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# Facial Feedback: Limited Effect for Videos of Opposite Emotions

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SCIENTIFIC RESEARCH ARTICLE  
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### **Abstract**

To prove the hypothesis of facial feedback (FF) for opposite emotional stimuli, 30 participants viewed a happy video, with 15 of the participants posing a sad expression; another 30 participants viewed a sad video, with 15 posing a joyful expression. Levels of joy, sadness, anger and anxiety were recorded before and after the videos. All observers of the happy video showed a decrease in sadness, but those who posed for sadness expressed lesser decrease. For their part, participants who posed joy during the sad video recorded an increase in anger and anxiety, attributed to having to pose for joy. No evidence was found that FF can counteract the effects of an intense emotional stimulus. The evidence related to the controlling of the intensity of an opposite emotion was also limited. The study found that posing for joy while undergoing sadness could provoke other negative emotions. The study questions the practical usefulness of FF.

**Keywords:** facial feedback, emotion, embodied cognition, cognition training, emotion simulation, emotional experience.

### **Feedback Facial: Efectos Limitados para Videos de Emociones Opuestas**

#### **Resumen**

Con el objetivo de probar la hipótesis del *feedback* facial (FF) para estímulos emocionales opuestos, 30 participantes vieron un video feliz, 15 posando una expresión triste; y otros 30 participantes vieron un video triste, 15 posando una expresión de alegría. Se registraron los niveles de alegría, tristeza, ira y ansiedad antes y después de ver los videos. Todos los participantes que vieron el video feliz mostraron una disminución en la tristeza, pero aquellos que posaron tristeza durante el mismo, mostraron una disminución menor. Por su parte, los participantes que posaron alegría durante el video triste indicaron un aumento de la ira y la ansiedad, atribuido a tener que posar alegría. No se encontró evidencia de que el FF pueda contrarrestar los efectos de un estímulo emocional intenso. La evidencia relacionada con la regulación de la intensidad de una emoción opuesta, también fue limitada. Se encontró que posar alegría durante la experimentación de tristeza, podría provocar otras emociones negativas. Se cuestiona la utilidad práctica del FF.

**Palabras clave:** *feedback* facial, emoción, cognición corporizada, simulación de la emoción, experiencia emocional.

### **Feedback Facial: Efeitos Limitados para Vídeos de Emoções Opostas**

#### **Resumo**

Com o objetivo de provar a hipótese do *feedback* facial (FF) para estímulos emocionais opostos, 30 participantes assistiram a um vídeo feliz, dos quais 15 posaram com uma expressão triste, e outros 30 participantes viram um vídeo triste, dos quais 15 posaram com uma expressão de alegria. Registraram-se os níveis de alegria, tristeza, ira e ansiedade antes e depois de assistir aos vídeos. Todos os observadores do vídeo feliz mostraram uma diminuição na tristeza, mas os que posaram tristeza durante esse vídeo expressaram uma diminuição menor. Por sua vez, os participantes que posaram alegria durante o vídeo triste registraram um aumento de ira e ansiedade, atribuído a ter que demonstrar alegria. Não se constatou evidência de que o FF possa neutralizar os efeitos de um estímulo emocional intenso. A evidência relacionada com a regulação da intensidade de uma emoção oposta também foi limitada. Constatou-se que posar alegria durante uma experiência de tristeza poderia provocar outras emoções negativas. Questiona-se a utilidade da prática do FF.

**Palavras-chave:** *feedback* facial, emoção, cognição corporizada, simulação da emoção, experiência emocional.

EVEN BEFORE Psychology was formally established as an experimental science in the 19<sup>th</sup> century, other authors studied the relationship between emotions and the body. Descartes (1649/1989) considered the existence of very small particles called animal spirits that circled throughout the body, carrying information regarding interaction with the environment from the organism to the pineal gland in the brain, resulting in reasoning or feeling, and vice-versa. Darwin (1872/2000) also argued that bodily reactions influence the subjective experience of emotion; by inhibiting facial expression, the emotional experience is less intense, while free expression results in higher intensity.

