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Art & Perception 5 (2017) 312–336

brill.com/artp

Canned Emotions. Effects of Genre and Audience Reaction on Emotions

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Submitted 13 November, 2016; accepted 29 June 2017

Abstract

Laughter is said to be contagious. Maybe this is why TV stations often choose to add so-called canned laughter to their shows. Questionable as this practice may be, observers seem to like it. If such a simple manipulation, assumingly by inducing positive emotion, can change our attitudes toward the film, does the opposite manipulation work as well? Does a negative sound-track, such as screaming voices, have comparable effects in the opposite direction? We designed three experiments with a total of 110 participants to test whether scream-tracks have comparable effects on the evaluation of film sequences as do laugh-tracks. Experiment 1 showed segments of comedies, scary, and neutral films and crossed them with three sound tracks of canned laughter, canned screams, and no audience sound. Observers had to rate the degree of their subjective amusement and fear as well as general liking and immersion. The sound-tracks had independent effects on amusement and fear, and increased immersion when the sound was appropriate. Experiment 2 was identical, but instead of canned sounds, confederates of the experimenter enacted the sound-track. Here, the effects were even stronger. Experiment 3 manipulated social pressure by explicit evaluations of the film clips, which were particularly influential in comedies. Scream tracks worked as well as laugh tracks, in particular when the film was only mildly funny or scary. The information conveyed by a sound track is able to change the evaluation of films regardless of their emotional nature.

Keywords

Humor, canned laughter, laugh track, scream track, emotions, immersion

> There is nothing in the world so irresistibly contagious as laughter and good-humour.
>
> Charles Dickens (*A Christmas Carol*)

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DOI: 10.1163/22134913-00002068

1. Introduction

Laughter is highly contagious. In ancient Greece, as well as in Rome, some audience members were paid to laugh at specific places in comical theater performances, so that the naive audience members would join in. The audience was thought to rate the piece as funnier and better in the presence of such induced laughter. In 16th century France, and later also throughout the rest of Europe, many playhouses hired so-called 'claqueurs', who were instructed to clap and cheer at designated scenes. Particularly, 'rieurs' (laughers), would laugh loudly at jokes (Provine, 2000). With the rise of electronic entertainment in the 20th century, first radio and later television used live audiences, which subsequently was enhanced and later replaced by completely recorded laughter (Lieberman *et al.*, 2009).

Smyth and Fuller (1972) were the first to study the effect of the laugh track in an academic setting. Other experiments that included a laugh track had been conducted earlier (but their effects were not intentionally studied), such as in a study by Leventhal and Mace (1970). Smyth and Fuller (1972) found that when adding a laugh track to a verbal recording of a joke, participants laughed more and longer and rated the material to be funnier. In a further study, Fuller and Sheehy-Skeffington (1974) were able to replicate the initial results and extend the findings to material intrinsically low in humor.

In contrast, Chapman (1973) did not find that participants rated humorous content accompanied by a laugh track as significantly funnier than the same content without the laugh track; however, the added laugh track generated more overt laughter. Participants who heard the jokes with the pre-recorded audience reaction laughed more and longer in response to the jokes. Chapman suggested that the participants were able to differentiate between their emotional reaction to a joke and its intellectual funniness. In general, however, mirth and subjective ratings of how funny a movie is appear to be highly correlated.

Nonsanchuk and Lightstone (1974) presented participants with a series of funny anecdotes. Half of the material was presented with an apparent audible reaction of other students via an intercom system, and half of the material was presented without any accompanying sound. They found an interesting interaction when they varied the funniness of the stimuli. Under the influence of the laugh track, less funny jokes became funnier, whereas jokes that were already funny were not rated more favorably. However, in this experiment, participants believed they heard the laughter of actual people that were in a booth next to theirs. Chapman and Chapman (1974) also demonstrated that when a confederate of the same age laughed openly at the humorous material, it enhanced laughter, smiling, and ratings of funniness in children.

Pistole and Shor (1979) have demonstrated that the laugh track was more effective when canned laughter was presented to a participant in isolation as

compared to a group of participants. However, this was only the case when the participants had already seen the material. On the first run, there were no group differences. Donoghue *et al.* (1983) found that pre-recorded laughter had a positive effect on group dynamics. The presence of a confederate enhanced the effect of the laugh track.

In all studies mentioned thus far, canned laughter had always accompanied actual humorous content. Provine (1992) isolated the laughter and presented pre-recorded laughter without a movie. Results confirmed that laughter itself evoked laughter, even if it appeared in isolation.

Lawson *et al.* (1998) studied how the cognitive evaluation of humorous material is affected by a laugh track. They found that perceivers' cognitive evaluations were influenced less by audience laughter that they were told was pre-recorded, as compared to laughter that they were told was live. Lawson *et al*. argued that only the live audience reaction is regarded as an authentic evaluation of the material and, thus, a reliable cue of the funniness of the material. This is in line with findings of Platow *et al*. (2005), who showed that canned laughter had more impact on judgment and overt laughter of participants who believed it came from members of an in-group (i.e. university students of the same university).

Lieberman *et al*. (2009) researched the effects of a laugh track on audience response to four episodes of *The Andy Griffith Show*. They found that the laugh track had no effect, with the exception of a negative impact on one of the episodes that stood out positively in terms of perceived humor and overall enjoyment. It also possessed a more complex story structure, higher levels of satire, and other distinctive elements. This supports the notion that canned laughter can improve weak jokes, whereas good jokes are not affected, or even harmed by canned laughter (see also Nonsanchuk and Lightstone, 1974). Further support comes from a recent study by Vraga *et al*. (2014) who looked into the effect of audience laughter in late night shows. They found that the laughter supported the credibility of a novel host, presumably because the laugh track reminded the viewers of the past success of a well-known host. This could be used to boost credibility of otherwise questionable statements.

The current study aims to examine two open research questions in this field. (1) Do scream tracks have comparable effects on the evaluation of film sequences as do laugh tracks? and (2) how do real reactions fare in comparison to canned screams and laughter? Furthermore, we were interested to know whether participants liked the addition of this kind of sound track and if it would lead to more immersion. Thus, we designed an experiment in which participants saw short movie clips with either pre-recorded laughter or no audience reaction. As a third level of the factor 'audience reaction', we introduced canned screaming, which consisted of pre-recorded screams and other oral expressions of fear. We also varied the movie genre because we expected

that audience reactions would be most affected in congruent contexts, that is, screams should elicit no or less fear in a comedy as compared to a scary movie. In a second experiment, we used human confederates instead of pre-recorded reactions to test for differences. Finally, we conducted a third experiment to test whether explicit instead of implicit social pressure could be used to influence participants' ratings. For this experiment, the movie clips were rated orally for funniness or scariness by a mock audience before being rated by naïve participants.

2. Pre-study

In order to obtain believable stimulus material of varying emotional quality, we needed film clips that would elicit the intended responses. Movies reflect the zeitgeist, i.e., the general fashion including the humor of a particular culture and time, so it was important to get a current sample of movie clips (Backhaus and Brandenburg, 2014). We selected our own sample, using a method comparable to that used by Gross and Levenson (1995). The method is described in detail in the next section.

2.1. Methods

2.1.1. Participants

Thirty psychology students (24 women, six men) from the University of Mainz, Germany, participated in exchange for partial course credit. The participants were on average 24.25 (SD = 5.59) years old. In this and all subsequent experiments, we only used participants with normal or corrected-to-normal vision.

