

## Original Article

## Promoting an Active Life Through Threatening Communication: Effects on College Student's Emotions

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### Abstract

This pilot study was aimed to evaluate the acute effects of a sedentary-focused intervention through threatening communication on college student's emotions. Thirty-six female college students (mean age  $20.8 \pm 2.7$  years) who participated voluntarily were exposed to five neutral and five sedentary-related threatening video messages. In order to evaluate the emotional impact of the messages, the subjects' faces were recorded and analyzed during these expositions using a facial expression recognition software (Face Reader System 4.0), and assessing the time-lapse percentage of the following basic expressions: neutral, sad, angry, surprised, scared, and disgusted. Compared to the neutral messages, a non-significant increase in sad, angry, and disgusted expressions were observed after threatening intervention; nevertheless, the effect size ( $d$ ) for the disgusted expression was .832. Moreover, the time-lapse percentage of neutral facial expression decreased after threatening messages although no statistical significance was reached ( $p = .174$ ).

### 1. Introduction

Most of the strategies for promoting an active lifestyle consist on providing neutral information about benefits and risk of sedentary behavior but in many cases they do not achieve the desired success. These strategies include web-based interventions, educational and cognitive strategies that lead to attitudinal changes or strategies to include exercises in your daily routine and performing physical

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activity in groups or individually among others (Grim, Hartz, & Petosa, 2011; Kozak, Nguyen, Yanos, & Fought, 2013; Werch et al., 2008; Maselli, Ward, Gobbi, & Carraro, 2018). Although some strategies have led to obtain significant improvements in the level of physical activity and weight loss (Maselli et al., 2018; Plotnikoff et al., 2015), it is unclear what component could play a key role in the promotion of physical activity, so in general, evidence of effectiveness is limited (Maselli et al., 2018).

However, and according to several psychological theories, both beliefs of individuals and the perception of risk related to the consequences of sedentary attitudes play great importance in behavioral change programs (Kim, Lumpkin, Lochbaum, Stegemeier, & Kitten, 2018).

Attending to the health-related educational programs, threatening messages are designed to impact emotions and to enhance the perceived risk of unhealthy behaviors (e.g. smoking) reporting positive changes in the lifestyle of the population. However, despite decades of research, consensus regarding the dynamics of fear appeals remains elusive (Peters, Ruiter & Kok, 2013). In any case, three theories currently prevail: the Extended Parallel Process Model (EPPM; Witte, 1992), the Terror Management Health Model (TMHM; Goldenberg & Arndt, 2008), and the Stage Model of Processing of Fear-Arousing Communications (SMPFA; de Hoog, Stroebe & de Wit, 2007). All of them postulate that behaviour change is possible only when threatening communication is offered to subjects who have sufficient perceived efficacy. A threat is a danger of harm, characterised by the degree of severity and the degree to which one is susceptible to this threat (and a threatening communication is a message conveying one or both of these elements).

Efficacy is one's ability to negate the harm, a function of the effectiveness of a potential response in negating the harm (response efficacy) and one's capability to enact that response (self-efficacy). Both theories predict no behaviour change when a threat is not severe, one is not susceptible to it, there exists no effective response, or when one is incapable to execute an effective response. Thus, when threat is increased but efficacy is low, defensive reactions are predicted, such as denying the severity of or susceptibility to a threat (Peters et al, 2013).

The severity of threatening messages can be evaluated by their impact on subject's emotions, since an emotion can be considered an affective reaction to a stimulus that leads to temporary changes of experience and behavior, specifically in the domains of subjective experience, cognition, physiology, motivation and expression (Izard, 2010). Although different methods have been employed to measure emotions, facial signals represent a central source of information (Cohn, Ambadar & Ekman, 2007; Harrigan, Rosenthal & Scherer, 2005). To tap into these signals, observation-based methods of facial expression measurement have been developed, with the Facial Action Coding System (FACS) by Ekman, Friesen, and Hager (2002) representing one of the most frequently used and influential methods. Actually, a facial coding software, such as FaceReader (Noldus Information Technology), has been developed and could become an alternative to traditional

manual coding as these new techniques specifically address disadvantages of previous facial coding methods.