One of the earliest psychological conjectures about the mechanisms of emotions was the James-Lange theory (James, 1890). This model stated that perception of a stimulus produces bodily changes and the sensation created by the visceral and muscular movement is recognized by the mind as an emotion. This view reversed the common sense knowledge, which traditionally views emotional expression as a consequence of an inner state. Thus, in James' own words, people do not run because they feel afraid, but they feel afraid because they run.

Although James' theory has been criticized and nowadays is generally considered false both in a theoretical and empirical level (for a review, see Reisenzein & Stephan, 2014), it generated a series of studies analysing the connection between an emotional experience and the body. One such outcome is the facial feedback hypotheses, which proposes that feedback from the muscles of the face is associated with subjective experiences, either modulating or initiating an emotion (Adelmann & Zajonc, 1989; Soussignan, 2002; Tomkins, 1962). In the former case, a facial expression would enhance the quality of an emotion similar to it, and weaken one that was distinct. For example, contracting nose and lips would enhance disgust, but if one was experiencing joy and then posed such disgust face, the joy would diminish. In the latter case, when no emotional state was present, posing a specific face would start the emotion associated with it.

In order to test the hypotheses, Strack, Martin and Stepper (1988) developed a simple method to activate the muscles that correspond to specific emotional expressions: by holding a pen between the teeth, a smile was simulated. The authors found that, when rating cartoons for their funniness, participants that were posing smiles with the pen found the cartoons funnier than the control group.

The same method or similar ones (e.g., using chopsticks instead of pens) were used in a number of later studies. For example, Kraft and Pressman (2012) presented their participants with tasks that induced stress and found that those who were posing smiles displayed a lower heart rate than those who were not, even when they were not aware of the emotional expression. Bilewicz and Kogan (2014) showed a positive story regarding a foreign character and then assessed the attitude toward that country. They found that participants who were posing a frown—and thus were not allowed to smile—did not improve their attitudes, while the group that had no physical constraints improved them. In Davey, Sired, Jones, Meeten, and Dash's study (2013), participants had to write down words they were listening to; these words were homophones (e.g., die and dye). Those who were posing a frown wrote more negative words than control group. The authors thus suggested that facial feedback could also influence cognitive processing.

Other methods were also used to test facial feedback, with botulinum toxin-A (commonly called Botox) featuring in a few studies because of its muscle-paralysing properties. Results showed that patients who received Botox showed a decrease in the ability to identify emotions (Neal & Chartrand, 2011) and lower speed while reading emotion-related sentences (Havas, Glenberg, Gutowski, Lucarelli, & Davidson, 2010).

A few studies did not use any device at all, simply giving instructions to participants to pose an expression. Lewis (2012) reported three experiments that showed that participants who were voluntarily frowning rated themselves as being more depressed and anxious; those who were raising their eyebrows

were more surprised by the facts that were presented; and those posing a disgust face rated odours as less pleasant than control groups. In Kraut's study (1982), participants were presented 12 types of odours and asked to rate their pleasantness. Those who were posing a pleasant face rated the odours as more pleasant, and those posing a disgust face rated them as less pleasant. However, the author reported that the effect, albeit statistically significant, was not large. For example, participants that were posing a disgust face did not rate a pleasant smell as bad, only as a little less pleasant. In the author's view, the characteristics of the stimuli were more powerful than the facial feedback.

The same conclusion can be found in other studies, including those presented above. Other examples are Davis, Senghas, Brandt and Ochsner (2010), which used Botox to compare emotional reactions to positive and negative videos and found no significant difference between pre and post injections. Dzokoto, Wallace, Peters and Bentsi-Enchill (2014) also studied how participants rated cartoons, but controlled for attention to emotion. They found that those with higher emotional awareness did not display the effect of facial feedback, thus showing that influence on cognition and interpretation is not universally present.

These results led authors to differentiate between a weak and a strong version of facial feedback (Buck, 1980; Dimberg & Söderkvist, 2011; McIntosh, 1996). Evidence from research seems to account for the weak version, in which facial feedback may influence but is not a requirement for emotional experience, and not for the strong version, in which the facial pose would overrule the emotional state. However, there is still no consensus in the literature regarding the measure of influence of facial feedback. In addition, most of the studies presented mild stimuli to participants, such as cartoons or pictures, or even no stimuli at all, simply comparing the subjective states between posing and not posing situations. We hypothesized that facial feedback effect may not be present if the stimuli were strongly incongruent

with the emotions being posed. To test this assertion, we studied the change in subjective emotional states of participants after they watched videos, comparing groups posing opposite expressions (i.e., happy face for a sad video, and sad face for happy video), as well as their appraisal for the videos.