2.1.2. Film Selection

Initially, we assembled a list of about 200 full-length commercial films by looking at various websites and collecting recommendations from colleagues and friends. From this list, four scientists selected roughly 50 films for close screening based on discreteness. That is, the movie had to include scenes that produced one dominant emotion (amusement, or fear) or no emotions at all. The list was further reduced to 18 movies (six comedies, six scary movies, and six movies with neutral scenes) by showing it to 30 participants. We use the term scary movies for movies that rely heavily on *jump scares* (i.e., a sudden, unexpected change in image or event), in contrast to horror movies, which rely more on horrific imagery. Of each movie, three short film clips were produced by editing especially (un)emotional scenes.

2.1.3. Procedure and Questionnaire

We showed the 54 movie clips (x_{length} = 133 s, SD = 25.35 s) to groups of three to six participants, as opposed to individual viewing, for ecological

reasons. In total, 30 students saw all movie clips in a two-hour session. We tested for satiation effects, because of the large number of clips shown, but did not find that ratings systematically changed over time. Also, clips were shown in randomized order to each group of participants to exclude possible sequence effects. Prior to the experiment, participants signed a consent form and answered several demographic questions. The experimenter pointed out that the clips contained scary scenes, and that participants could close their eyes or stop the experiment at any time. At this point, the participants also received the rating questionnaire that they should fill out after each film. That is, they could read through it and ask questions if anything had remained unclear. The experimenter then told them to relax and clear their mind of all thoughts, feelings, and memories before each clip. Subsequently, the light was turned off and the experimenter presented the first clip on a large projection screen (1.50×2.65 m). Participants were sitting on average 3 m in front of the screen. After each movie scene, ambient light was switched on, and participants filled out a 16-item emotion self-report inventory (items with German translation used in the sample were: amusement/lustig, anger/wütend, arousal/erregt, confusion/verwirrt, contempt/verachtend, contentment/zufrieden, disgust/angeekelt, embarrassment/verlegen, fear/ängstlich, happiness/erfreut, interest/interessiert, pain/verletzt, relief/erleichtert, sadness/traurig, surprise/überrascht, and tension/gespannt). The scale extended from 0 (not at all) to 8 (very strongly). We translated the scale from Gross and Levenson (1995), who in turn had adapted it from Ekman *et al*. (1980). We included two additional items, liking ("You liked the film clip and would like to see the rest of the film"), and immersion ("You felt completely immersed in the film clip and forgot about your surroundings"), and asked participants after each film clip whether they had already seen the movie, and if they had chosen to close their eyes. A cover sheet explained all emotions and the two additional items in a few sentences, to make sure the meaning of the original rating scale was not lost in translation (Appendix A).

2.2. Results

Among the 54 film clips, we selected the nine clips that had elicited the most (i.e., highest intensity) amusement, the nine most fearful clips, and the nine clips that had elicited the lowest levels of emotion (see Appendix B). This final selection included funny scenes from *The Naked Gun: From the Files of Police Squad!* (1988), *Anger Management* (2003), and *Along Came Polly* (2004), scary scenes from *The Ring* (2002), *The Exorcism of Emily Rose* (2005), *Boogeyman* (2005), *Paranormal Activity* (2008), and *The Haunting in Connecticut* (2009), and neutral scenes from *Patch Adams* (1998) *Gangs of New York* (2002), *Garden State* (2004), *King Kong* (2005), and *Black Swan*

(2010). In order for a film to be 'neutral', the average rating of all emotions had to be less than 1 on the 9-point scale. In Fig. 1, the mean ratings for all 27 clips are presented, broken down by genre. Both comedy ($M = 4.51$, SD = 1.79) and scary movies ($M = 4.39$, SD = 1.97) were similarly intensive with an average value around 4.5. Also, the remaining emotions were similarly low in all three conditions ($M_{comedy} = 1.46$, SD = 1.26; $M_{scary} = 1.69$, SD = 1.43; $M_{rest} = 1.19$, SD = 1.25).

We also assessed the discreteness of the emotions of each clip, which was operationalized by deriving an idiographic hit rate index. The index consisted of the percentage of participants who indicated that they had felt the target emotion at least three points more intensely than the non-target emotion. In the case of the comedies, the hit rate was 94.10%; in the case of scary movies it was 92.71%. When we reduced the difference to only one point but included other basic emotions (amusement, anger, contentment, disgust, fear, sadness, surprise; Gross and Levenson, 1995), the hit rate dropped to 69.10% and 49.79% for comedies and scary movies, respectively.

2.3. Discussion

The movie clips selected in the pre-study seemed to elicit the desired emotions adequately. The intensity was similar to that found in other studies in the field while the discreteness was slightly lower (e.g., Gross and Levenson, 1995). The division into three categories worked very well with a high hit rate,

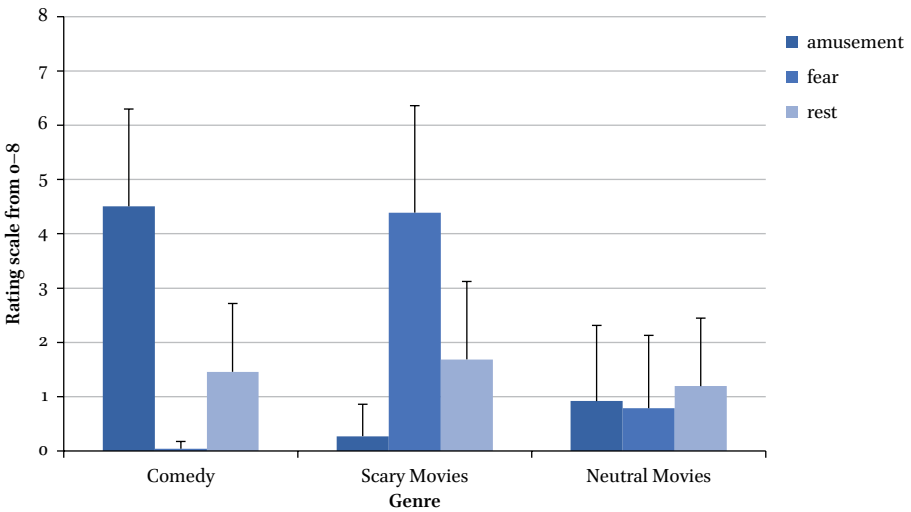

Figure 1. Mean intensity of emotional ratings for the target emotions, from 0 (not at all) to 8 (very strong). Error bars represent standard deviations.

and we can assume in the subsequent studies that they are valid. The movies selected in the pre-study were used in Experiments 1 and 2. In Experiment 3, slightly different movies were used due to the objective of the experiment. This will be detailed in the methods section of Experiment 3.

3. Experiment 1

We designed the experiment to see whether scream tracks have comparable effects on the evaluation of film sequences as do laugh tracks. We wanted to know what happens when we placed a laugh track on scary movies or screams on comedies. The experiment was a fully crossed within-subject 3 genre (comedy, scary movie, neutral movie) × 3 audience sound (canned laughter, canned screams, no audience sound) design. Thus, each participant saw all conditions.

3.1. Methods

3.1.1. Participants

Four male and 26 female psychology students participated in the experiment in exchange for partial course credit. Mean age was 23.40 with SD = 5.81.

