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## Is this a Joke? Altering the Derivation of Humor Behavior

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### ABSTRACT

Despite the vast number of studies analyzing humor and its relation to other psychological variables, there is no consensus regarding under which conditions humor emerges. The current study aims to explore in this direction using three experimental protocols designed to alter the context of several jokes: the Reality protocol, to respond as if being in the situation described in the joke; the Identification protocol, to take the perspective of the characters in the jokes; and the Discomfort protocol, to respond to aversive functions given to these characters. Twenty-three participants were assigned to one of two conditions: in the Experimental condition, the first three jokes were preceded by one of the experimental protocols, whereas in the Control condition, the same jokes were presented without any contextual manipulation. Then, all participants were re-exposed to the jokes with no manipulation in a second phase. Facial responses and self-reports were used as measures of humor. Results show that the experimental protocols altered the emergence of humor in a replicable manner (mainly with the Reality and the Discomfort protocols) by reducing the humor responses and affecting their agreement. However, a decrease in humor responses as well as variability in the agreement between measures was observed in both conditions when re-exposed to the same jokes. These findings are discussed according to the contextual components defining each experimental protocol and highlight the functions that might be derived according to the interaction between the jokes and the participants' histories of relating events.

**Key words:** functional analysis of jokes, humor derivation, incongruity, participant's functional history of relating, relational responding, smiling response.

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### Novelty and Significance

*What is already known about the topic?*

- Humor is a complex behavior with no clear consensus about the conditions under which it emerges.
- There are no experimental studies analyzing the conditions for humor derivation.

*What this paper adds?*

- First empirical analysis of the conditions that are involved in humor derivation.
- It provides data combining facial responses and self-reports when several jokes are presented.
- A relational frame interpretation of the experimental protocols to disrupt humor response is highlighted regarding to the role of perspective or deictic framing and the role of aversive functions.

Let us imagine Paul is in a bar with some friends when one of them says, "In the surgery room, a surgeon says to a patient: Relax David, it is just a small surgery. Don't panic. Surprised, the patient says that his name is not David and the surgeon quietly responds: I know. I am David." Paul smiles.

Most verbally sophisticated individuals will also respond to this story with a humorous response: smiling or laughing as a function of his/her personal history. Humor response has been demonstrated to be a language-based skill experienced across cultures (Apte, 1985; Lefcourt, 2001), with a vast number of studies on humor been published

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in mainstream Psychology. These studies are mainly focused on the correlations between self-reports about the presence of humor and its psychological or physiological benefits, such as improving emotion regulation and reducing blood pressure (e.g., Lefcourt, Davidson, Prkachin, & Mills, 1997, Samson & Gross, 2012). However, the correlational evidence has not served to achieve a consensus about the definition of humor and, mainly, about what might be the conditions under which humor responses develop (Martin & Ford, 2018; Morreall, 2009). A common issue among humor theories is the emphasis on “incongruity” as the central factor (Martin & Ford, 2018; McGhee, 1979; Morreall, 1983; Raskin, 1985; Ritchie, 2018), which is mainly described as conflicting expectations coming along when hearing or reading the contents of a joke, with one situation violating the expectation of another situation (Ritchie, 2004; McGraw & Warren, 2010). That is, the joke mentioned above was funny to Paul because, according to his history, he should not be expecting a surgeon saying “Relax, don’t panic”, and doing it in the presence of the patient who is going to receive the surgery from him.

Incongruity has also been taken into account when approaching humor behavior from a functional perspective on behavior. For instance, Skinner (1957) addressed humor as verbal behavior, giving several reasons why people laugh and indicating that “some behavior may be laughable merely because it is clumsy, awkward, surprising, or otherwise amusing in character...” (p. 285). Similarly, the account of language proposed by Relational Frame Theory (Hayes, Barnes-Holmes, & Roche, 2001) defined that “most jokes create relational networks that are complete, meaningful, and coherent but incongruous” (Stewart, Barnes-Holmes, Hayes, & Lipkens, 2001, p. 83). Two studies have been published in this context, one that taught double meaning comprehension to young children (Jackson, Núñez, Maraach, Wilhite, & Moschella, 2021), and the other that taught children with autism to detect and respond to sarcasm (Persicke, Tarbo, Ranick, & Clair, 2013). However, experimental evidence is needed to further identify the conditions under which humor emerges.

In moving forward the research in this area, the problems regarding the type of measure used to identify humor response are well noticed. Typically, the research conducted has used self-report measures (e.g., using a Likert scale for participants to write how funny was a specific joke or how they felt after listening to a joke). The practice of self-reports has been found troublesome in different areas as it relies on the assumption that there is a correspondence between what the participant reports and what he/she does, but these two behaviors do not necessarily go together (e.g., Critchfield, Tucker, & Vuchinich, 1998; Perone, 1988; Shimoff, 1986; see for a review, Cabello & O’Hora, 2002). In the case of humor, the actual behavior of laughing or smiling at the moment a joke is presented might, or not, be equivalent to reporting the impact of a joke in a subsequent moment. Accordingly, when the joke is presented, selecting facial responses as the main measure seems to be more adequate than reporting the identification of humor responses even when both measures might agree as parts of the same class.

As already mentioned, there is extensive literature correlating humor with different psychological and physiological variables, but little is known about the conditions under which humor emerges. Then, the question of why one person laughs at a joke remains unanswered. This study aims to move forward in this direction to explore the impact of three experimental protocols to alter the humor response. First, by inviting the participant as if being in the situation described in the joke (the reality protocol); second, by inviting the participant to take the perspective of the characters in the joke (the identification protocol); and lastly, describing the discomfort in the characters of the

joke (the discomfort protocol). Facial responses are measured as the primary indicator to identify humor responses, while self-reports are used as a secondary measure.

## METHOD

### *Participants, Settings, and Apparatus*

Twenty-three Spanish-speaking undergraduate students participated (14 female; age range 21-33) in exchange for course credits. Participants were randomly assigned to one of two conditions described in the procedure, the first one with 11 participants (8 female; *Mean age*= 23.8) and the second one with 12 participants (7 female; *Mean age*= 23.3).

The experiment was conducted individually in a laboratory room equipped with a table, two chairs, a Samsung computer with headphones, and a webcam device that recorded participant's facial reactions. The software for presenting stimuli and collecting responses was written in Visual Basics for Applications 2013 and is available upon request from the first author.

### *Instruments and Measures*

*Acceptance and Action Questionnaire-II* (AAQ-II; Bond, Hayes, Baer, Carpenter, Guenole, Orcutt, Waltz, & Zettle, 2011; Spanish version by Ruiz, Langer, Luciano, Cangas, & Beltrán, 2013). A general measure of experiential avoidance. It consists of 7 items rated on a Likert-type scale, and the Spanish version of the AAQ-II has shown good psychometric properties (mean alpha= .88).