## Method

### Participants

Participants were selected from undergraduate students of the university where the research took place. The selection criterion was a similar distribution of age and gender in all groups. Sixty Brazilian people participated, with mean age of 23.75 years ( $SD=7.04$ ) and 31 (51.7%) being female. All were undergraduates of several different courses, aged 18 or higher. The participants were divided in two groups for each of the two videos, in the following way: 15 participants watched the "Funny" video with no pose, 15 watched Funny posing sadness, 15 watched "Sad" with no pose, and 15 watched Sad posing joy.

### Materials

We used two videos: Funny and Sad. Funny was a 4-minute long compilation of videos of cats found on YouTube. It was composed of several brief shots of cats in funny situations (e.g., chasing a laser pointer, getting themselves trapped, missing a jump, etc.) with cheerful background music. Sad was a 6-minute excerpt of the end of 1979's movie *The Champ*. The scene showed the main character coming out of a boxing fight heavily beaten and dying while his child son burst into tears. This scene was studied before (Gross & Levenson, 1995) and showed a high activation of sadness.

A self-report questionnaire was used to assess the levels of four emotions: joy, sadness, anger, and anxiety. Participants rated how strongly they were feeling each emotion on a scale ranging from 0 (*not at all*) to 10 (*totally*). Each emotion was rated twice: before and after watching the video. Because the participants were Brazilian, the

questionnaire was written in Brazilian Portuguese. Terms that described emotions were the same as used in previous research and shown to adequately represent their translation from English: *alegria* for joy, *tristeza* for sadness, *raiva* for anger, and *ansiedade* for anxiety (see Miguel & Primi, 2014).

### Procedure

Participants signed the consent form, and then were given the self-report questionnaire to rate the level of each of the four emotions at the moment. They were divided into four groups, with balanced distribution of ages and gender (there was always seven or eight females in each group): 15 watched Funny video without pose; 15 watched Funny posing sadness; 15 watched Sad without pose; and 15 watched Sad posing an expression of joy. The instructions were that they would watch a video and then would rate their emotions again after watching it. The participants that were going to pose an expression were also told that the research was studying the relationship between posing and emotional states, without further information or expected results.

All participants were seated facing the computer that would display the videos. To generate the sad expression, participants were asked to raise the middle of the eyebrows and lower the lips, forming an arc with edges pointing down. In addition, their heads were to be gently facing downward, with hands and arms between their legs. To generate the expression of joy, participants were asked to smile showing their teeth, relax the eyebrows, and lean back on the armchair in a comfortable position with arms on the side and not touching the body. Those that were not posing were simply asked to sit in a comfortable position. After the instructions, the researcher left the room, leaving the participant alone to avoid social desirability, and the videos were played.

After watching the video, the participants rated the levels of the four emotions again. For the participants posing an expression, the researcher also asked, on a scale from 0 to 10, how much they were able to maintain it. In addition, all participants

were encouraged to comment on the experience of watching the videos.

### Data Analysis

The ratings from the questionnaire were analyzed concerning the level of change for each of the four emotional states. For this, repeated measures ANOVAs were calculated using the levels before and after the video as within-subject variable, and the pose or no-pose situation as between-subject factor. The results were also calculated for male and female participants separately. It was not possible to control for the ability to hold the pose because that variable was only measured in the group that was posing. However, we correlated it with the change in joy and sadness, in order to check if maintaining a pose was related to feeling happier or sadder.

### Results

Table 1 displays the mean emotional levels before and after watching the video for each emotion, while Figure 1 displays graphical representations of the means. For the Funny – Sadness pose condition, participants reported a mean of 5.40 ( $SD=3.27$ ) in the ability to maintain the pose during the video. All of them claimed they constantly felt an urge to let go of the pose and laugh at the video, saying it was very funny. Those who attributed higher levels of pose-holding used strategies such as concentrating on the muscles or focusing on the edges of the screen. Participants in the Funny – No pose condition did not elaborate on their ratings, saying it was a funny video. Only one of them reported a low increase in joy because she did not like cats.