3.1.2. Audience Reaction

For each of the 27 film clips, we created three versions. In the version without a laugh or scream track (here called neutral), no audience reaction was used. In the other two conditions, we introduced either canned laughter or canned screams. The audience reactions were collected from multiple internet sources. They were reactions to funny/scary material and sudden outbursts of laughter/screams. The stimuli had roughly the same length of about 1 s and were placed in each film 8–10 times. We tried to make sure that the audience sound, which was placed directly after the jump scare or 'punch line', could be interpreted as a reaction to the content of the material, albeit a sometimes unfitting one. This sometimes produced hard cuts, because there were no actual breaks in the movies to allow for these reactions. Each individual clip had as much laughter in the canned laughter condition as screams in the canned screaming condition.

3.1.3. Questionnaire

The same questionnaire as in the pre-study was used in Experiment 1. It included demographic questions as well as the 16-item emotion self-report inventory. The scale for each emotion ranged from 0 (not at all) to 8 (very strong). Amusement and fear were our target emotions whereas the others served as distractor items. As before, we included an item for liking and another for immersion, and asked participants after each film if they had been familiar with

it, and if they had closed their eyes. Familiarity with the film and closing the eyes (which occurred only rarely) had no effect on the results. A cover sheet explained all emotions and the two additional items in a few sentences.

3.1.4. Procedure

Each student was tested individually in a within-subject design. We used the same laboratory and the same screen as in the pre-study. Upon arrival at the laboratory, participants were seated 3.40 m (horizontal viewing angle 45°) from the screen (1.50 × 2.64 m) (see Fig. 2). They first received a written description of the experiment, which described the procedure, and were then told that we tested for surround effects on movie perception. Additional sound would be present during some clips, but they should not get too distracted by it. Participants then signed a consent form and were told that they could close their eyes and stop the experiment at any time without giving a reason. They were also informed of the fact that some information about the experiment might be disclosed to them only after the testing. Then, participants received the questionnaire and were asked to read the definitions for the rating scales.

For each of the nine conditions, consisting of genre (comedy, scary movie, neutral movie) by audience sound (canned laughter, canned screams, no audience sound), the participant saw three movie clips per condition (e.g., nine different scary movie clips, three accompanied by canned laughter, three

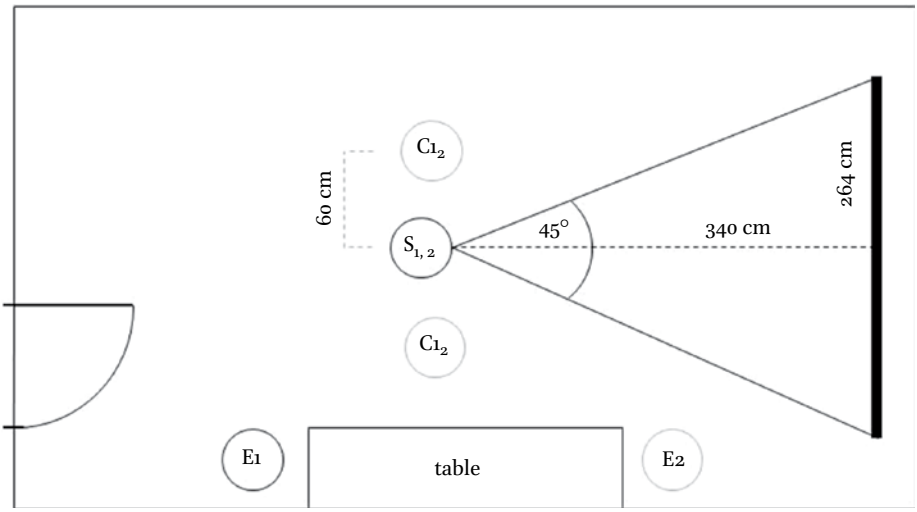

Figure 2. Set-up of Experiments 1 and 2. The seats marked in gray were only present in the second experiment. Subscript numbers indicate to which experiment/s the seats belonged. The pre-study took place in the same room with a very similar set-up. E = experimenter, S = subject, C = confederate.

accompanied by canned screams, and three without additional sound), amounting to a total of 27 clips. The average rating for the three films per condition was then used for further analysis. The film clips were shown in random order and the light was switched off during the movie presentation. Five seconds after each movie scene had finished, ambient light was switched on, and participants filled out the rating scales. Soundtrack volume was controlled for and ranged between 60 and 70 dB. The whole experiment lasted about 1.5 hours. We tested for satiation effects but did not find that ratings systematically changed over time.

3.2. Results

3.2.1. Main Findings

We performed a 3 × 3 (genre: comedy, scary movie, neutral movie × audience sound: canned laughter, canned screaming, no audience sound) two-way rmMANOVA with the dependent variables amusement, fear, liking, and immersion. A MANOVA was calculated to protect subsequent ANOVAs against *p*-value inflation. Mean scores of the dependent variables in relation to genre and audience sound are presented in Figs 3A and B.

A Pillai-trace test indicated significant main effects of genre, $F(10,20) = 90.31$, $p < 0.001$, $\eta_p^2 = 0.89$, and audience sound, $F(10, 20) = 3.79$, $p < 0.001$, $\eta_p^2 = 0.26$, but no interaction between them, $F(10,20) = 0.53$, $p = 0.98$, $\eta_p^2 = 0.04$. A univariate test of genre, using Greenhouse–Geisser correction against violations of sphericity, revealed that amusement [$F(1.25,36.38) = 401.56$, $p < 0.001$, $\eta_p^2 = 0.93$], fear [$F(1.34,38.99) = 271.65$, $p < 0.001$, $\eta_p^2 = 0.90$], liking [$F(1.94,56.24) = 19.11$, $p < 0.001$, $\eta_p^2 = 0.40$], and immersion [$F(1.68,48.68) = 10.79$, $p < 0.001$, $\eta_p^2 = 0.28$], differed among genres. The same procedure for audience sound unveiled a main effect for amusement [$F(1.98,57.29) = 16.37$, $p < 0.001$, $\eta_p^2 = 0.36$] and fear [$F(1.91,55.45) = 8.03$, $p < 0.001$, $\eta_p^2 = 0.22$], but not for liking [$F(1.93,55.89) = 1.14$, $p = 0.324$, $\eta_p^2 = 0.04$] or immersion ($F(1.58,45.78) = 1.78$, $p = 0.186$, $\eta_p^2 = 0.06$], We also found an interaction of genre and audience sound for rated fear $F(3.46,100.42) = 8.03$, $p < 0.001$, $\eta_p^2 = 0.22$ and immersion [$F(3.20,92.91) = 8.03$, $p < 0.001$, $\eta_p^2 = 0.22$], but not for liking [$F(2.96,85.75) = 1.78$, $p = 0.186$, $\eta_p^2 = 0.06$]. There was also a non-significant trend of an interaction of genre and audience sound for amusement $F(2.69,78.11) = 1.81$, $p = 0.081$, $\eta_p^2 = 0.08$].