*Perspective Taking, scale of the Interpersonal Reactivity Index* (IRI, Davis, 1983; Spanish version by Escrivá, Frías, & Samper 2004) is a self-report measure in which the score indicates a subject's attempts to adopt another's perspective in real situations. The scale contains 7 items rated on a Likert scale. The Spanish version of the PT has good psychometric properties with a mean alpha= .56.

*Cheerfulness and Seriousness scales of the State Trait Cheerfulness Inventory* (STCI-S; Ruch, Kohler & van Thriel, 1997; Spanish version by López Benítez, Acosta, Lupiáñez, & Carretero-Dios, 2017) also has good psychometric properties (cheerfulness mean alpha= .86, seriousness mean alpha= .86).

*Jokes*. Four jokes were used during the study. They were considered the funniest from a larger pool of jokes by a sample of 107 undergraduate students during a pilot study. Table 1 shows the jokes in English with explanations to overcome the cultural differences (the original versions in the Spanish language are incorporated in Appendix 1).

*In-between jokes activities*. Participants performed 36 activities presented between jokes, such as watching videos and images (e.g., a video of a mandala or a weather forecast, taken from YouTube and Google) or responding to the presented situations and tasks (e.g., reporting sensations about something that was displayed, or memorization tasks). A gray screen lasting 3 to 5 seconds separated the activities (Appendix 2 describes the specific type and entire sequence of activities, and Appendices 3 and 4 describe the instructions for the different activities).

*Humor facial responses*. The presence of smile or laugh is defined, during the presentation of a joke, as an upward curvature of the edges of the lips, with or without the display of teeth, with or without a vocal sound (Ekman, Davidson, & Friesen, 1990; Provine, 1996; Ruch & Ekman, 2001). The presence or absence of smile was determined by the agreement between the experimenter and two independent evaluators using the videos recorded during the experiment. Interobserver agreement was calculated using Cohen's kappa (Cohen, 1965).

*Self-reports*. To collect self-reports, participants responded to one of five options: (1) "Seemed unfair to me"; (2) "Seemed funny to me"; (3) "It worried me"; (4) "It has angered me"; and (5) "Another." The presence of humor was considered when participants selected the second option, and is termed "funny report" in this paper.

Table 1. Jokes presented during the experiment.

Doctor	Doctor: "Relax David! It's just a little surgery. Don't panic."
	Patient: "My name is not David."
	Doctor: "I know. I am David."
Beer	"Listen Juan, I wasn't going to drink a beer but then my cat came and said MAHOU* and I told the cat... let's have one!"
	Job interviewer: "English knowledge?" Candidate: "High."
Job	Job interviewer: "Translate juguete". Candidate: "Toy.**"
	Job interviewer: "Use it in a sentence." Candidate: "Toy sad."
	Job interviewer: "Hired!."
	Two football players in a very rough match Player 1 said to Player 2:
Soccer	Player 1: "Keep doing me that and I am going to break the bone in your leg." Player 2: "It is said... tibia."
	Player 1: "OK, As I said, TIBIA break the leg."

Notes: Job, and Soccer jokes have a double meaning of cultural character and were translated from Spanish to English; \*= Mahou is a popular beer in Spain, but this joke is used for the cat's meow; \*\*= Toy in Spanish is a relaxed and colloquial way to pronounce *Estoy*, which means "I am" (present tense of to be). Toy is used as a present-tense version of a Spanish sentence in this joke. \*\*\*= TIBIA in Spanish means the same as in English but its phonetics sounds similar to a relaxed and colloquial way of pronouncing *te voy a*, which means "I am going to". In this joke, TIBIA has a double meaning for breaking the bone and that verb.

## Design

An experimental design with two conditions was implemented, as described in Figure 1. In the Control (not-manipulated) condition, participants were presented with the four jokes without any kind of manipulation in the first phase. Then, in the second phase, participants were presented with the same four jokes. Jokes were separated by the presentation of in-between activities in all cases.

The second condition included both manipulated and non-manipulated jokes. That is, in the Experimental condition, participants were presented, in the first phase, with the manipulation (an experimental protocol) applied to, respectively, the first three jokes (the Doctor, Beer, and Job jokes respectively), and then with a non-manipulated joke (the Soccer joke). Then, in the second phase, all the four jokes were presented without any kind of manipulation, that is, as in the Control condition.

In other words, both conditions differed in the first phase of the experiment, in which the Control condition becomes a control for the effect of the protocols used in the Experimental condition. During the second phase of the experiment, the jokes presented did not involve any manipulation because the aim was to explore the effects of presenting the jokes for a second time.

## Procedure

Upon arrival at the laboratory, participants sat individually in a chair in front of the computer, signed an informed consent form, and filled out the pre-experimental measures (e.g., the AAQ-II, IRI, and STCI-S questionnaires). Then, the experimenter (who was the same for all participants) briefly explained that the purpose of the study was to determine how people responded to different contexts and tasks. He also indicated that all instructions would appear on the computer screen. Then, he asked the participants to use headphones and instructed them to press a button on the keyboard to begin the experiment. The experimenter then left the room. All procedures were approved by the Ethics Committee for Research with Human Participants of the University of Almería.

The following instructions appeared on the computer screen for all participants:

“Our responses change depending on the circumstances. Sometimes we watch a movie and get excited, while sometimes we do not. Sometimes we see something and have feelings of pleasing or fun, while other times we feel boredom, annoyance, pain, or discomfort. In this study, we try to investigate how we respond to different situations. There are no right or wrong answers. Whatever you might respond, will be fine. We kindly request you to pay attention and answer honestly.”

As indicated (see Figure 1), the experiment’s first phase was different for each condition. In the Control condition, four jokes were presented, starting with the Doctor joke, followed by the Beer joke, the Job joke, and ending with the Soccer joke. In the Experimental condition, the same four jokes were also presented, but the first three were preceded by the respective experimental protocol (that is, the reality, Identification, and Discomfort protocols). The experimental protocols were:

*Reality protocol* (lasting 50 seconds): “Please imagine that you are in a hospital... that what you are listening to is real as if it were happening at this moment;” (the screen turned dark gray, and the rest of the protocol was presented through the headphones). “Now try to imagine as much as you can, that you are close to the surgery room, that you are observing what is happening. Imagine that you are seeing people entering and leaving that place, the doctors, the nurses... and then, you see the patient... he is lying on the surgery table (a heartbeat starts and still until the joke ended). At this moment you can see the surgeon approaching the patient.” Then, the Doctor joke was presented.

*Identification protocol* (lasting 29 seconds): “You are going to read something about someone named Juan. We ask you to try to imagine that you are him. Now, imagine that you, as if you were Juan, have been trying to help a friend to stop drinking for a long time. Imagine that you are worried about him, and you ask how he is doing.” Then the following sentence was added: “Remember trying to be Juan and the efforts you are making to help your friend stop drinking.” Then, the next sentence followed: “Juan: Hey, how are you doing? Friend’s answer.” The Beer joke was then presented.