For the Sad – Joy pose group, participants reported a mean of 5.80 ( $SD=2.73$ ) in the ability to maintain the pose. One of them said she was not touched by that kind of movie, while the other fourteen said they found the video extremely sad, with two of them crying. Those who reported a higher level of pose-holding used strategies such as thinking it was only a movie. The majority of participants of this group also claimed they felt bad because they had to smile at such a sad situation,

explaining why they reported an elevation on levels of anger and/or anxiety. Most of the participants of the Sad – No pose group did not elaborate on their ratings either, saying it was a sad video. One of them said the levels did not change because that type of video does not move him too much.

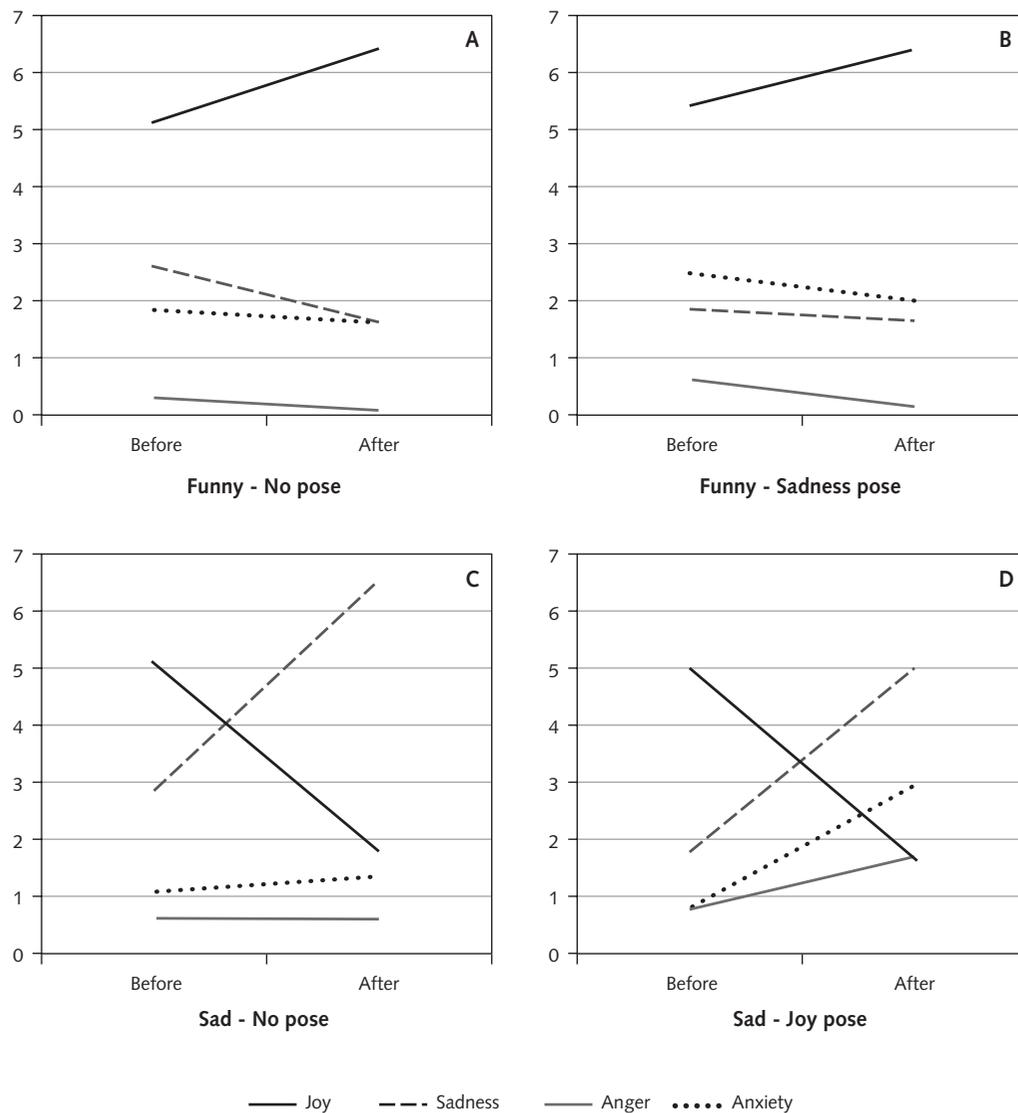
**Table 1**

*Means and standard deviations of each emotion before and after watching the videos, for the groups posing and not posing*