3.2.2. Contrast Analysis

A contrast analysis of the genre revealed that participants found comedies more amusing than neutral movies [$F(1,29) = 426.08$, $p < 0.001$, $\eta_p^2 = 0.94$], which they found in turn more amusing than scary movies [$F(1,29) = 19.21$, $p < 0.001$, $\eta_p^2 = 0.40$. Scary movies aroused more fear than neutral movies

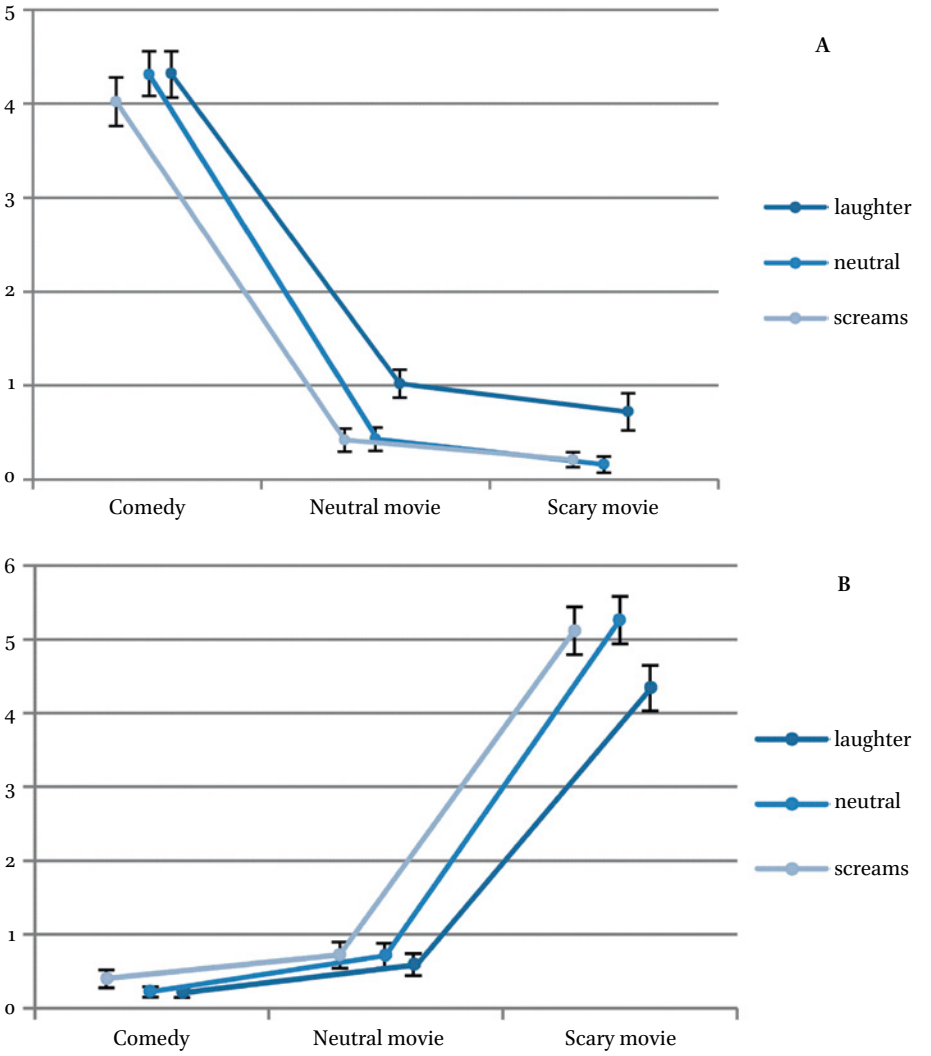

Figure 3. Mean scores of the dependent variables amusement (Fig. 3A) and fear (Fig. 3B) divided by genre and audience sound. Ratings ranged from 0 (not at all) to 8 (very strongly). Error bars indicate standard error of the mean.

[$F(1,29) = 299.12$, $p < 0.001$, $\eta_p^2 = 0.91$], which again were scarier than comedies [$F(1,29) = 4.71$, $p = 0.003$, $\eta_p^2 = 0.26$]. Participants liked comedies [$F(1,29) = 30.03$, $p < 0.001$, $\eta_p^2 = 0.51$] and neutral movies [$F(1,29) = 21.74$, $p < 0.001$, $\eta_p^2 = 0.43$] more than scary movies but were less immersed in them [$F(1,29) = 17.04$, $p < 0.001$, $\eta_p^2 = 0.37$, and $F(1,29) = 11.46$, $p < 0.001$, $\eta_p^2 = 0.28$, respectively]. A contrast analysis of the audience sound showed

that movies with a laugh track aroused higher amusement and less fear than movies without sound [$F(1,29) = 18.22$, $p < 0.001$, $\eta_p^2 = 0.37$, and $F(1,29) = 11.66$, $p = 0.002$, $\eta_p^2 = 0.29$] or with a scream track [$F(1,29) = 30.44$, $p < 0.001$, $\eta_p^2 = 0.51$, and $F(1,29) = 10.55$ $p = 0.003$, $\eta_p^2 = 0.27$].

We found a significant interaction between genre and audience sound. When watching a scary movie, the laugh track (as compared to the scream track) was significantly more efficient in reducing fear than it was when watching a comedy [$F(1,29) = 4.97$, $p = 0.034$, $\eta_p^2 = 0.15$] or a neutral movie [$F(1,29) = 5.30$, $p = 0.029$, $\eta_p^2 = 0.15$]. Also, the laugh track was more efficient than no audience sound in reducing fear when comparing neutral to scary movies [$F(1,29) = 9.33$, $p = 0.005$, $\eta_p^2 = 0.24$]. Comedies were significantly more immersive with a laugh track whereas neutral movies were more immersive without one [$F(1,29) = 5.06$, $p = 0.032$, $\eta_p^2 = 0.15$]. Comedies where most immersive with canned laughter, scary movies were most immersive with canned screams $F(1,29) = 12.14$, $p = 0.002$, $\eta_p^2 = 0.30$].

3.3. Discussion

The data suggest that we induced the desired target emotions with the movie selection. Comedies were rated as amusing and scary movies as scary, while neutral movies hardly elicited any emotions. Also, participants liked comedies and neutral movies more than scary movies, but the latter were more immersive. This should not be surprising because people usually prefer feeling happy to feeling scared. The higher immersion might reflect the higher intensity of fear compared to the intensity of amusement during the comedy (Cohen's $d = 0.44$). However, the data also showed that each genre produced the highest level of immersion with the appropriate audience reaction. Comedies were most immersive when playing a laugh track, scary movies when playing a scream track, and neutral movies when there was no audience sound at all.

On top of this, we found a general effect for the laugh track. No matter to which genre we added it, participants felt generally more amused than when there was no audience sound ($d = 0.46$) or canned screaming ($d = 0.56$). There was a clear trend for the laugh track to work best in the neutral and scary conditions. When looking at the effect between no laughter and canned laughter for comedies, it can be statistically neglected ($d < 0.01$). This finding supports former studies indicating that a laugh track works best in movies of weak comical content (Nonsanchuk and Lightstone, 1974). One alternative reason why the laugh track worked for the scary movies might be an incongruence effect. Laughter following a scary event might seem quite odd, and the incongruity itself might generate amusement. Our analysis revealed further that the laugh track was most efficient in reducing fear in scary movies, which were the only movies that elicited any noticeable fear.

Overall, there is a clear effect of the laugh track, whereas the scream track does not differ from no audience sound. This supports a differential effect of positive and negative emotion.

4. Experiment 2

In order to determine if these findings can be generalized to more realistic displays of emotion, or if they might be limited to artificial canned emotions, we designed another experiment that replaced the laugh and scream tracks with actors exhibiting the same emotions.

