M = 87.63$, $SD = 15.85$), $t(8) = -1.40$, $p = .20$. In relation to the overall rating, five of nine participants reported similar discomfort during the Opposition Task and the Inclusion Task (respectively, $M = 86.33$, $SD = 15.24$ and $M = 80.56$, $SD = 12.61$, $t(9) = -1.40$, $p = .20$) (see Table 1, row 3).

Similar results were obtained in Condition 4. Figure 3 (bottom graph) shows that there were no differences between the mean level of discomfort during baseline ($M = 83.28$, $SD = 13.98$) and during Opposition Task ($M = 86.91$, $SD = 15.63$), $t(8) = -1.44$, $p = .19$, nor between this and the Inclusion Task ($M = 81.54$, $SD = 18.88$), $t(8) = 1.69$, $p = .13$. Similarly, the overall discomfort rating was very similar at the end of both tasks ($M = 82.78$, $SD = 18.07$, and $M = 75.44$, $SD = 25.30$, respectively, $t(9) = 1.56$, $p = .16$; see Table 1, row 4).

Finally, a 4×6 (experimental conditions by blocks of sounds) ANOVA was conducted on discomfort ratings during the six blocks of sounds of the first task (see Figure 4). There was a significant main effect of the experimental condition ($F(3, 34) = 30.34$, $f = .73$, $p < .000$). Other significant effects, like a change in the discomfort ratings across blocks, or interaction effects, were not found. As shown in Figure 4, post hoc tests revealed that the mean discomfort in Condition 1 was significantly lower than Conditions 2, 3, and 4. As well, the mean discomfort in Condition 2 was significantly higher than Conditions 1 and 3, but not 4.

Although accumulation of points was not contemplated as a relevant variable (i.e., points were provided contingently to solving the tasks, not to persisting in the tasks) the possible influence of the amount of points accumulated