Video	Posing mode	Moment	Joy	Sadness	Anger	Anxiety
<b>Funny</b>	<b>No pose</b> ( <i>n</i> =15)	Before	5.13 (1.81)	2.60 (1.45)	.27 (0.594)	1.80 (2.08)
		After	6.40 (1.50)	1.60 (1.35)	.07 (0.26)	1.60 (2.17)
	<b>Sadness pose</b> ( <i>n</i> =15)	Before	5.40 (2.17)	1.87 (2.03)	.60 (1.30)	2.47 (3.70)
		After	6.40 (1.72)	1.67 (1.63)	.13 (0.35)	2.00 (2.51)
<b>Sad</b>	<b>No pose</b> ( <i>n</i> =15)	Before	5.07 (1.79)	2.87 (2.20)	.60 (1.60)	1.07 (1.16)
		After	1.80 (1.42)	6.60 (1.24)	.60 (1.35)	1.40 (1.30)
	<b>Joy pose</b> ( <i>n</i> =15)	Before	5.00 (2.27)	1.73 (2.19)	.73 (1.94)	.80 (1.61)
		After	1.60 (1.84)	5.00 (2.93)	1.67 (2.29)	2.93 (2.76)
<b>Females</b>						
<b>Funny</b>	<b>No pose</b> ( <i>n</i> =8)	Before	5.00 (1.93)	2.50 (1.20)	.13 (0.35)	1.88 (2.23)
		After	6.63 (1.51)	1.38 (1.51)	.00 (0.00)	1.75 (2.32)
	<b>Sadness pose</b> ( <i>n</i> =7)	Before	4.57 (1.72)	2.14 (2.41)	.29 (0.76)	1.43 (2.57)
		After	5.71 (1.50)	2.29 (1.98)	.14 (0.38)	1.71 (2.22)
<b>Sad</b>	<b>No pose</b> ( <i>n</i> =8)	Before	4.63 (1.85)	3.00 (2.27)	.63 (1.77)	1.25 (1.39)
		After	1.25 (0.89)	7.00 (1.07)	.75 (1.75)	2.00 (1.31)
	<b>Joy pose</b> ( <i>n</i> =8)	Before	5.25 (2.49)	2.38 (2.39)	1.38 (2.56)	1.38 (2.07)
		After	2.13 (2.23)	6.00 (3.51)	2.38 (2.88)	4.63 (2.72)
<b>Males</b>						
<b>Funny</b>	<b>No pose</b> ( <i>n</i> =7)	Before	5.29 (1.80)	2.71 (1.80)	.43 (0.79)	1.71 (2.06)
		After	6.14 (1.57)	1.86 (1.22)	.14 (0.38)	1.43 (2.15)
	<b>Sadness pose</b> ( <i>n</i> =8)	Before	6.13 (2.36)	1.63 (1.77)	.88 (1.64)	3.38 (4.44)
		After	7.00 (1.77)	1.13 (1.13)	.13 (0.35)	2.25 (2.87)
<b>Sad</b>	<b>No pose</b> ( <i>n</i> =7)	Before	5.57 (1.72)	2.71 (2.29)	.57 (1.51)	.86 (0.90)
		After	2.43 (1.72)	6.14 (1.35)	.43 (0.79)	.71 (0.95)
	<b>Joy pose</b> ( <i>n</i> =7)	Before	4.71 (2.14)	1.00 (1.83)	.00 (0.00)	.14 (0.38)
		After	1.00 (1.16)	3.86 (1.68)	.86 (1.07)	1.00 (1.00)

*Note:* Standard deviations are presented in parenthesis.

**Figure 1.** Means of emotional ratings before and after watching the videos for the four groups.



The results of the levels of within-subject emotional change comparing the Pose group with the No-pose group are presented in Table 2. For the Funny video, the only significant result was for the change in sadness ( $F=4.42, p=.045$ ). In both groups, the level of sadness decreased, but the results show that, in the Pose group, the decrease was smaller.