4.1. Methods

4.1.1. Participants

Thirty participants (18 female, 12 male) participated in the study voluntarily. Three participants saw through the cover story and were subsequently excluded from further analysis. Participants were on average 23.19 years old (SD = 5.64). Two-thirds of the participants were university students, the rest had already joined the work force in various fields.

4.1.2. Material

The same films as in Experiment 1 were used. The only difference was that none of the clips had audience reactions. The reactions were produced by confederates. These were students trained in a four-hour session to deliver a very similar performance to the canned reactions in Experiment 1. The confederates were trained to show the same rehearsed reaction at any given scene. Their laughter and screams were less intense than those of the soundtrack in the previous experiment to avoid overacting or appearance of artificiality. Laughter was operationalized by smiling, grinning, snorting, and loud laughter. Fear was operationalized by tension, nervous twitching, heavy breathing, and screaming. Neutral emotions were conveyed by sitting quietly and avoiding quick movements, strong facial expressions or loud noises.

The questionnaire was substantially reduced to decrease testing time. We only kept the target items of amusement and fear as well as the distractor items interest, sadness, and embarrassment. Further, the feeling of immersion and liking was rated. The scale ranged from 0 (not at all) to 5 (very strongly). We included the questions "Did you notice anything unusual during the experiment?" and "If so, did that affect your answer pattern?" to assess the validity of our cover story. This led to the exclusion of three participants who saw through the cover story.

Additionally, the experimenter observed the participants' behavior and rated it on amusement and fear. The scale was coded from 0 (neutral face) to 5 (loud laughter, closes eyes or looks away).

4.1.3. Procedure

Upon arrival at the laboratory, participants met one of the confederates who was already 'waiting' for the experiment to start. The second confederate arrived shortly after the participant. We used two, instead of one, confederates to produce the feeling of sitting in an audience, albeit a small one. All three 'participants' were led into the laboratory. They were told that the objective of the experiment was to test the effect of sitting angle on movie perception. Subsequently, they were asked to draw a number out of a hat. The numbers were rigged to ensure that participants would sit between the two confederates separated by 60 cm on either side. As in the previous experiment, participants were sitting 3.40 m away from the screen, amounting to a vertical viewing angle of 45°. Laboratory and screen were the same as in Experiment 1 (see Fig. 2).

Participants and confederates filled out a consent form and acknowledged that they could close their eyes or stop the experiment at any time. They consented to rate the movies and were made aware that not all details of the study could be disclosed in the beginning but that a full debriefing would follow after the testing. They then received the questionnaire and had an opportunity to ask questions. After they had finished, the light was switched off, and the experiment proceeded as Experiment 1. In the end, participants were fully debriefed about the purpose of the experiment and were able to withdraw their consent.

Confederates were trained to present a reaction comparable to the laugh/scream track. They had to show reactions at the same time as in the previous study and with the same intensity.

4.2. Results

4.2.1. Main Findings

All values were transformed to a 0–8 scale by multiplying the values with 1.5. This only affected the descriptive values, so that they could be compared to Experiments 1 and 3. Subsequently, these values are reported here (Figs 4A, B). Note that the interference statistic is not changed by this procedure.

We conducted a 3 × 3 (genre: comedy, scary movie, neutral movie × audience sound: laughter, screams, no reaction) two-way rmMANOVA with the dependent variables amusement, fear, liking, and immersion. Using Pillai's trace, we found main effects for genre [$F(8,22) = 65.27$, $p < 0.001$, $\eta_p^2 = 0.82$ and audience reaction [$F(8,22) = 6.18$, $p < 0.001$, $\eta_p^2 = 0.31$], as well as an interaction between the two [$F(16,14) = 3{,}48$, $p < 0.001$, $\eta_p^2 = 0.11$]. A univariate test of genre, using the Greenhouse–Geisser correction, indicated a significant effect on amusement [$F(2,28) = 585.93$, $p < 0.001$, $\eta_p^2 = 0.89$], fear [$F(2,28) = 130.54$, $p < 0.001$, $\eta_p^2 = 0.82$], liking [$F(2,28) = 22.37$, $p < 0.001$, $\eta_p^2 = 0.44$], and immersion [$F(2,28) = 5.85$, $p = 0.008$, $\eta_p^2 = 0.17$].

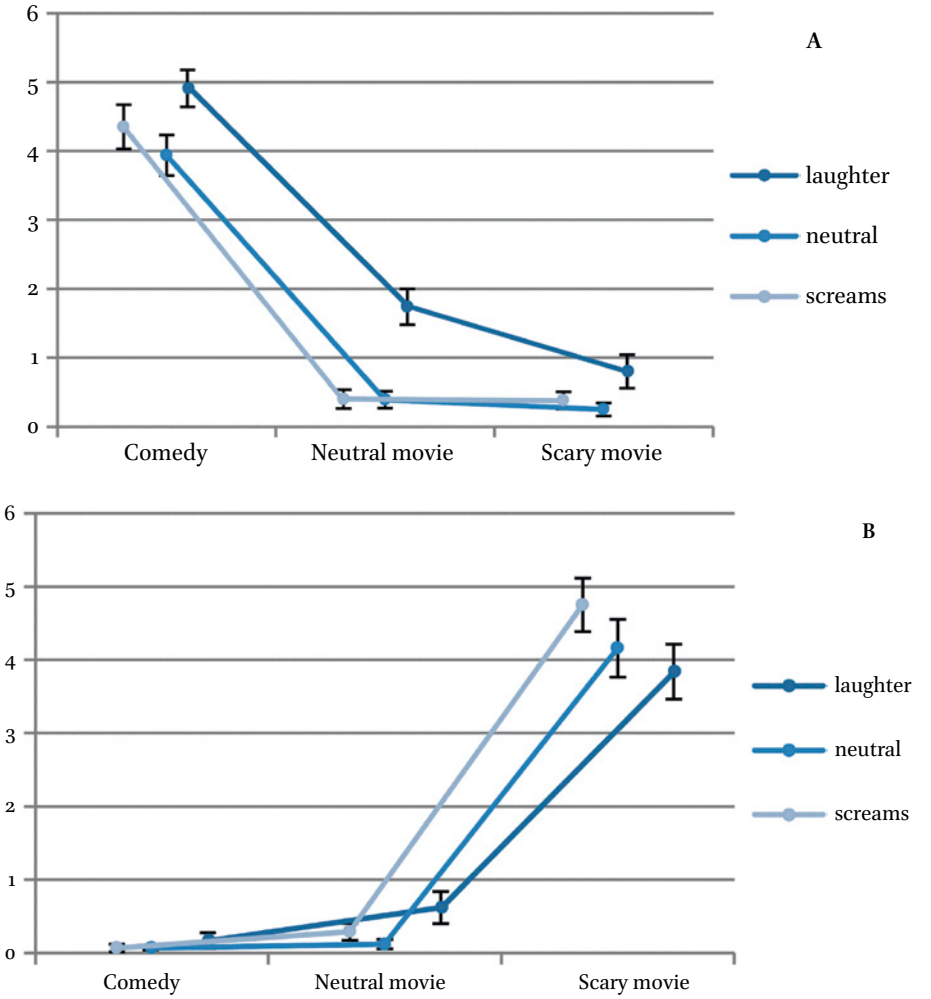

Figure 4. Means and standard deviations for the target emotions amusement (A) and fear (B). Values ranged from 0 (not at all) to 8 (very much). Error bars indicate SEM.