*Discomfort protocol* (lasting 19 seconds): all the sentences in this protocol appeared simultaneously on the screen: “Now you are going to watch a job interview. These are interviewers who laugh at people and set up false interviews to laugh at candidates. They enjoy giving them a hard time, inviting unqualified people with financial troubles to ridicule them, and they tell they got the job when it is all a lie.” Then, the Job interview joke followed.

After the three manipulated jokes were presented, the fourth joke (the Soccer joke) was presented without manipulation. Then, all participants were invited to a 10-minute break, after which they went through the second phase of the experiment. In both conditions, this phase consisted of presenting the four jokes without manipulation and in the same order as in the first part (i.e., Doctor, Beer, Job interview, and Soccer). As shown in Figure 1, all participants received the same sequence of jokes although in the Control condition the jokes were presented without manipulation while in the Experimental condition the Doctor, Beer and Job jokes were presented without the experimental protocols for the first time in the second phase. Finally, when the four jokes had been presented, the computer screen displayed a message indicating that the experiment was over and participants were debriefed.

### *Data Analysis*

Quantitative variables were described by mean and standard deviation and categorical variables by absolute and relative frequencies. The normality test applied was the Shapiro-Wilk test, and all variables showed normal distribution.

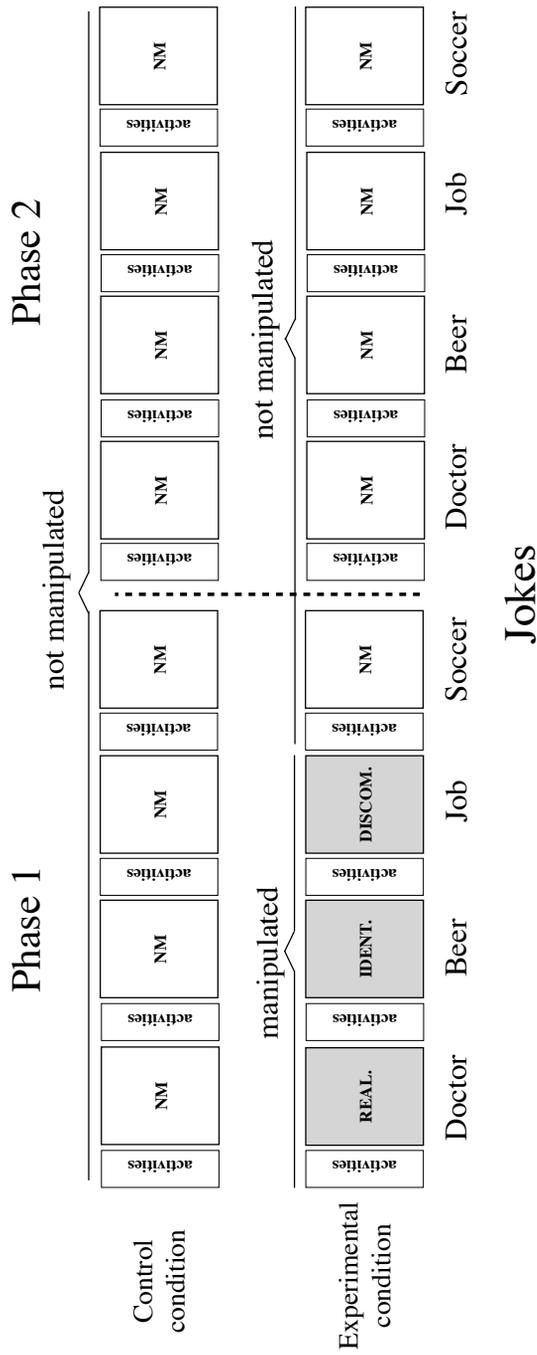


Figure 1. Experimental design. Jokes are indicated at the bottom and were the same for both conditions. NM= indicates that the joke was presented without any manipulation. REAL., IDENT., and DISCOM. indicate the presence of the corresponding experimental protocol before the joke (Reality, Identification, Discomfort).

To compare mean age and the scores of experimental avoidance, perspective taking, and cheerfulness and seriousness across conditions, the *t*-student test for independent samples was applied. For comparing facial responses and self-reports between the Experimental and Control condition, Fisher’s exact test were used because more than 25% of the cells had an expected frequency of less than 5, and thus Pearson’s chi-square test could not be calculated.

The agreement between observers to determine whether participants were smiling or not was calculated using the kappa coefficient. This coefficient is a value between 0 and 1 and the higher the value, the greater the strength of the agreement. The kappa values between 0.8 and 1.0, represent a very good agreement between observers, and the kappa values between 0.4 and 0.6 represent a moderate agreement. The significance level adopted was  $p < .05$  and the analyses were performed in SPSS 21.0.

**RESULTS**

In this section, we will firstly present the data from the pre-experimental measures and the inter-observer agreement for the presence of smile during the experiment. Then, we present the data for smiling and self-report responses across jokes, and finally, the agreement between facial responses and self-reports, per participants and across the different jokes.

Table 2 shows the mean score for each condition in the questionnaires that participants completed before the experimental sequence (individual data are available upon request to the first author). Independent sample *t*-tests showed no statistically significant differences between conditions in any of the measures: the AAQ-II, with  $t(21) = 1.774$ ; the PT scale of the IRI, with  $t(21) = -.175$ ; the CH scale of the STCI-S, with  $t(21) = -.566$ , and the SE scale of the STCI-S, with  $t(21) = -.374$ . These results indicate that both conditions were homogeneous regarding to these measures.

*Table 2. Comparison between conditions in pre-experimental measures.*

Measures	Jokes condition		Modified jokes condition	
	Mean	SD	Mean	SD
AAQ-II	28.6	11.7	21.2	8.4
IRI (PT scale)	27.1	5.2	27.4	3.6
STCI-S (CH scale)	114.6	18.4	118.8	16.5
STCI-S (SE scale)	83.6	13.2	85.5	11.8

Participants’ facial responses were analyzed by the first author (Ob1) and two observers (Ob2 and Ob3), and the agreement for the presence of smile was calculated using Cohen’s kappa.

The Ob1 trained Ob2 and Ob3 to identify smile responses in the videorecorded faces. After training with ten different facial expressions, the trained observers performed a test identifying the presence or absence of smiles in 20 images, both achieving a score of 95%. Then, all observers watched the participants’ videotaped faces throughout the experiment. The three observers were blinded to the moment the joke was happening. The total number of faces evaluated was 175, corresponding to four for each of the 23 participants in the first phase and four for the 20 participants in the second phase (two participants quit after the first phase and another participant was not properly recorded

due to an error in the computer program). The observers evaluated the face responses in a separate room over seven days (the specific data regarding interobserver agreement is available upon request of the first author).