For the Sad video, significant results were obtained for changes in anger ( $F=7.98, p=.009$ ) and anxiety ( $F=8.61, p=.007$ ), which shows that, in the

Pose group, the levels of both emotions increased significantly. There was no significant differentiation in the decrease of joy and increase of sadness.

The same analyses were conducted for female and male participants (also displayed in Table 2). The results tended to be similar to the general sample, although some only attained a marginal significance level, which may be due to the low number of participants. In addition, there was a striking difference between females and males regarding posing sadness to the Funny video.

While there was no significant difference for men, women did show a significant increase in their level of sadness, along with a slight increase in joy.

We correlated the degrees that participants were able to maintain the pose with the change

in levels of joy ( $r = -.11, p = .582$ ) and sadness ( $r = .14, p = .458$ ). Correlations were not statistically significant, indicating there is no covariance between those variables, and thus, no effect should be expected by level of pose-holding.

**Table 2**

*Differences in emotional state change between posing and non-posing subjects*

		Joy	Sadness	Anger	Anxiety
Funny ( $n=30$ )	<i>F</i>	.79	4.42	.82	.28
	<i>p</i>	.382	.045	.372	.604
Sad ( $n=30$ )	<i>F</i>	.04	.40	7.98	8.61
	<i>p</i>	.853	.535	.009	.007
<b>Females</b>					
Funny ( $n=15$ )	<i>F</i>	1.29	6.65	.01	.50
	<i>p</i>	.276	.023	.926	.491
Sad ( $n=15$ )	<i>F</i>	.06	.13	3.94	7.45
	<i>p</i>	.811	.722	.067	.016
<b>Males</b>					
Funny ( $n=15$ )	<i>F</i>	.00	.37	.70	1.13
	<i>p</i>	.965	.555	.418	.308
Sad ( $n=15$ )	<i>F</i>	.30	.26	3.59	5.44
	<i>p</i>	.596	.619	.083	.038

Note:  $df=1$  for all analyses.

### Discussion and Conclusions

Results from the experiment did not support a strong version of the facial feedback hypotheses. Participants posing a happy expression to the sad video had a decrease in their happiness, while participants posing a sad expression to the happy video had a decrease in their sadness. However, there was partial support for the weak version of facial feedback. Participants that watched the Funny video and posed a sad expression had a significant smaller decrease in sadness than those who were not posing. However, it is clear that the

effect is very low: those participants still reported an increase in joy and a decrease in sadness, albeit the latter was at a smaller magnitude. Thus, the main cause of the emotional state seems to be the characteristics of the stimuli and not the muscle pose, similar to what was found in previous studies (Davis et al., 2010; Kraut, 1982).

The results were similar when analysing only female or male participants, indicating that the emotional phenomenon is not gender-related, with the possible exception for women posing sadness to the funny video. Although joy in

those women increased, sadness also increased, which could be related to a facial feedback effect. However, the low number of participants might have been a potential limitation for the analysis. Thus, we suggest that further studies expand the sample to verify possible differences between genders in facial feedback. Another possible explanation to be addressed in other studies is the type of strategy used to maintain the pose. It may be the case that female participants used more efficient strategies, such as thinking of sad situations, which could be responsible for the increase in sadness.

It is possible that the significant effect found in Funny is attributed to stimuli intensity. Although participants still classified the Funny video as funny, its intensity was not as large as the sadness in Sad. The former showed a mean increase of 1.13 in joy, while the latter showed a mean increase of 3.5 in sadness. In a similar way, Davis, Senghas, and Ochsner (2009) found non-significant mood variation for a positive video. If that indeed is the case, it suggests that facial feedback effect may be present only with low intensity stimuli, and not with high intensity, which is corroborated by the group that watched Sad posing an expression of joy and did not differ in joy decrease and sadness increase when compared to the control group. To test this hypothesis, another study could use a video with higher intensity of funniness or a video with lower intensity of sadness.