We also found an effect of audience sound on amusement [$F(2,28) = 26.42$, $p < 0.001$, $\eta_p^2 = 0.48$], and liking [$F(2,28) = 3.19$, $p = 0.048$, $\eta_p^2 = 0.10$], but not on immersion [$F(2, 28) = 0.24$, $p = 0.789$, $\eta_p^2 = 0.01$]. There was a non-significant trend of fear [$F(2,28) = 2.85$, $p = 0.076$, $\eta_p^2 = 0.09$]. The MANOVA indicated a significant interaction between genre and audience sound on fear $F(2,28) = 8.60$, $p < 0.001$, $\eta_p^2 = 0.23$], but not on liking [$F(2,28) = 2.51$, $p = 0.120$, $\eta_p^2 = 0.06$]. There was also a non-significant trend on amusement [$F(2,28) = 2.69$, $p = 0.060$, $\eta_p^2 = 0.09$[and immersion [$F(2,28) = 2.51$, $p = 0.066$, $\eta_p^2 = 0.08$].

4.2.2. Contrast Analysis

A contrast analysis revealed that comedies were rated to be funnier than neutral movies [$F(1,29) = 237.20$, $p < 0.001$, $\eta_p^2 = 0.89$] and scary movies [$F(1,29) = 282.82$, $p < 0.001$, $\eta_p^2 = 0.91$]. Also, neutral movies were rated as more amusing than scary movies [$F(1,29) = 8.32$ $p = 0.007$, $\eta_p^2 = 0.22$]. In turn, scary movies aroused more fear than neutral movies [$F(1,29) = 130.31$, $p < 0.001$, $\eta_p^2 = 0.82$] or comedies [$F(1,29) = 138.80$, $p < 0.001$, $\eta_p^2 = 0.83$]. Comedies were less scary than neutral movies [$F(1,29) = 7.14$, $p = 0.0120$, $\eta_p^2 = 0.20$]. Participants liked comedies more than neutral movies [$F(1,29) = 10.57$, $p = 0.003$, $\eta_p^2 = 0.27$], which they liked more than scary movies [$F(1,29) = 13.43$, $p = 0.001$, $\eta_p^2 = 0.31$]. However, they found scary movies significantly more immersive than comedies [$F(1,29) = 9.70$, $p = 0.004$, $\eta_p^2 = 0.25$]. Confederates' laughing led to higher mirth scores than when they did not laugh [$F(1,29) = 41.95$, $p < 0.001$, $\eta_p^2 = 0.59$] or showed signs of fear [$F(1,29) = 22.94$, $p < 0.001$, $\eta_p^2 = 0.44$]. Also, participants liked movies more when there was laughter than when there was none [$F(1,29) = 6.00$, $p = 0.021$, $\eta_p^2 = 0.17$].

There was a significant interaction between genre and audience sound for the fear ratings. Whereas the screams of confederates had almost no effect during the comedy, they heightened the fear level during scary movies, opposite to the effect of the confederates' laughter [$F(1,29) = 20.63$, $p < 0.001$, $\eta_p^2 = 0.42$] or to neutral reactions [$F(1,29) = 7.12$, $p = 0.012$, $\eta_p^2 = 0.20$]. The same was true for the neutral movies versus the scary movies. Compared to no reaction, the confederates' signaling of fright aroused stronger fear in the congruent scary movies than in the incongruent neutral movies [$F(1,29) = 9.89$, $p = 0.004$, $\eta_p^2 = 0.25$].

Experimenter ratings of participants' amusement and fear correlated highly with self-reported emotions. Amusement was correlated with $r = 0.57$, $p < 0.001$ and fear with $r = 0.63$, $p < 0.001$. Thus, when participants felt amused or scared, they usually showed it.

4.3. Discussion

Experimenter ratings of participants' emotions correlated highly with self-reported experience. We introduced this measure to validate our questionnaire. We are aware that a single experimenter rating, when the experimenter is aware of the condition, does have serious limitations, however, the findings support our claim that participants reported genuinely on their experiences.

Most of the findings in this experiment showed the same pattern as observed in Experiment 1. That is, each genre produced the corresponding emotions. Also, participants liked comedy and neutral movies more than scary movies but were more immersed in the scary movies. In accordance with Experiment

1, the movies with the appropriate audience reaction produced the highest level of immersion. We found a general effect for audience laughter; with it, participants felt more amused than when confederates showed no reaction ($d = 0.79$) or signs of fear ($d = 0.62$).

There were, however, two important differences. Firstly, the confederates' laughter raised amusement ratings in all conditions, including the comedies (with $d = 0.63$). In Experiment 1, this had not been the case. Secondly, the scream track had an enhancing effect on congruent scary movies when the screams were real—which was not the case for the canned screams used in Exp. 1 ($d = 0.28$).

5. Experiment 3

Thus far, participants were influenced by canned and more so by real audience reactions. The latter were, however, merely implicit. In Experiment 3, participants were exposed to confederates who explicitly rated the emotions of movies, as opposed to only implicitly showing them by laughing or screaming in the presence of the participant.

5.1. Methods

5.1.1. Participants

Twenty participants (10 female, 10 male) participated in the study voluntarily. None of the participants knew the Asch (1951) conformity experiments, as evaluated in the questionnaire. Mean age was 21.50 years (SD = 3.56).

5.1.2. Material

In this experiment, we used 24 comedies and scary movies. Half of these were not particularly intense, with low to medium ratings ($M = 3.22$, SD = 1.58; $M = 2.92$, SD = 1.13), while the other half consisted of the movies previously rated to be most funny ($M = 4.54$, SD = 1.29) and most scary ($M = 4.68$, SD = 1.34). Participants saw three samples of each of the eight movie conditions that resulted when fully crossing genre (comedy vs. scary), intensity (high vs. low), and social pressure (consistent vs. inconsistent).

A questionnaire was given to the participants after the experiment. The questions "How well could you immerse yourself in the movies?", "How likable did you find the other participants?", and "How much did the ratings of the others influence your ratings?" were answered on nine-point Likert-like scales ranging from 0 (not at all) to 8 (very much). Participants were further asked if they had answered faithfully, how many of the movies they had already known, and if they knew the Asch conformity experiment. The questionnaire ended with questions about age, sex, and occupation.

5.1.3. Procedure

In each screening, the participant, three confederates, and one experimenter participated. Upon arriving at the laboratory, the participant had to wait with the confederates until the experimenter was ready. This gave confederates a chance to talk to the participants, which facilitated the formation of an in-group atmosphere. Then the experimenter asked the group to come in, explained the cover story, and pointing out the pilot character of the study asked for quick verbal ratings of the presented movies. Scary movies and comedies were shown in blocks, so that participants either began with 10 scary movies (rating them on scariness) followed by 10 comedies (rating how funny they were), or they began with the comedies followed by the scary movies. The rating scales ranged from 0 (not at all) to 8 (very much). To ensure that the participant would be last with her/his ratings (and thus had already heard all the other ratings) a manipulated lottery for the seats was conducted (Fig. 5). Initially, participants were informed that scary movies would be shown as part of the experiment and that they could close their eyes or stop the experiment at any given time.