Table 3 indicates the kappa coefficient for each pair of observers and for each of the four jokes. Kappa values ranged from 0.85 to 1, indicating almost perfect agreement (Landis & Koch, 1977). Therefore, these results assure that the facial expressions were adequately measured.

Table 3. Kappa values for interobserver agreement per each joke across two faces.

Joke	Ob1 vs. Ob2	Ob1 vs. Ob3	Ob2 vs. Ob3
Doctor	.93	.93	1.0
Beer	1.0	.95	.95
Job	1.0	.88	.88
Soccer	.90	.85	.95

Figure 2 shows the percentage of participants who smiled during the presentation of the jokes in the upper graph, whereas the lower graph indicates the percentage of participants who reported the jokes as funny. In both graphs, the four jokes on the left correspond to the first phase, and the four jokes on the right to the second phase.

Regarding the facial response measure, the smiling faces in the first phase show the following data (see Figure 2 left part of the upper graph): when the Doctor joke was presented to the 11 participants in the Control condition, and to the 12 participants in the Experimental condition 8 (73%) and 1 (8%) participants smiled, respectively, (significant difference,  $p = .003$ ). In the Beer joke, nine participants (82%) in the Control condition smiled, while when the Beer joke was manipulated with the identification protocol, six participants (50%) did, with no significant difference. Regarding the Job joke, all the participants in the Control condition smiled, while only two participants (17%) did when the discomfort protocol was implemented ( $p < .001$ ). Lastly, when the Soccer joke was presented in both conditions without any manipulation, ten (91%) and eight (67%) participants, respectively, in both conditions smiled (no significance was obtained).

As for the self-report measure during the first phase (see Figure 2 right part of the lower graph), data were as follows. In regard to the Doctor joke, nine participants (82%) reported the joke as funny in the Control condition, while two participants (17%) reported in the same direction when the joke was manipulated with reality protocol (the difference was significant,  $p = .003$ ). Regarding the Beer joke, nine participants (82%) responded to the joke as funny. In contrast, when the Beer joke was manipulated with the identification protocol, seven participants (59%) responded that the joke was funny (no significant difference was found). In the Job joke, eight participants (73%) reported that the joke was funny in the Control condition. In contrast, one participant (8%) smiled when the discomfort protocol was implemented to the Job joke in the Experimental condition ( $p = .003$ ). When no protocols were applied in the Soccer joke with no manipulation in both conditions, ten (91%) and seven (58%) participants reported that the joke was funny (no significant difference was found).

These results indicate that there was a consistent pattern in the first phase when participants were exposed to the three distinct experimental protocols, that is, they showed a much lower percentage of smiling and of reporting the jokes as funny as compared to participants who were exposed to the unmodified jokes. The absence of smiling and

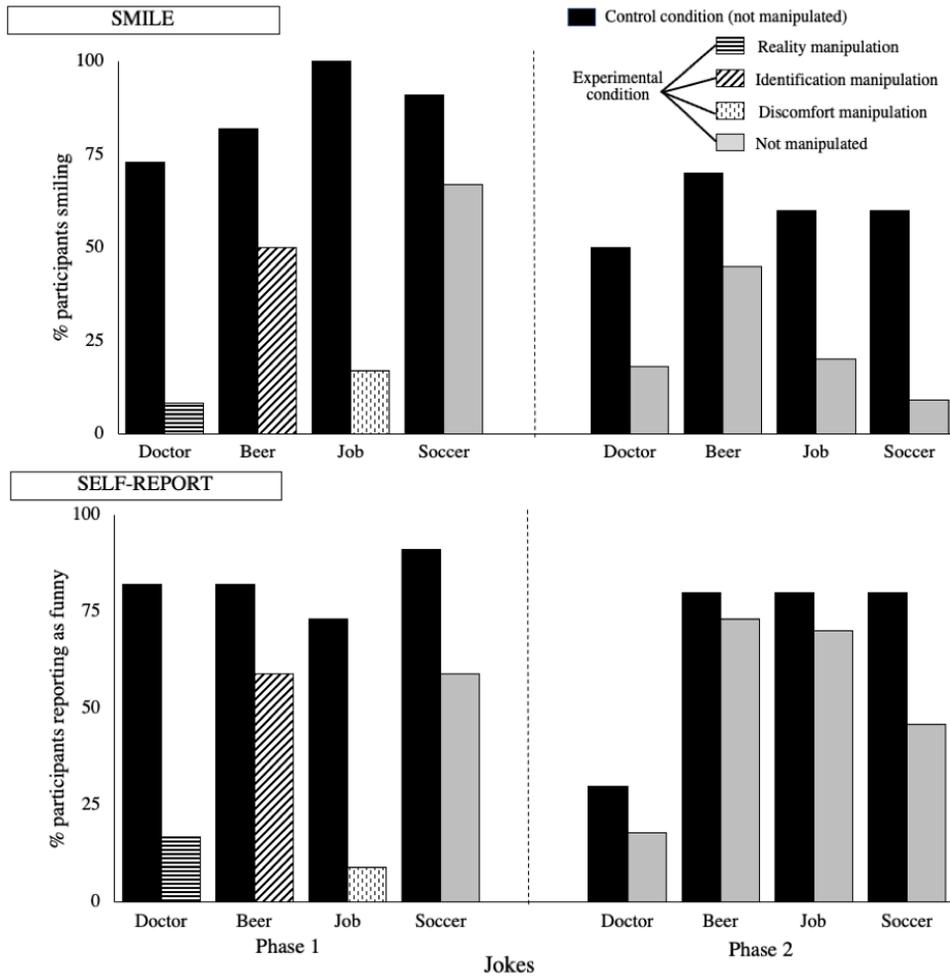


Figure 2. The upper and the lower histograms show the percentage of smiling and reporting funny responses per joke. Black bars represent the Control condition (not manipulated jokes), and gray bars represent the Experimental condition (three manipulated jokes represented with horizontal lines, diagonals, and points and one not-manipulated joke represented with plain gray).

funny reporting was particularly large when the reality and discomfort protocols were presented and, to a lesser degree, when the identification protocol was implemented.

During the second phase, the four jokes were repeated for the Control condition while, for the Experimental condition, the three first jokes were presented for the first time unmanipulated while the fourth joke was presented again without manipulation. The data obtained (see Figure 2, right upper part) show that when participants were exposed to the Doctor joke, five of them (50%) smiled in the Control condition, while only two did (18%) in the Experimental condition (no significant difference was found). In the Beer joke, seven participants (70%) and five (45%) smiled (no significant difference between conditions was found). When the Job joke was presented, six participants (60%) smiled in the Control condition but only two of ten did (20%) when the joke was not manipulated (no significance difference between conditions was found). Lastly, when

the Soccer joke was presented, six participants (60%) in the Control condition smiled while only one participant did (9%) in the Experimental condition ( $p = .024$ ).