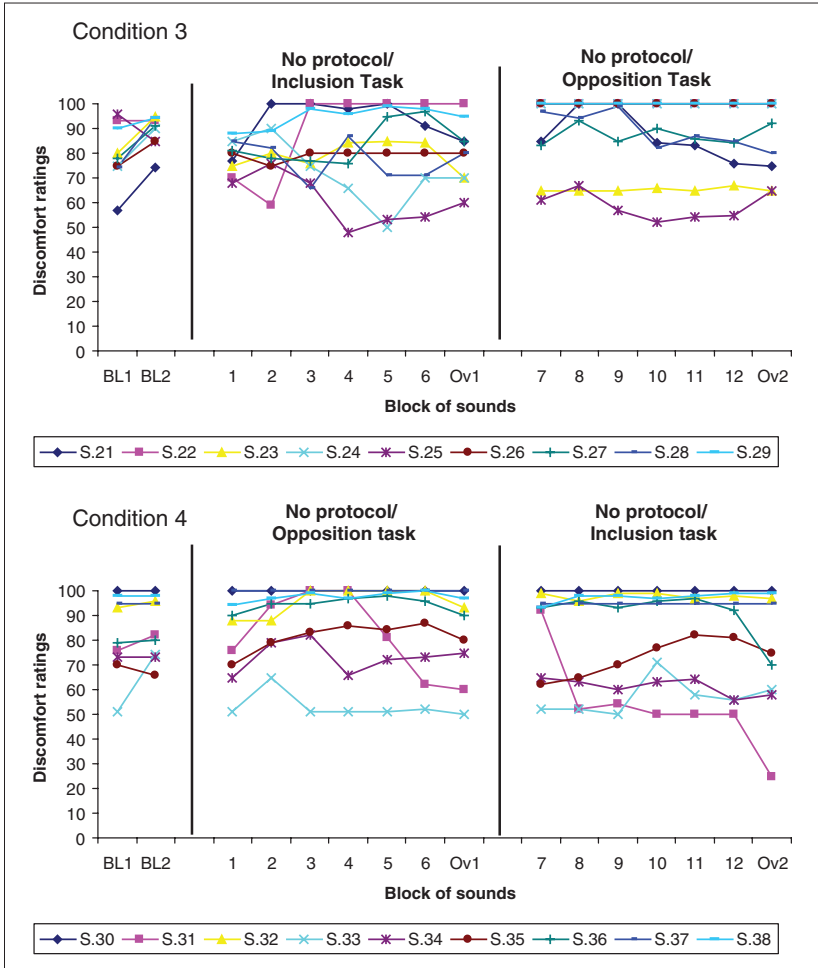


Figure 3. Individual discomfort ratings for participants in Condition 3 (S.21-S.29)—upper graph- and Condition 4 (S.30 S.38)—bottom graph—across assessments. Note: Baseline (BL1, BL2), Inclusion task (blocks 1-6) including the final overall rating (Ov1), and Opposition task (blocks 7-12) including the final overall rating (Ov2). In Condition 4, the order of the tasks was reversed.

during the tasks on the discomfort associated to the sounds was explored with an ANCOVA (data regarding the points accumulated by each participant are available upon request to the first author). The independent variable was the

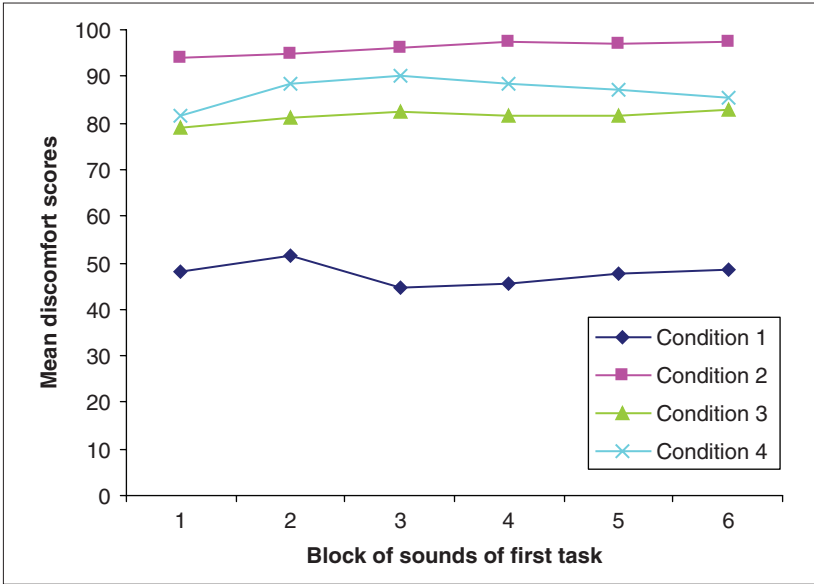


Figure 4. Average rating of discomfort across blocks of sounds during the first part of the experiment in Conditions 1, 2, 3, and 4

experimental condition and the dependent variable consisted of the averaged discomfort ratings reported in the first task. The averaged points earned in the first task were used as the covariate in this analysis. After adjusting for the point accumulation scores, the ANCOVA showed a significant main effect of the experimental condition ($F(3, 33) = 18.08, f = .62, p < .000$). The effect of the covariate was not significant, $F(1, 33) = .36, p = .55, f = .01$.

Postcontrol Conditions

Results of the previous conditions yielded clear evidence of the impact of introducing the ACT protocol before performing the Inclusion Task on reducing the discomfort produced by the sounds. However, we need to keep in mind that the whole intervention (protocol, task, and question for the assessment of discomfort) was coherent with an acceptance-based rationale. We do not know, then, the relative impact of each of the components in Condition 1 on the reduction of discomfort. Two postcontrol conditions were designed to isolate the possible interaction between the Inclusion Task and the ACT-based protocol, as well as the relative impact of the type of

question on discomfort. In both conditions, participants performed the Inclusion Task after being presented with the EA protocol. Depending on the condition, an opposition-coherent or an inclusion-coherent question was utilized to assess the level of discomfort.