The first six movies presented in each genre, three of high intensity and three of low intensity, were non-critical trials. Confederates rated these clips with the same intensity as had the participants in the pre-study, producing consistent social pressure. In the next six film clips, the critical trials, the confederates always rated the scenes opposite to the original intensity ratings. This meant that movies with low ratings on the amusement/fear scale were rated in the critical trials to be of high intensity, and vice versa, producing inconsistent social pressure.

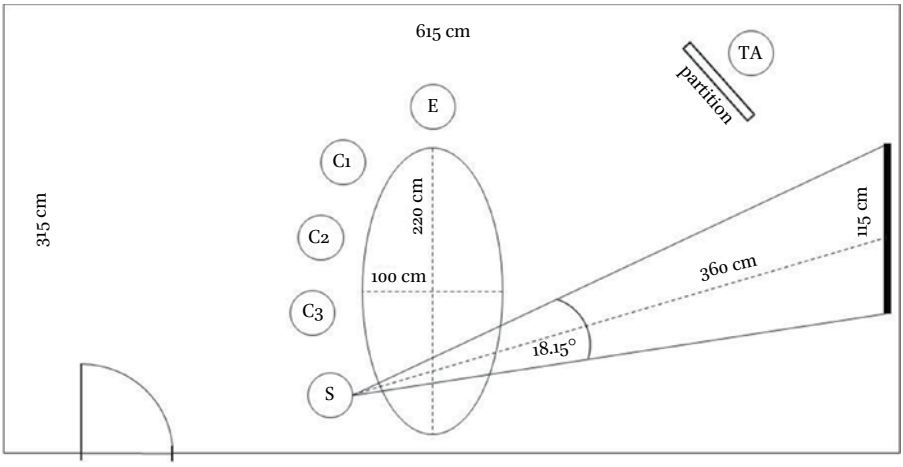

Figure 5. Set-up of Experiment 3. E = experimenter, $C_{1–3}$ = confederates, S = subject, TA = technical assistant.

After the experiment, participants received a questionnaire. Once finished they were fully debriefed about the purpose and the goal of the experiment and had the chance to withdraw their consent.

5.2. Results

We calculated the difference between the initial ratings of the movies in the pre-study and the current ratings produced by the participants. Deviation from the mean rather than the mean itself was used to compare all three conditions against each other. If we had used the means, high and low valence movies would differ by definition and a meaningful comparison would not be possible. We then performed a $2 \times 2 \times 2$ (genre: comedy vs. scary movie $\times$ valence: high vs. low $\times$ social pressure: consistent vs. inconsistent) rmANOVA with the dependent variable amusement for comedies and fear for scary movies. Mean scores of the dependent variables are presented in Table 1.

We found main effects of genre, valence, and social pressure, but no effect for the interaction of these variables, using a univariate ANOVA with Greenhouse–Geisser correction. Comedies led to higher deviations in the emotion ratings than scary movies [$F(1,19) = 7.80$, $p = 0.012$, $\eta_p^2 = 0.29$]. We also found that movies with high valence lead to more variance than movies with low valence [$F(1,19) = 7.80$, $p = 0.012$, $\eta_p^2 = 0.29$]. When participants were exposed to inconsistent social pressure, this led to a stronger deviation from the original movie ratings than when consistent social pressure was applied, $F(1,19) = 133.93$, $p < 0.001$, $\eta_p^2 = 0.88$ (Fig. 6).

5.3. Discussion

Social pressure produced remarkably strong changes in the emotional assessment of the movie. This was the case for both comedies and scary movies, albeit with even higher deviations in the emotion ratings in comedies than in scary movies. We speculate that participants have been somewhat less prone to social pressure and more reliant on their 'gut feeling' during scary movies

Table 1.
Mean differences between original intensity ratings and participants' judgments. Negative numbers indicate the opposite direction to the confederates' ratings. The numbers in parentheses indicate standard deviations.

	Comedy		Scary movie	
	High valence	Low valence	High valence	Low valence
Consistent social pressure	0.28 (0.94)	−0.18 (0.92)	0.42 (1.04)	−0.62 (0.90)
Inconsistent social pressure	2.23 (0.98)	−1.97 (1.29)	1.66 (1.24)	−1.29 (1.08)

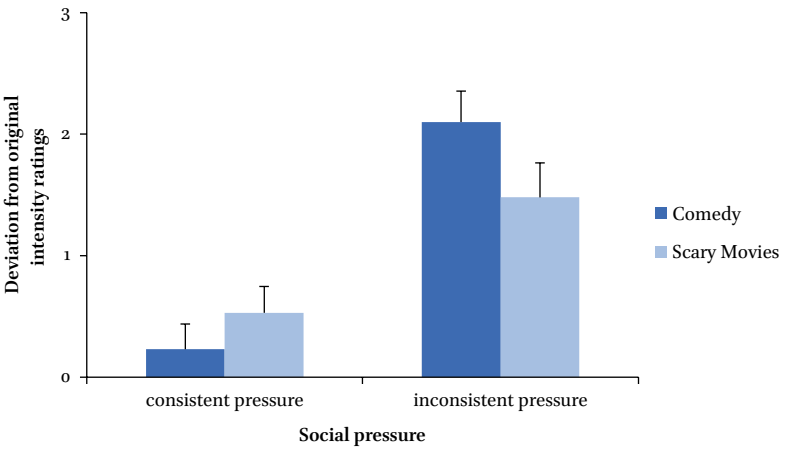

Figure 6. Inconsistent pressure led to a stronger deviation from the original movie rating than inconsistent pressure. Error bars represent standard deviation.

compared to comedies. This might reflect that humor is typically more of a social agent than fear. The data also show that movies with high valence produced more variance in the ratings than movies with low valence. One explanation for this could be that we feel emotions in high valence situations more clearly and are thus less inclined to follow the judgment of others.

6. General Discussion

Why do laugh tracks continue to be added to many sitcoms? When measuring the emotional reactions to thus enhanced movies, they appear to be intensified by the laugh track. We sought to determine whether other emotions—in this case added screaming—would have a similar enhancing (in horror movies) or tempering effect.

We found that a laugh track was very potent. Adding the track to any condition made the content appear funnier. This was particularly true for clips that were not inherently funny, which is in line with previous research suggesting that a laugh track works best in movies of weak comical content (Nonsanchuk and Lightstone, 1974). In contrast, canned screams did not succeed in producing more fear. There might be a number of reasons why we failed to find an effect for artificial screams. While it is common for audience to hear a laugh track over comedic material, a scream track is an unfamiliar stimulus. However, canned laughter was initially uncommon, too, but prevailed due to its strong effect. Thus, a scream track may not work as well due to its qualitatively different nature.

When replacing the pre-recorded with real emotional expressions, we did find a strong effect for both laughter and screams. In this case, laughter even

worked to further enhance funny material. However, the scream track (or enactment) only enhanced scary movies, but did not alter the assessment of neutral or funny ones.

Additionally to the implicit, we tested for explicit expression of emotions. Explicit verbal expression of emotions inconsistent with the movie as conveyed by rating the content had strong effects, likewise for positive (laughter) and negative (screaming) emotions. This is in line with the Asch (1951) conformity experiments, which showed that not just behavior but also perception may be altered by the judgment of other people. Participants considered the opinion of others before they made their own decision. Shariff and Tracy (2011) likewise demonstrated the communicative function of emotions, happiness and fear, in various contexts.