Data were as follows regarding the self-report in the second phase (see Figure 2, right part of the lower figure). When the Doctor joke was presented, three participants (30%) and two (18%) responded that the joke was funny in the Control and Experimental condition, respectively (no significant difference was found). In the Beer Joke, eight participants (80%) reported that the joke was funny in the Control condition, while also eight participants (73%) reported in the same direction (the difference was not significant). When participants were asked about what they just saw in the Job joke, eight participants (80%) in the Control condition reported it to be funny, while seven of ten did (70%) in the Experimental condition (no differences were found). Finally, in the Soccer Joke, eight participants (80%) and five (45%) responded that the joke was funny in the Control and Experimental condition, respectively (no significant differences between conditions was found).

To sum up, the data obtained in the second phase reveal that both conditions show a reduction in smiling, either when they were re-exposed to the jokes as in the Control condition, or when they received the jokes for the first time without being preceded by the experimental protocols as in three first jokes in the Experimental condition. In contrast, the data of the funny report in the jokes of the Control condition was almost the same for all jokes (except the Doctor joke), while the funny report of the Experimental condition increased in the Beer and Job jokes, decreased in the Doctor joke, and slightly decreased in the Soccer joke. These changes in the funny report show a similar percentage of participants reporting the joke as funny in both conditions during the second phase.

Table 4 shows each participant's responses for all jokes, indicating an agreement or not between the facial and self-reports. The left panel demonstrates whether the

Table 4. Facial responses and self-reports across all participants, jokes and conditions.

Condition	Partic	Phase 1					# Agr	Phase 2					# Agr
		Doctor S/FR	Beer S/FR	Job S/FR	Soccer S/FR	Doctor S/FR		Beer S/FR	Job S/FR	Soccer S/FR			
Control Condition N= 11	P1	N/Y	N/Y	Y/Y	Y/Y	2/4	N/N	Y/Y	Y/Y	N/Y	3/4		
	P2	Y/Y	Y/Y	Y/Y	Y/Y	4/4	Y/Y	Y/Y	Y/Y	Y/Y	4/4		
	P3	N/N	Y/Y	Y/Y	Y/Y	4/4	Y/N	N/Y	N/Y	N/Y	0/4		
	P4	Y/Y	Y/N	Y/N	Y/Y	2/4	Y/N	Y/Y	Y/Y	Y/Y	3/4		
	P5	Y/Y	Y/Y	Y/Y	Y/Y	4/4	Y/Y	Y/Y	Y/Y	Y/Y	4/4		
	P6	Y/Y	Y/Y	Y/Y	Y/Y	4/4	-	-	-	-	-		
	P7	Y/Y	Y/Y	Y/Y	Y/Y	4/4	N/Y	Y/Y	Y/Y	Y/Y	3/4		
	P8	Y/Y	Y/Y	Y/N	Y/Y	3/4	N/N	N/N	N/N	N/N	4/4		
	P9	Y/Y	N/N	Y/Y	Y/Y	4/4	Y/N	N/Y	N/Y	N/N	1/4		
	P10	Y/Y	Y/Y	Y/Y	N/N	4/4	N/N	Y/N	N/Y	Y/Y	3/4		
	P11	N/N	Y/Y	Y/N	Y/Y	3/4	N/N	Y/Y	Y/Y	Y/Y	4/4		
Total		8/9	9/9	11/8	10/10	38/44	5/3	7/8	6/8	6/8	29/40		
% Total		73%/82%	82%/82%	100%/73%	91%/91%	86%	50%/30%	70%/80%	60%/80%	60%/80%	72%		
Y/Y Agreement (%)		8 (73%)	8 (73%)	8 (73%)	10 (91%)		2 (20%)	6 (60%)	6 (60%)	6 (60%)			
N/N Agreement (%)		2 (18%)	1 (9%)	0 (-)	1 (9%)		4 (40%)	1 (10%)	2 (20%)	2 (20%)			
Total Agreement (%)		10 (91%)	9 (82%)	8 (73%)	11(100%)		60 (60%)	7 (70%)	8 (80%)	8 (80%)			
Experimental Condition N= 12	P12	N/Y	N/Y	N/Y	N/Y	0/4	N/Y	N/N	N/Y	N/Y	1/4		
	P13	N/N	N/N	N/N	N/N	3/4	N/N	Y/Y	Y/Y	N/N	4/4		
	P14	N/N	Y/Y	N/N	Y/N	3/4	N/N	Y/Y	N/N	N/N	4/4		
	P15	N/N	N/Y	N/N	Y/Y	3/4	-	-	-	-	-		
	P16	N/N	Y/Y	Y/N	N/N	3/4	Y/N	N/Y	-	N/N	1/3		
	P17	N/N	N/N	N/N	Y/Y	4/4	N/N	Y/Y	N/Y	N/Y	2/4		
	P18	N/N	N/Y	N/N	Y/Y	3/4	N/N	Y/Y	N/Y	N/Y	2/4		
	P19	N/Y	Y/Y	N/N	Y/Y	3/4	N/N	N/N	N/N	N/N	4/4		
	P20	N/N	N/N	N/N	Y/Y	4/4	N/N	N/Y	N/Y	N/Y	1/4		
	P21	Y/N	Y/N	N/N	Y/Y	2/4	Y/Y	Y/Y	Y/Y	Y/Y	4/4		
	P22	N/N	Y/N	Y/N	N/N	2/4	N/N	N/N	N/N	N/N	4/4		
P23	N/N	Y/Y	-N/N	N/N	4/4	N/N	N/Y	N/Y	N/N	2/4			
Total		1/2	6/7	2/1	8/7	34/48	2/2	5/8	2/7	1/5	29/39		
% Total		9%/17%	50%/58%	17%/9%	67%/58%	70%	18%/18%	45%/73%	20%/70%	9%/45%	74%		
Y/Y Agreement (%)		0 (-)	4 (33%)	0 (-)	6 (50%)		1 (9%)	5 (45%)	2 (20%)	1 (9%)			
N/N Agreement (%)		9 (75%)	3 (25%)	9 (75%)	3 (25%)		8 (73%)	3 (28%)	3 (30%)	6 (55%)			
Total Agreement (%)		9 (75%)	7 (58%)	9 (75%)	9 (75%)		9 (82%)	8 (73%)	5 (50%)	7 (64%)			

Notes: # Agr= number of agreements; FR= funny report; N= no; Partic = participants; S= smile; Y= yes. Gray background indicates manipulated jokes.

participants smiled or not and whether or not they reported the joke as funny in each phase (indicated with a Y or N for both measures). Second, it shows data regarding the number of agreements between facial response and self-reports for the four jokes of each phase, including either smiling and reporting the joke as funny (named Y/Y agreement) or not smiling and reporting other sensation (named N/N agreement).