Thus, and considering that female adolescents and young adult women are the populations with lower rates of physical activity in Spain, it is interesting to evaluate the acute effects of a sedentary-focused intervention through threatening communication on college student's perceived risk and on emotions using computerized facial recognition methods.

## 2. Material and methods

### *Study design*

A crossover study design with two different interventions (neutral and threatening messages) was applied in order to define their effects on emotions and perception of risk related to the sedentary lifestyle consequences.

*Sample.* The sample was composed of a total of 36 female college students, with an average age of 20.8 years (sd = 2.7). The selection of these subjects attended to non-probability techniques (of judgment or criteria), although their participation was voluntary. In addition, considering the objective of the study, only two exclusion criteria were considered: the usual practice of physical exercise (minimum established by the ACSM) or the presence of any disease that caused a relative or absolute contraindication to exercise.

### *Variables*

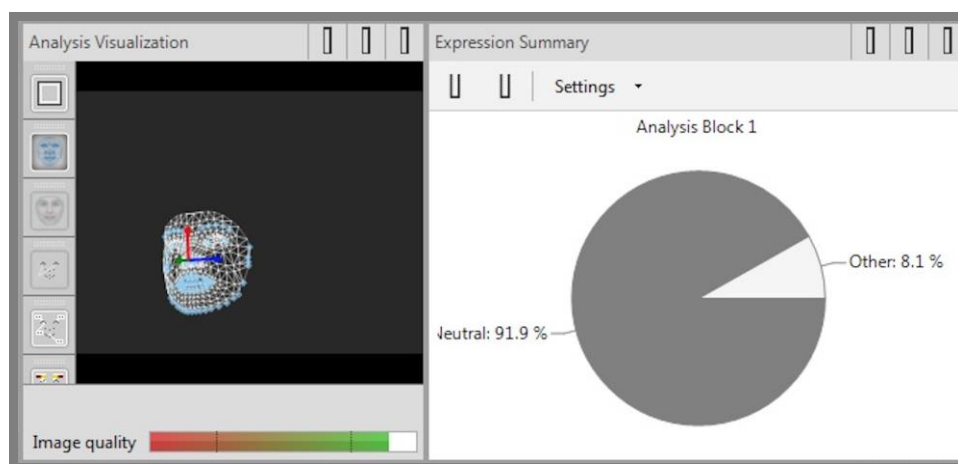
The variables considered in the present study were mainly related to the emotions produced by threatening messages; in addition the perceived risk on a sedentary lifestyle was also evaluated.

*Analysis of emotions.* Emotions were analyzed using the computerized facial analysis system FaceReader 4.0 (Noldus Information Technology, Wageningen, The Netherlands). Expressions linked to basic emotions according to the active appearance model (Kuilenburg et al., 2005) were analyzed in two one-minute video messages exposures (both neutral and threatening). For this analysis, which was carried out at a frequency of 20 Hz, the participants' faces were recorded during their exposure to the aforementioned messages (Figure 1). The expressions (emotions) evaluated were: neutral, happiness, sadness, anger, surprise, fear, disgust and others not classifiable among the previous ones. The value of each expression was expressed as a percentage of the time of its prevalence during the exposures (Figure 2).

Perceived risk on sedentary lifestyle. The perceived risk was analyzed through a visual analogue scale (VAS) designed ad-hoc and scoreable between 0 (no perceived risk) and 10 (maximum risk).