We also found that each genre produced the highest level of immersion with the appropriate audience reaction, independent of whether the latter were real or recorded. Comedies were most immersive with laughter in the background, scary movies when hearing screams, and neutral movies when there were no audience reactions at all. This can be explained by the fact that we expect to hear congruent reactions in a movie. When during a scary movie sudden laughter can be heard, this incongruence requires cognitive processing, which pulls participants out of the movie and reduces immersion.

Interestingly, movies with artificial audience reactions did not differ in liking from movies without added reactions. When adding confederates, movies with laughter were even liked more.

Our study focused solely on quantitative differences that occurred due to artificial or real displays of emotions. In our and other laboratory studies, the material that was shown was stripped of its context. Factors such as knowledge of the show and its characters, watching it over a longer period, and placing it in a cultural and social context, might change the evaluation of a laugh track.

In our study, we placed canned and real reactions artificially into preexisting movies. Further studies should attempt to produce laughter that is a real reaction to the material shown. This is very challenging when comparing different emotions, because material is needed that matches occurrence and valence of audience reactions. It may be altogether impossible when properly crossing reactions and genres. An audience will not normally laugh at a horror film or show signs of fear during a comedy.

In conclusion, we have demonstrated that implicit and explicit expressions of emotion by an audience enhance the effect a film scene has on naïve observers. Only scream tracks failed to increase fear in participants. Movies with additional audience reactions are liked the same or even more than when no reactions are present. Congruent emotions enhance immersion, but they are not necessary to induce the respective emotion. Further studies will have to

test for other emotions and focus on the underlying mechanism for the contagious effect of canned laughter and screams.

Acknowledgements

We thank Rebecca Teichmann for help with selecting movie sequences, editing the movie sequences, and testing them. Dario Heymann, Laura Malcher, Simone Jana Meier, Anne Peschel, and Alina Wuttke conducted and acted as experimenter/confederates in Experiment 2. Lisanne Breiling, Karolina Farr, Judith May, Janis Renner, Chantal Sonntag, and Franziska Waizmann conducted and acted as experimenter/confederates in Experiment 3.

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Appendix A. English version of introductory text presented to subjects before the film clips were shown, including a description of each emotion used for scoring in the questionnaire

You will see a short film clip. After each clip, the light will be switched on and we would ask you to fill out a short questionnaire. Please watch each clip attentively. If a film clip is to disturbing, you can close your eyes. Should you decide to do so, please note this on the questionnaire.

The questionnaire is the same for each film clip. Each sheet consists of a list of different emotions. Please mark on a scale from 0 to 8 the intensity of each emotion you felt during the film clip. The 0 means you did not experience the emotion at all. The 8 means that you experienced the emotion strongly.

Please read the emotions closely and pay attention to the definition, so that you know, what is meant with each emotion.

amusement = You were amused and had to laugh during the film clip
anger = What you saw angered and provoked you and led to aggression
arousal = The film clip produced sexual arousal in you
confusion = The film clip was confusing and irritating. You do not understand what you just saw.
contempt = What you saw displeases you and does not conform to your values.
contentment = The film clip was all right with you and you are content with what you saw.
disgust = The film clip disgusted you and contained content that you experienced as disgusting and repulsive.
embarrassment = The film made you feel embarrassed.
fear = You experienced the film content as threatening and felt fear.
happiness = You experienced the film as positive and felt happiness and an elevated mood.
interest = The film clip sparked your interest and you gave it all your attention. You would like to learn more about the topic of the clip.
pain = What you saw was hurtful and you felt offended.
relief = Through the film clip you felt relieved from fears and sorrows, and relaxed.
sadness = The film clip made you feel distressed and depressed. You felt attendance and sadness.
surprise = What you saw surprised you and hit you unprepared. You did not expect the development in the film clip.
tension = The editing of the film clip led to tension, you were excited and experienced the film clip as thrilling.
Liking = You liked the film clip and would like to see the rest of the film.
Immersion = You felt completely immersed in the film clip and forgot about your surroundings.

Appendix B. Descriptions of the scenes used in the present study

Genre	Movie	Scenes used
Comedy	Anger Management (2003)	Dr Rydell asks to sleep with Dave in the same bed without wearing trousers. The next day he demands further an exorbitant breakfast. Dave meets Dr Rydell, who stands out by loud laughter and inappropriate comments, in an airplane. Dave is angered by a delay. Dr Rydell puts on the hand brake in the middle of the road and does not let Dave continue driving, until he has sung 'I feel pretty' with him.
	The Naked Gun	Drebin wants to pursuit a criminal and lands in the driving school car with an insecure beginner as driver. Norberg wants to arrest a drug gang who tries to shoot him. However, Norberg is so clumsy that he knocks himself out. Drebin plans to secretly frisk a room. Accidently, he destroys the expensive interior and has to escape through the window.
	Along Came Polly	Reuben has to go to toilet at Polly's and realizes too late that there is no toilet paper. Out of desperation he uses a towel, which ends up blocking the toilet and causing a flood. Reuben and Polly are about to sleep with each other, which makes Reuben very nervous so that he acts incredibly clumsy. Reuben shouts at his wife Lisa and the diving teacher Claude, who he caught red-handed. He chases out and ends up accidently destroying his own car.
Scary	Boogeyman (2005)	Tim is shown as a child in his room. Suddenly, objects start to move and a dark shadow comes out of the closet and moves towards him.
	The Exorcism of Emily Rose (2005)	Emily is at the university and sees the devil's face in the window. She runs out of class and towards a church, while on the way people have distorted faces.
	The Haunting in Connecticut (2009)	Joyce and Sara are awakened by strange noises and scared by ghostly figures. The children play hide and seek in the house. One boy hides in a food elevator, where a dark figure appears. Matt wakes up and goes into the cellar, where he sees a scary face in a mirror.

Appendix B. (Continued)

Genre	Movie	Scenes used
	The Ring (2002)	Rachel falls in a well and finds the corpse of Samara.
	Paranormal Activity 3 (2011)	Dennis slowly moves towards Katie who is crouched at the staircase. Suddenly she turns round and shows a demonic distorted face.
		Randy and Katie play Bad Bloody Mary in the bathroom. As a consequence, something scurries along the door and tries to get into the bathroom.
		Dennis searches for Julie and comes across old women who appear to be witches. He finds Julie lifeless hovering over the stairs, before she falls toward him.
Neutral	Black Swan (2010)	Nina trains after getting up and has breakfast with her mother, who notices an injury on Nina's back.
		Nina parties with Lily in a club. Lily talks to her about becoming more relaxed and taking drugs.
	Gangs of New York (2002)	Priest Vallon shaves and cuts himself. He gives the knife to his son Amsterdam and explains to him that he never should clean the blood. Afterwards they march towards a battle.
		Cutting sits in Amsterdam's bedroom and talks to him about how he maintains power in New York by means of fear.
		Cutting meets William Tweed at the harbor as new immigrants from Ireland arrive. Tweed tries to convince him to recognize the immigrants as voters to make profit from them. However, Cutting does not change his negative view of immigrants.
	Garden State (2004)	Andrew meets his father. Both realize that they don't have much to talk about. After an uncomfortable conversation Andrew leaves the room..
		Andrew sits on a couch with his friend Mark and his friend's mother. When Mark and his mother have a dull conversation, he leaves to work.
	King Kong (2005)	Carl invites Ann for lunch and wants to convince her to play in his movie.
	Patch Adams (1998)	Patch confronts his flat mate, who denounced him to the head of the hospital.