Data show a high number of agreements in the first phase. Each participant presented an amount of total agreement (i.e., Y/Y plus N/N) in three or four of the jokes, except for P1, P4, P21, and P22, who showed agreement in two of the jokes, and for P12, who showed no agreement. In the second phase, the pattern of agreement responses differs across conditions. The participants in the Control condition showed a similar number of agreements (except for P3 and P9 with none and one responses agreement, respectively). In contrast, the participants in the Experimental condition showed higher variability, with 5 of 11 participants showing agreement in the four jokes, whereas the other 6 showed agreement just in one or two jokes.

Following Table 4, the number of participants showing some type of agreement (either Y/Y and N/N agreements) is reported at the bottom of each condition, and the percentage that those participants represent from the total in the condition. With these data Figure 3 illustrates the percentage of total agreement (including Y/Y and N/N agreement), and the percentage of Y/Y agreement are presented for both conditions.

The Control condition (upper graph) shows a high percentage of agreement in both total and Y/Y agreement (between 75% and 100%) in both phases. However, the total agreement decreased in the first two jokes when participants responded by the second time (from 91% to 60% in the Doctor joke and from 82% to 70% in the Beer joke). In regard the Experimental condition (lower graph), the total agreement percentage is lower than those in the Control condition (upper graph) in both phases. Comparing first and second phases in the Experimental condition, data show a similar tendency, between 75% and 60%, except for the Job joke in the second phase where total disagreements were almost 50%.

Looking at the Y/Y agreement, data from both conditions show a different pattern which point to the impact of responding in different conditions. In phase one, Y/Y agreement is higher when the jokes were presented without manipulations than when they were presented after the experimental protocols (the first three jokes in the Experimental condition). Further, the last joke without manipulation (the Soccer joke) also presented a higher Y/Y agreement in the Control condition. In phase two, data show a similar pattern of agreement, except for the a decreased percentage of agreement in the Doctor joke for the Control condition, and in the Soccer joke of the Experimental condition.

## DISCUSSION

This study is the first behavioral-analytic attempt to analyze the conditions under which humor emerges. Specifically, this experiment aims to explore different contextual ways to alter the derivation of humor. To this end, four jokes were used and three experimental protocols were designed to alter the context of the jokes. The four jokes were selected on the basis of having been chosen as funny jokes by the university population in Spain. The rationale of the designed experimental protocol was that if any of them produced differences in the effects of a joke, that should mean that the conditions included in the specific protocol might be relevant for altering the derivation of humor responses. Four jokes were presented with no manipulation to the participants in the

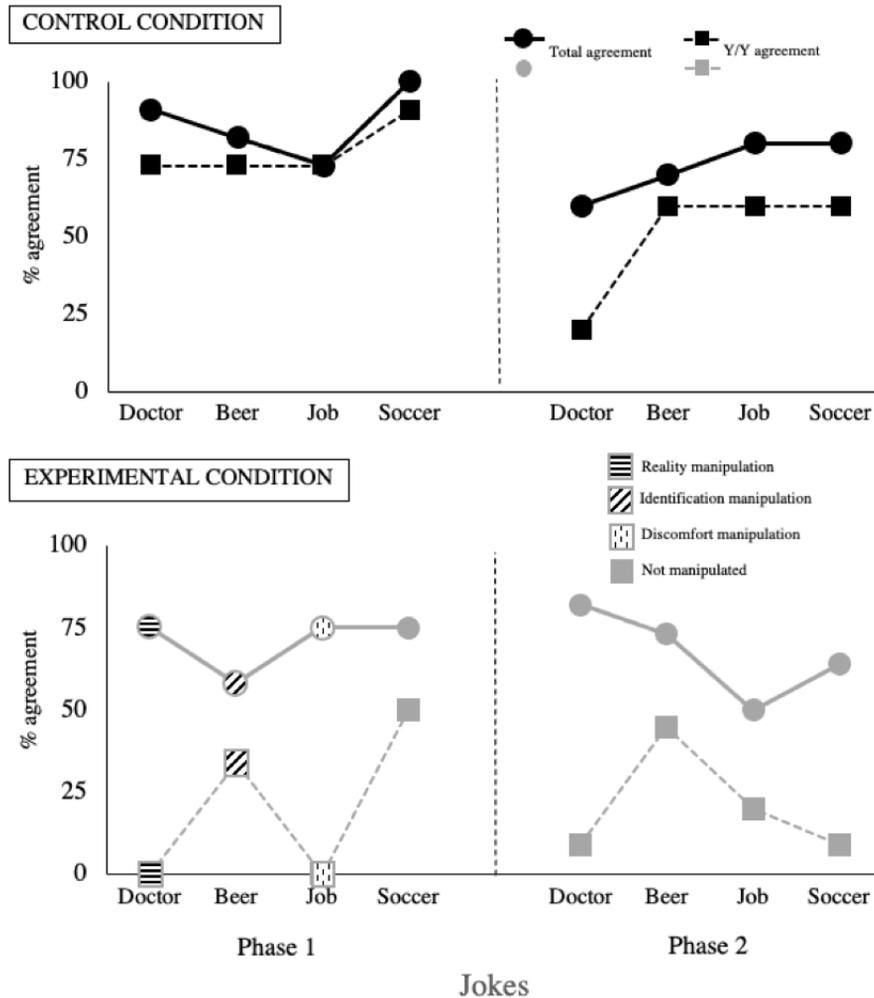


Figure 3. The upper and lower graphs show the agreement of smile and funny report (Y/Y) plus the opposite (N/N) (shown in circles) and only Y/Y (shown in squares) for both conditions. The Control condition condition (upper graph) with black circles and black squares, and the Experimental condition (lower graph) with gray circles and gray squares.

Control condition. In the Experimental condition, the first three jokes were presented preceded by one of the three experimental protocols. The fourth joke was presented without any contextual manipulation. Then, all participants were exposed to a second phase in which the four jokes were presented with no manipulation.

The results obtained might be summarized as follows. Firstly, when participants were presented with the jokes for the very first time, those in the Control condition smiled and reported the joke as funny. This result occurs in all the jokes, which replicates previous studies where these jokes were evaluated as funny jokes in this type of university population. In contrast, the findings from the Experimental condition showed that the experimental protocols effectively produced consistent, replicable changes in how participants responded to the jokes. Specifically, participants did not smile and did not

report the joke as funny when the Reality and Discomfort protocols were implemented, while a variable effect was obtained when the Identification protocol was in place.