**Figure 1.** Recording subject's face for the assessment of emotions



**Figure 2.** Results of emotions' analysis after neutral message (example)

### *Intervention*

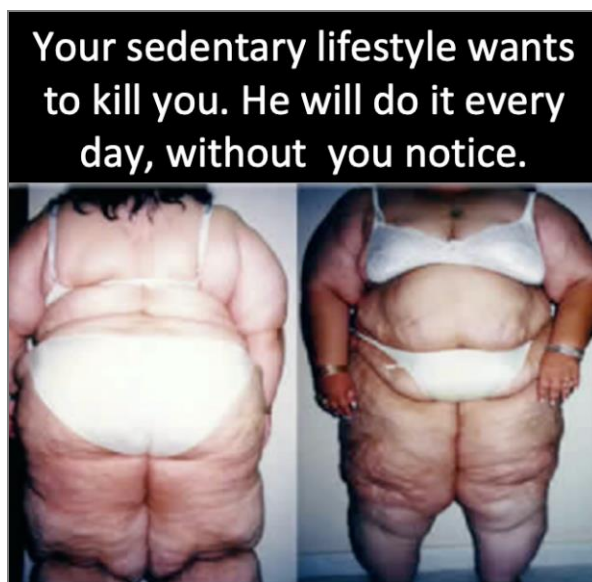
*Exposure to video messages.* In order to analyze the effect of messages based on the communicative theory of the threat, the subjects were exposed to both neutral and threatening messages. Five neutral stimulation messages served to calibrate or to reference the analysis of facial expressions. Their content focused mainly on characteristic aspects of the city in which participants develop their academic activity (geographical location, weather, etc.).

On the other hand, the five video messages with threatening stimulation were focused on the unhealthy consequences of sedentary behaviors. As already indicated before, the duration of each exposure was similar (1 min) and each message (accompanied by representative images) was shown for 12 s. During each

exposure, the subjects' faces were recorded according to the instructions of the FaceReader System manufacturer. Figures 3 and 4 show an example of neutral and threatening messages, respectively.



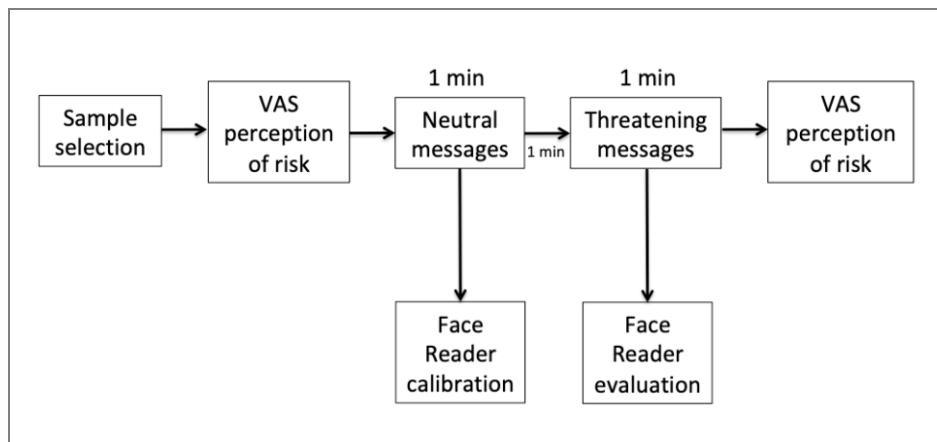
**Figure 3.** *Neutral message (example)*



**Figure 4.** *Threatening message (example)*

#### *Procedures*

The outline of study protocol can be found in Figure 5.



**Figure 5.** Outline of study protocol

### Statistical analysis

Simple effects were tested using T-paired samples test with T-student test in case of normal distribution. Cohen's *d*-effect (*d*) size statistics were used for parametric paired t-test comparisons with <0.1, 0.1-0.3, 0.3-0.5, 0.5-0.7, 0.7-0.9 and >0.9 were considered to represent trivial, small, moderate, large, very large and nearly perfect effects, respectively (Hopkins, Marshall, Batterham, & Hanin. 2009).