Nineteen additional participants were recruited from the same subject pool used for the main four conditions. They were randomly assigned to Condition 5 ($N = 9$) or Condition 6 ($N = 10$). Participants in both conditions went through Baseline assessment (Phase 1), Task training (Phase 2), and Inclusion Task (Phase 3). During Phase 3, participants in Condition 5 were presented with the EA protocol before performing the Inclusion Task. Still, the question to measure the discomfort produced by the sounds (after each block and at the end of the task) focused the participants' attention in the fact that despite the sounds, they could continue performing the task. That is, the question was in line with an inclusion-based rationale, as in Condition 1 (first task). Participants in Condition 6 were likewise presented with the EA protocol before the Inclusion Task, and the question to measure discomfort focused the participants' attention in the fact that the sounds were not allowing them do the task. That is, the question was in line with an opposition-based rationale, as in Condition 2 (first task; see Figure 1 for schematic overview of these postcontrol conditions and the previous ones).

Baseline ratings in both conditions, except for one participant, ranged from 60 to 100, with an overall mean of 75.71 ($SD = 12.21$). ANOVAs revealed no significant differences between the baseline ratings of Conditions 5 and 6 ($F(1, 17) = .18, p = .68$). The ratio of female to male participants for the two conditions was, respectively, 8:1 and 8:2.

Figure 5 (upper graph) shows individual discomfort ratings for participants in Condition 5 (most of them rated discomfort higher than 70). There were no differences between the mean ratings during Baseline ($M = 74.44, SD = 12.52$) and during the Inclusion Task ($M = 68.22, SD = 22.84$), $t(8) = .78, p = .46$. The overall rating of discomfort at the end of the task ranged from 50 to 97 ($M = 70.78, SD = 13.80$; see Table 1, row 5).

Most participants in Condition 6 rated discomfort higher than 70 (see Figure 5, bottom graph). No differences were found between the mean ratings during Baseline ($M = 76.85, SD = 12.49$) and during Inclusion Task ($M = 76.27, SD = 21.61$), $t(8) = .10, p = .93$. The overall rating of discomfort measured at the end of the task ranged from 25 to 97 ($M = 74.90, SD = 22.85$; see Table 1, row 6).

No significant differences between Condition 5 and 6 were found on either the average discomfort ratings during the six blocks of the Inclusion Task, $t(17) = -.79, p = .44$, or the overall discomfort rating at the end of the task,