Secondly, when the jokes were presented for the second time, participants in both conditions reduced smiling responses, with no significant differences between the conditions (except for the Soccer joke). These findings might indicate that being re-exposed to the jokes (even being the first time without any manipulation, as in the experimental condition) impacted laughing. These results might be analyzed considering the relatively short interval between the two exposures to the joke. Longer intervals might result in no reduction of the humor responses.

Thirdly, the facial responses (smiling or not) and the self-reports (considering the joke as funny or reporting other sensation) mainly ran parallel to each other in the first phase, with a high level of agreement in both conditions (a little higher in the Control condition). Only the Beer joke with the Identification protocol showed variability between the two measures. Furthermore, the agreement between them decreased slightly when the jokes were presented for the second time in both conditions. That is, the synchronicity of the two responses seemed to have been altered when the jokes were presented for the second time in either of the conditions.

The analysis of the conditions under which the experimental protocols might have produced the lack of smiling and funny reports requires recognizing that no precise experimental comparison between the three protocols can be made in the current experiment. This is so because the three protocols result from the interaction of the person's history of the participant with one specific experimental protocol applied to one specific joke: that is, the Reality protocol with the Doctor joke, the Discomfort protocol with the Job joke, and the Identification protocol with the Beer joke. That said, we will focus on the impact of each protocol in comparison with the impact of the joke with no protocol (a comparison between conditions). As well, we will focus on the comparisons of responding in the same experimental participants when each of them responded to the jokes for a second time (first manipulated and later on with no contextual manipulation).

Both the Reality protocol-Doctor joke and the Discomfort protocol-Job joke radically altered the derivation of smiles and funny reports in almost all the participants, while the Identification protocol-Beer joke did so in a lower number of participants. Although no comparison between them is intended, we will conceptualize these data according to the characteristics of the specific joke in the context of the specific experimental protocol applied. On one hand, the Reality protocol was built with cues to establish a different participant's perspective with the elements of the joke. In the Reality protocol, the participant was asked to imagine that the things being told were really occurring, that is, the protocol establishes framing the events THERE in the context of I (the participant)-Now-There. Perhaps, moving the participant to that perspective relation might contextualize the socially established function of a surgeon's role and the interactions in the surgery room, so that the participant should derive an aversive function instead of deriving a discriminative function for smiling. On the other hand, the Discomfort protocol applied to the Job interview joke was focused on coordinating the characters' behaviors with aversive functions, so that the socially established functions linked to doing a job interview might augment or dominate and, consequently, might prevent the incongruity of the participants relating the components of the joke and, consequently, the prevention of the derived smiling response. That is, at the very end –and as could not be in any other way– the protocol interacts with the specific ideographic relational

history and might have also derived in the participants changing his/her perspective from YOU-There to I-There-Now so that the functions given to the characters in the interview be transferred to him/herself.

These conceptualizations are only tentative at the conceptual and experimental levels. As said, there is no option in the current study to move further in its analysis. Future experiments might isolate the impact of these changes in perspective or deictic framing based on relational responding to give an account of the conditions under which the coherent, but incongruous, networks are derived (Stewart *et alia*, 2001). Finally, the Identification protocol was implemented as the context for the Beer joke and only prevented smiling in some participants. Contrary, most of them smiled and reported the joke as funny. As previously indicated, to provide a precise account of these differential responses among participants should require further experimental analysis that isolates the interactions between the contextual changes and the participants' way of relating things in the world, including perhaps the participant's flexibility for changing perspectives. In the Identification protocol, the participants were asked to explicitly imagine to be one of the characters, and the joke was presented in a format that might have precluded the intended aim of the protocol. Perhaps, the participant's perspective-taking history might not be fluent enough or, perhaps, the functions given to not following compromises in the context of friendship as well as the participant's functions with cats and drinking beer. In addition to the latter options, the most parsimonious variable for the variability shown in responding to the Beer joke, in the context of the Identification protocol, might be associated with the functions likely actualized by the specific format selected for presenting the Beer joke (e.g., the word Mahou was written in a fond letter different to the rest of the words, and all the dialogue was presented in speech bubbles). Consequently, further analyses should advance in identifying the conditions under which the functions generating the incongruity of the components, as networks, are in place to account for smiling or not smiling.

The results obtained in this experiment need to be replicated through different conditions, and caution is emphasized to not generalize these results to conditions other than those that define the current experiment, including the type of history that participants might have and that form part of the whole event of responding to the jokes as in any other event (Luciano, Törneke, & Ruiz, in press). That is, young or adult persons might have a different relational history in regard to the functional components of the jokes and perhaps to the flexibility to change from one perspective to another. For the same reason, people with different repertoires about the cultural meaning of the content of these jokes might respond differently. To sum up, different patterns of results might be obtained when the whole context of the experiment is considered.

Lights and darks emerge in this study as in any scientific step. In regard to the former, humor responses were registered through two measures, the participant's smiles when they read the jokes and, some seconds later, the self-report about the feeling in the previous experience. As indicated in the introduction, most of the studies relied on self-reports while measuring the changes in facial expression is advocated to avoid the limitations associated with the use of self-reports (Cabello & O'Hara, 2002; Critchfield, Tucker, & Vuchinich, 1998; Perone, 1988; Shimoff, 1986). This study provides a clear agreement of both responses at the individual level, but the absence of coordination between the two responses was also present, perhaps when the context was not clear enough for the participants. The agreement might be analyzed as two behaviors under the same functions or forming part of the same functional class. The lack of coordination

might be analyzed in terms of different contextual functions. One way or another, the systematic analysis of agreements is a step forward that strengthens the conditions under which this study is presented, especially because different personal histories might allow for both responses not being “in the same package.” Consequently, further studies on humor are encouraged to measure facial expressions.

The dark points or limitations of the study are also worth mentioning. Probably the most relevant is that each protocol’s effect was restricted to a particular context (that is, a particular joke), and that the sequence and timing of the presentations of all the jokes to the same participant might have generated carry-over effects. Also, the fact that although the participants were equivalent in regards to some repertoires as measured by the pre-experimental questionnaires, these measures did not constitute good measures of the self-rules about the components of the jokes and about the flexibility in relating and transforming functions, for example, for one perspective to another in time (now, then), agent (I, You), and place (here, there).

To conclude, this paper constitutes a first exploratory study showing the disruption of humor responses when the Reality and the Discomfort protocols were implemented, and to a lesser degree with the Identification protocol, which in turn might be useful to answer our original question of why a joke produces humor for a person. The study was not designed to compare these three protocols among them but to analyze each of them in the context of a joke with no protocols. Also, the study was not designed to isolate the processes involved in each of these protocols when they alter the functions that typically generate the joke. All in all, conclusions should be considered cautiously and replications are needed. Further research will focus on clarifying the functional roles of perspective framing as processes involved in changing the functions of the networks of the jokes, either for preventing or for promoting the emergence of humor behavior. That way, the incongruity that has been advocated in the humor literature, might be distilled in the relational processes involved in humor behavior.