In addition, participants found that the obligation to pose an expression of joy—opposite to the sad video being played—generated anger and anxiety. These emotions were not created by the muscular activity. We hypothesize that they could have been originated by the cognitive appraisal of the task. To test this hypothesis, a study should be conducted using standardized measures to evaluate the individual's appraisal. If it does show a stronger effect on emotional arousal than facial feedback, it would contradict a large number of studies that claim that facial feedback

actually influences cognition, and it would give support to appraisal theories of emotion (for a review, see Miguel, 2015).

Another important aspect of our results is the indication that smiling while feeling sad could activate other negative emotions. This corroborates studies that showed that suppression of emotions is related to higher health risk, such as cardiovascular diseases, cancer, diabetes, stress, among others (Chapman, Fiscella, Kawachi, Duberstein, & Muennig, 2013; Mund & Mitte, 2012). Although our study did not evaluate such health conditions, it showed that anger and anxiety rose while faking joy. This result has important implications for everyday life in modern society, in which people may be prone to hide their sadness because smiling is a valued behaviour (Beaupré & Hess, 2003; Shore & Heerey, 2011). Thus, the effects of posing a fake emotion as a psychotherapeutic strategy may even turn out to be deleterious. As other authors have stated (Buck, 1980; Lewis, 2012), the implications of facial feedback have not been fully explored yet.

A possible limitation of our study is the fact that we used voluntary facial poses instead of devices such as pens, chopsticks or golf tees that have been used in other researches. Voluntary poses are not considered authentic or Duchenne smiles—one that contracts both the orbicularis oculi muscle and the zygomatic major. Nevertheless, they are still considered indications of joy and pleasant feelings in social interactions (Ekman, Davidson, & Friesen, 1990; Messinger, Fogel, & Dickson, 2001). In that sense, Dimberg & Söderkvist (2011) reported evidence that voluntary expressions also display facial feedback effect and could be used in research, even though the amount of studies using artificial devices is much larger. However, we found that the majority of our participants were moderately capable of maintaining the facial expression throughout the videos, with only a few completely capable. Correlations between the ability of holding the

pose and the changes in emotions were non-significant, indicating that there is no covariance between these variables. Still, it is clear that some people are not capable of holding a pose, depending on the stimuli. Other research that replicates our method with the use of devices could address this issue.

Nevertheless, we chose to use voluntary expression because we believe it is an ecological approach. If facial feedback were ever to be used by psychotherapists as a strategy to enhance emotional states in their clients, holding a pen in the open mouth or attaching devices to the forehead could hardly be considered adequate in work, reunions, or other social meetings.

However, the results of the present research corroborated other studies that did not show support for a strong version of facial feedback (i.e., it does not overrule a present emotional state), showed mild support for a weak version (i.e., only in few cases may it have effect), and showed that it is not possible for all people to maintain a pose without the use of devices. Thus, the practical utility of the phenomenon is questionable. It seems likely that its application is limited to the laboratory as a strategy to set the participant's mood, and very unlikely that it may be used in the "real world" as a psychotherapeutic method, despite the claims in lay media that smiling could make one happier (Wenner, 2009).

In addition, research on facial feedback predominantly studies smile and frown, or basic emotional states such as joy, sadness, pride, anger, and disgust. It still has not moved on to complex emotions such as love, disappointment, envy, jealousy, guilt, pity, curiosity, nostalgia, and so forth. It may turn out that finding a unique pattern of facial expressions to these emotions is not as simple as with the basic emotions –a critique that was already made to the James-Lange theory of emotional embodiment. In fact, they may not even reside in the face at all. A number of researchers (Ades & Hegenberg, 2010; Hupka, Zaleski, Otto, Reidl, & Tarabrina, 1996;

Nummenmaa, Glerean, Hari, & Hietanen, 2014) found that, even though people tend to associate specific body regions to distinct emotional states –with a few cultural divergences– some of the emotions include chest, arms, but not the face, which may be a further limitation to the facial feedback hypothesis. In our research, participants kept a bodily position that was congruent with the facial expression. Even so, effects of facial and bodily posing were only mildly found, given the strength of the emotional stimuli.

As a final limitation, we only assessed the levels of four basic emotions: joy, sadness, anger and anxiety. Further studies could understand the effects of emotion suppression by broadening the range of emotions, including, for example, disgust or love.

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