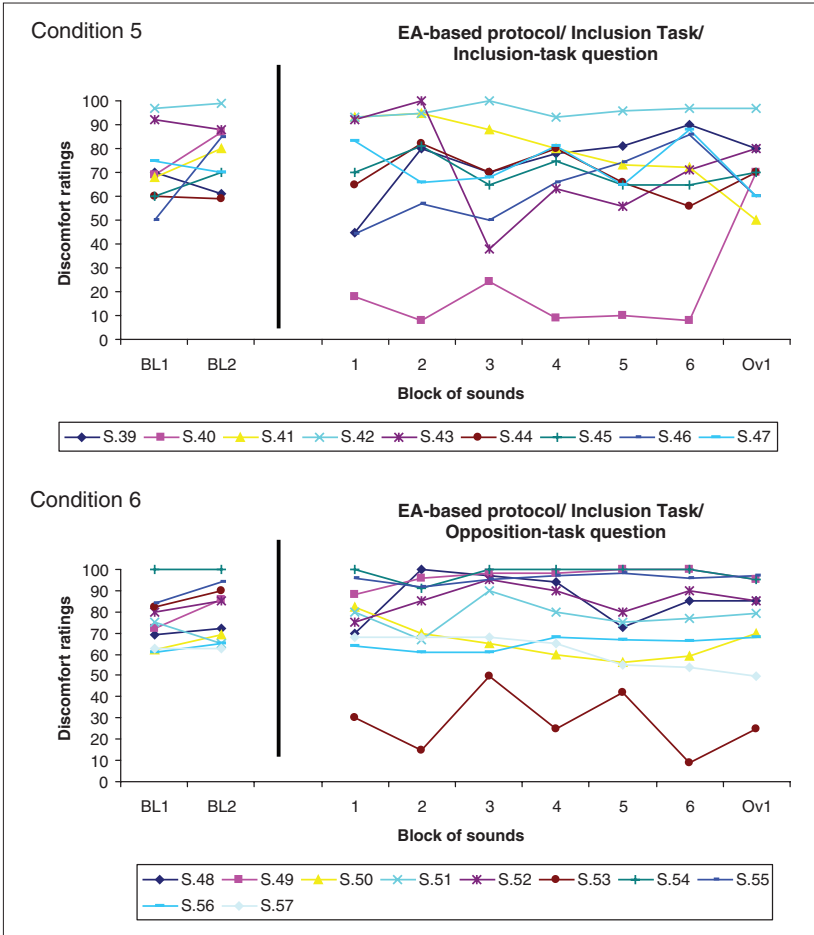


Figure 5. Individual discomfort ratings for participants in Condition 5 (S.39-S.47)—upper graph- and Condition 6 (S.48-S.57)—bottom graph- across assessments. Note: Baseline (BL1, BL2), and Inclusion task/EA protocol/inclusion question vs. opposition question (Conditions 5 and 6, respectively) (blocks 1-6) including the final overall rating (Ov1).

$t(17) = -.47, p = .65$. Although the experimental design did not allow comparisons between Conditions 5 and 6 and Conditions 1 and 2, independent two-sample t -tests were conducted to explore the differences in the mean discomfort ratings during the first task. The mean ratings reported by participants in Condition 1 (ACT protocol plus Inclusion Task plus inclusion

question; $M = 47.53$, $SD = 14.82$) was significantly lower than the mean ratings in Condition 5 (EA protocol plus Inclusion Task plus inclusion question; $M = 68.22$, $SD = 22.84$), $t(17) = -2.37$, $p < .05$, and in Condition 6 (EA protocol plus Inclusion Task plus opposition question; $M = 76.27$, $SD = 21.61$), $t(18) = -3.45$, $p < .005$. On the other hand, the mean discomfort ratings in Condition 2 (EA protocol plus Opposition Task plus opposition question; $M = 96.17$, $SD = 4.26$) was significantly higher than in Condition 5 ($M = 68.22$, $SD = 22.84$), $t(17) = 3.81$, $p < .005$, and in Condition 6 ($M = 76.27$, $SD = 21.61$), $t(18) = 2.86$, $p < .05$.

Discussion

The data obtained across the different experimental conditions show an important reduction of experienced discomfort when it is framed as an integral part of the valued task in which participants are involved. Four 2-part main conditions were implemented: two experimental conditions (with protocols) and two control conditions in which the tasks were performed without any preceding protocol. In the first part of Condition 1, the ACT protocol was administered before the Inclusion task, which allowed participants to continue performing in spite of the aversive sounds, and discomfort was assessed using a question whose content was coherent with the acceptance protocol. In the first part of Condition 2, the EA protocol was administered before the Opposition task, which did not allow participants to continue performing until they had eliminated the aversive sounds, and discomfort was measured through an opposition-coherent question. During pretest, all but 3 participants in all the four conditions scored the sound as relatively highly aversive (higher than 60 out of 100, with no differences across conditions). However, we observed a significant reduction of the discomfort/unpleasantness associated to the sound for participants receiving the ACT protocol (Condition 1), and an increase of reported discomfort/unpleasantness for participants receiving the EA protocol (Condition 2). Participants in the control Conditions 3 and 4 showed no relevant differences in discomfort associated to the sound across tests. Moreover, these differences in the level of discomfort across conditions were not influenced by the amount of points accumulated during each task. This confirms that the experimental effect was neither because of simply being involved in the Inclusion task, nor to the points accumulated during the task, nor to the multiple assessments of the discomfort produced by the sounds.