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APPENDIX 1

Jokes in Spanish

Joke' name	Joke
Doctor	(Audio) Médico: “¡Relájate David! Es sólo una pequeña cirugía. No entrés en pánico.” Paciente “Mi nombre no es David.” Médico: “Ya lo sé... Yo soy David.”
Beer	 <p>“Mira, Juan, es que no iba a beber pero ha venido mi gato y ha dicho  <i>iiii Mahou !!!!!</i>                      Y yo he dicho ..... ¡¡¡ VENGAAAA !!!”</p>
Job	 <p><b>Lo que dice el Entrevistador</b></p> <p>¿Nivel de inglés?</p> <p>Traduzca Juguete</p> <p>Úselo en una oración</p> <p>¡Contratado!</p> <p><b>Lo que dice el Candidato</b></p> <p>Alto</p> <p>Toy</p> <p>Yo Toy triste</p>
Soccer	Dos futbolistas que están en un partido muy duro: Dice uno a otro: Uno: “Si sigues asíííí... te voy a romper el hueso de la pierna” Otro: “Se dice tibia” Uno: “Pues eso... TIBIÁ romper el hueso de la pierna”

## APPENDIX 2

List of brief activities and sequence of presentation. In-between activities and their sequence of presentation in Control and Experimental conditions. The numbers denote the sequence of presentation, with 1 being the first and 36 the last. In parentheses is the duration of each task.

Presentation Sequence (Time)				
1. Athletic Video Situation (57s)	2. Weather Forecast of the Day (12s)	3. Instruments Memory Task (60s)	4. Screensaver 1 (12s)	
5. Find Pictures Attention Task (60s)	6. Screensaver 2 (12s)	7. Poetry Situation (45s)	8. Weather Forecast of the Week (12s)	9. Screensaver 3 (12s)
10. Mandala Video 1 (12s)	11. Politic Situation (50s)	12. Find Pictures Attention Task (60s)	13. Screensaver 4 (12s)	
14. Quarterly Weather Forecast (12s)	15. Mandala Video 3 (12s)	16. Man in the Garden Situation (20s)	17. Painting Memory Task (60s)	18. Screensaver 5 (12s)
19. Athletic Video Situation (53s)	20. Weather Forecast of the Day (12s)	21. Clothes Memory Task (60s)	22. Screensaver 6 (12s)	
23. Bottle Counting Attention Task (60s)	24. Screensaver 7 (12s)	25. Poetry Situation (45s)	26. Weather Forecast of the Week (12s)	27. Screensaver 8 (12s)
28. Screensaver 9 (12s)	29. Politic Situation (33s)	30. Toy Counting Attention Task (60s)	31. Screensaver 10 (12s)	
32. Quarterly Weather Forecast (12s)	33. Mandala Video 4 (12s)	34. Man in the Garden Situation (20s)	35. Painting Memory Task (60s)	36. Mandala Video 5 (12s)

## APPENDIX 3

Instructions for scene activities.

Activity	Scene Instruction
1. Athletic Video Scene	<i>You are going to see a true story ... The story happened in 2012, where the Spanish athlete refused to win the track and field event, giving the victory to the Kenyan ... Click on 'continue' to see the full story.</i> Followed by the video scene.
11. Politic Scene	<i>Jaime has three friends: B1, B2, and B3. 'Click continue' ... Jaime and all the B's have the same political, social, and economic vision ... However, recently, B3 met some friends who are making him think ideas contrary to the B's ... These friends are the N1, N2, and N3 ... (speech bubble of B3 appears). My other friends are making me change my mind. 'Click Continue' Now, imagine that B3 invites all the Bs and the Ns to get together for dinner ... Jaime accepts the invitation and goes to B3's house ... But when he arrives at B3's house, he learns that his friends will not be there ... So, Jaime meets only B3's friends ..."</i>
16. Man in the Garden Scene	<i>I heard a bird in my garden and went to see it. When I got to the garden, I found that my husband was there. He loves to appreciate the birds and the movement of the leaves. He also loves to listen to the sounds of nature, especially birds.</i> The participant clicked 'continue.'
17. Athletic Video Scene	<i>You are about to see a true story ... British athlete collapses, and his brother helps him cross the finish line of the Cozumel Triathlon. Click 'continue' to see what happened.</i> Followed by the video scene.

APPENDIX 4

Instructions and description of interactive in-between activities.

Activity	Task Instruction	Task Description
Instrument or Clothes Memory Task	<i>Now, you will see different musical instruments. Try to memorize the order in which the instruments are presented. Please click 'continue'.</i>	Then, three instruments/clothes appeared on the screen for 6s. The objects disappeared, and the screen was grayed out for 5 seconds. Then the participant was asked to select one of the three options of instruments/clothes. The task continued in the same way, gradually increasing the number of objects to memorize and the time of gray screen between instruments and questions (6 and 9 and 12s and 18s, respectively).
Find Pictures Attention Task	<i>Now, different figures will appear on the screen. Your task is to find a figure identical to the one presented to you at the top left. When you find it, click on the shape with the mouse. Click 'Continue.'</i>	Then, 45 to 48 figures appeared, and the participant should find the figure identical to the one presented at the top left. Figure Then, a new figure to find would appear at the top left, and the participant was to follow along like this until the task ended. The task was scheduled to end after 60 s.
Painting Memory Task	<i>Now, you will see different paintings. Your task is to look at the missing part of the picture and answer the question. Please click 'continue' to proceed.</i>	After 2 seconds of the gray screen, a painting without a part appeared on the screen for 8 seconds. The painting disappeared, and the screen remained gray for 6 seconds. Then the participant had to select one of two options for the missing part of the painting. Upon selecting the correct part, the screen would turn gray again for 4 seconds, and a new frame would appear. The task continued in the same way with the appearance of two more frames.
Bottle Counting Attention Task	<i>'Some bottles will appear on the screen. Your task is to count them and follow the instructions. Please click 'continue.'</i>	Bottles appeared in a temporal sequence from 1 to 10 bottles. After seeing the bottles, the participant answered the following question <i>How many bottles did you just see?</i> The participant typed with the numbers on the keyboard the number of bottles and pressed continue. The task was scheduled to end after 60 s.
Dolls Counting Attention Task	<i>Next, a race will appear. Your task is to count the number of dolls that cross the finish line and follow the instructions. When you finish, click 'Continue'.</i>	Eight identical dolls, differing only in color, appeared on the screen. The dolls started from one point and stopped running the race either before or after crossing the finish line. After seeing the dolls crossing the finish line, the participant answered the following question <i>How many dolls crossed the finish line?</i> The participant typed with the numbers on the keyboard the number of dolls and pressed continue. The task was scheduled to end after 60 s.