### 3. Results and Discussions

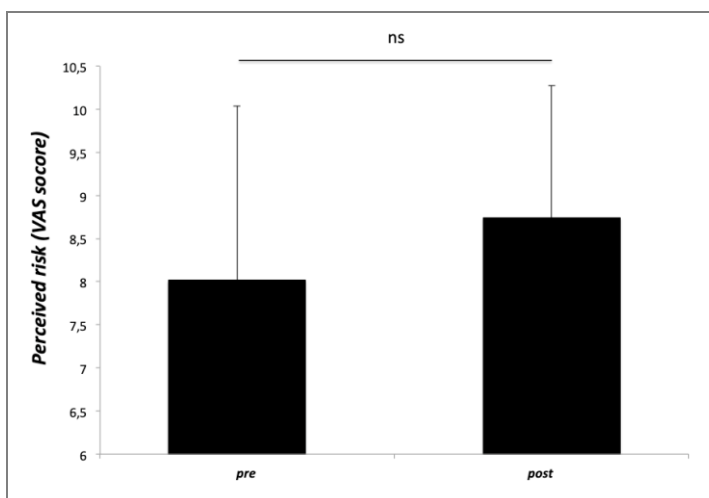
Compared to the neutral messages, a non-significant increase in sad, angry, and disgusted expressions were observed after threatening intervention (Table 1); nevertheless, the effect size (*d*) for the disgusted expression was .832. Moreover, the time-lapse percentage of neutral facial expression decreased after threatening messages (Table 1) although no statistical significance was reached ( $p= .174$ )

**Table 1.** Pre-post intervention comparisons

| Emotions<br>(pre vs post)   | Mean<br>difference | sd       | Differences CI 95% |          | Sig. |
|-----------------------------|--------------------|----------|--------------------|----------|------|
|                             |                    |          | Inferior           | Superior |      |
| Neutral                     | ,98889             | 4,28051  | -,45943            | 2,43720  | ,174 |
| Sad                         | -1,5000            | 6,37103  | -9,41068           | 6,41068  | ,626 |
| Angry                       | -2,3000            | 6,08112  | -56,93668          | 52,33668 | ,687 |
| Surprised                   | 1,32857            | 3,89218  | -2,27109           | 4,92824  | ,401 |
| Disgusted                   | -3,9500            | 4,87904  | -47,78641          | 39,88641 | ,457 |
| Other                       | ,40556             | 2,67560  | -,49974            | 1,31085  | ,369 |
| Sum of negative<br>emotions | ,17500             | 11,22910 | -3,62438           | 3,97438  | ,926 |

As it is shown in Figure 6, the perception of risk on sedentary lifestyle increased slightly from  $8.02 \pm 2.02$  in pre-intervention to  $8.74 \pm 1.52$  points post-

intervention (+9% approximately), but non-significant differences were observed ( $p = .152$ ).



**Figure 6.** Evaluation of perceived risk on sedentary lifestyle

The results obtained point to the threatening communication objectives that are included in the main fear appeal theories (EPPM, TMHM, and SMPFA) since threatening messages related to sedentary lifestyles induced an increase in negative emotions such as sad, angry, and disgusted. Moreover, the perceived risk on sedentary lifestyle evaluated by VAS was higher after threatening messages. However, these increases were non-significant, suggesting that the threatening messages used here did not cause enough the fear or threat to induce emotional stress and to impact on the perceived risk of sedentary lifestyle. Attending to Izard (2010) and Kim et al. (2018) these two factors play a key role in behavioral changes so it is necessary to select even harder contents if threatening communication wants to be used together with computerized facial recognition in the promoting of active life in young adults. On the other hand, all abovementioned theories postulate that behavior changes are possible only when threatening communication is offered to subjects who have sufficient perceived efficacy, so all seems to indicate that self-efficacy is presented as the third key factor to consider in this kind of behavioral change programs. Self-efficacy implies to negate the harm, to develop an effective response in negating the harm (response efficacy) and to enact that response. Thus, as it was pointed out by Peters et al. (2013), it is difficult to induce behavioral changes when a threat is not severe (as occurred in the present study), one is not susceptible to it, there is no effective response, or when one is incapable to execute an effective response. In this sense, one of the main limitations of our study is related to the lack of evaluation of the participant's self-efficacy in terms of active lifestyle attitudes.

#### 4. Conclusions

Considering the limitations of this pilot study (mainly a small sample size and lack of data about participants' self-efficacy), the present findings suggest that threatening messages based on the consequences of sedentary lifestyle could impact the emotional status of inactive students boosting an increase of their perceived risk associated to the sedentary attitudes which is a key factor for the success in the behavioral changes of this population.

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