The present data are consistent with previous research where acceptance and defusion protocols showed a slight reduction in discomfort (Healy et al., 2008; Masuda et al., 2004, 2009; McMullen et al., 2008; Páez-Blarrina et al.,

2008a), although the mixed components of the respective protocols prevent in establishing a direct comparison with these findings. However, present findings represent an advance over previous studies which did not isolate the specific effects of either acceptance-based or control-based protocols on the level of experienced discomfort. The present results show that effects on discomfort are radically different by virtue of the explicit context of relating discomfort and the valued task actions. Thus, this study shows that an experiential avoidance-based protocol produces a significant increase in the level of discomfort, when it comes from a task and a protocol that establish a relation of opposition between discomfort and the valued action, and mainly when it is assessed with a coherent opposition-based question. Also, we have isolated that conditions under which an acceptance-based protocol produces a significant decrease of discomfort are: a task or context that establish a relation of inclusion between discomfort and the valued action, and an assessment method consistent with this relation.

However, to analyze where the discomfort associated to the sounds comes from, it was necessary to isolate the effect of the coherence among the protocols, the tasks, and the content of the questions assessing sound-produced discomfort. The postcontrol Conditions 5 and 6 served to isolate such effects by introducing the Inclusion task with the EA protocol in both conditions, but with the question assessing discomfort varying across conditions (i.e., inclusion-coherent question in Condition 5 and opposition-coherent question in Condition 6). Discomfort produced by the sound was scored relatively high in both conditions (although it seems higher in Condition 6) with no significant differences between them. This means that neither the specific question, nor the Inclusion task, was per se related to a low level of sound-produced discomfort. Although the experimental design does not allow establishing comparisons between these postcontrol conditions and the main four experimental and control conditions, visual analysis of the data from all the conditions yields clear differences between the level of discomfort reported by participants who received the ACT protocol in the first place (Condition 1) and by participants in all other conditions. That is, considering all the six conditions, the data revealed that participants receiving the ACT protocol in the first place (Condition 1) reported the lowest levels of discomfort, and that participants receiving the EA protocol in the first place (Condition 2) reported significantly higher levels of discomfort than in any of the additional conditions. Still, future studies may employ experimental designs which allow for direct comparison among all the conditions.

Basic research in transformation of functions has shown that framing an event in opposition with a positive reinforcer may transform the function of

such event, which will become negative or absent of any value (Whelan & Barnes-Holmes, 2004). On the contrary, and although the empirical evidence on transformation of function via hierarchical framing is still very scarce (e.g., Gil-González, 2008; Griffee & Dougher, 2002), when aversive stimulation (in this case, loud noises) is framed as part of something valued, its functions might be transformed so that less discomfort is experienced. Accordingly, the lower levels of discomfort reported in Condition 1 (first task) might be because of framing this discomfort as part of actions in a valued context, whereas the high discomfort reported in Condition 5 would be the result of framing it in opposition with valued acting. All in all, future studies should incorporate additional measures or procedures to isolate the participants' historical interaction with discomfort to establish the degree of coherence or incoherence of such personal histories with the experimental protocols.

Although previous studies on ACT (both experimental preparations and controlled treatment trials) have shown that participants may engage in valued actions even in the presence of private aversive experiences (e.g., Gutiérrez et al., 2004; Hayes, Bissett et al., 1999; McMullen et al., 2008; Páez-Blarrina et al., 2008a, 2008b), it is probably shared by any human being that it will be easier to do that when less distress is experienced (Biglan, Hayes, & Pistorello, 2008). Based on the present data, a lower degree of discomfort might be the result of integrating aversive private events as an inherent part of performing a chosen action in a valued trajectory. This is particularly relevant in the field of prevention. The present study provides relevant information as to advantages of promoting, since early in life, coping strategies that integrate discomfort and unwanted thoughts and memories as part of valued directions. For example, level of discomfort reported by participants who received the ACT protocol in the first place (Condition 1, task 1) was dramatically lower than the discomfort reported by participants who received this protocol but after having learned to use an experiential avoidance strategy (Condition 2, task 2). This means that learning, from the very beginning, to integrate discomfort as part of valued behaving, not only opens possibilities to be successful (i.e., reinforcement is more likely when individuals stay on the current task instead of trying to control their private thoughts and emotions), but also reduces the likelihood of experiencing high levels of discomfort. The applied implications for prevention and treatment are evident. If parents, teachers, and practitioners promote coping practices that are based on the opposition between discomfort and valued actions, then conditions are in place for the development of behavior regulation that might be problematic (Törneke, Luciano, & Valdivia-Salas, 2008). Contrarily, integrating discomfort as part of a valued direction, and practicing it before other coping strategies are potentiated in the repertoire, yields to less discomfort. As noted

before (Biglan et al., 2008; Luciano & Hayes, 2001) and evidenced here, the promotion — by education and health professionals, and the media in general — of practices derived from empirical research on the origin of discomfort in verbal or language-able beings is highly recommended for the goal of alleviating psychological suffering and improving overall quality of life.

Data in the present study are consistent with previous studies, but unique in isolating the conditions under which the experience of discomfort may be more or less intense. Further research is needed to overcome some of the limitations of the present study and to replicate the results. Nevertheless, our findings so far seem to have important and promising applied implications for prevention.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interests with respect to the authorship and/or publication of this article.

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Bios

Carmen Luciano, PhD, is a full professor of psychology in the Universidad de Almería since 1995. She received her PhD from the Universidad Complutense, Madrid in 1984. She is director of the Experimental and Applied Analysis of Behavior (EAAB) group and the Doctorate Program in Functional Analysis. Her research interests include verbal behavior development as relational learning, experiential avoidance regulation and Acceptance and Commitment Therapy. She has published numerous scientific publications in relevant journals.

Francisco J. Molina received his PhD from Universidad de Almería in 1997, where he has been a permanent Titular Teacher since 1999. He has conducted research within the EAAB since 1994, mostly on imitation and behavioural treatments for problematic children.

Olga Gutiérrez-Martínez, PhD, is an associate professor at the University of Barcelona, Spain, and received her doctorate from the Universidad de Almería, where she was part of the EAAB group. Her research interests are focused on acceptance and commitment therapy and the transformation of psychological functions in emotional avoidance and psychopathology.

Dermot Barnes-Holmes, PhD, obtained his doctorate from the University of Ulster, Coleraine in 1990 and spent nine years as a lecturer and senior lecturer at University College, Cork. He was offered and accepted the foundation Professorship in Psychology at the National University of Ireland in 1999 and continues in this post. He has published widely in the experimental analysis of human behavior and has served on the editorial boards of all of the major journals in behaviour analysis.

Sonsoles Valdivia-Salas received her PhD from the Universidad de Almería. She has been developing her research within the EAAB group that includes the experimental analysis of motivated behaviour, the onset and maintenance of cognitive bias, and the (de)potentiation of the reinforcing properties of events characteristic of anxiety and mood-related disorders. She joined the Anxiety Disorder Research Program at State University of New York, as a postdoctoral fellow in 2007.

Francisco Cabello received his PhD from the Universidad de Almería. He has been part of the research EAAB group since 2000, where he has developed basic research on relational learning and transformation of olfactory functions, as well as on relational models of analogical reasoning and its application to educational contexts. At present he works as an assistant professor at the Universidad de Murcia in Spain.

Yvonne Barnes-Holmes obtained her PhD from National University of Ireland in 2001, where she has been a lecturer in psychology since 2003. Her research interests include Relational Frame Theory and its applications to development and Behavioral and Cognitive Therapies.

Miguel Rodríguez-Valverde received his PhD from the Universidad de Almería in 2006. His research interests include relational learning and the transformation of the respondent and avoidance function, and its applications to the aetiology of anxiety disorders. He has been developing his research within the research group EAAB since 2001. At present, he works as assistant professor at the Universidad de Jaén in Spain.

Kelly G. Wilson is an associate professor of psychology and Director of the Mississippi Center for Contextual Psychology at the University of Mississippi. His research focuses on Acceptance and Commitment Therapy, Relational Frame Theory, and the interface between basic and applied psychology.