

# Emotional Induction Through Films: A Model for the Regulation of Emotions

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**Abstract** This paper introduces a software program to recognise discrete emotions on an ageing adult from his/her physiological and psychological responses. This research considers the capacity from an audiovisual method to evoke different emotions and uses it to interpret and modulate basic emotion states. Different body sensors, in the case of physiological response, and a set of questionnaires, in the case of psychological responses, are selected to measure the power in causing fear, anger, disgust, sadness, amusement, affection and the neutral state, through a set of films used as an emotional induction method. The initial results suggest that it is possible to extract discrete values about positive and negative emotional states with films and to use these responses as keys to get emotion regulation.

**Keywords** Emotion induction · Films · Emotional regulation

## 1 Introduction

In the history of health research, numerous papers have focused on physical aspects, especially in older people. Although the concept of quality of life includes “physical health of the subjects, their psychological state, level of independence, social relationships, and their relationship with the environment” [1], only a few works have attempted to regulate their emotional state. The recognition of emotions is very

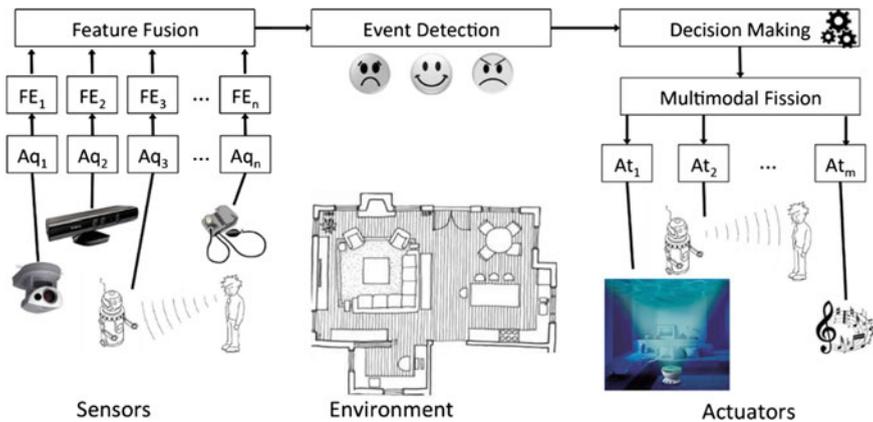
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**Fig. 1** Outline of the project

important for the relationship between people, in this case ageing adults, and their psychological health.

On the one hand, thanks to technological and medical advances, there has been an increase in life expectancy and an increasing ageing population [2]. On the other hand, most people prefer to stay at home as long as their quality of life does permit it. From both premises the project “Improvement of the Elderly Quality of Life and Care through Smart Emotion Regulation” [3–5] is born (see Fig. 1). It addresses a challenge related to “Economy and Digital Society”, linked to the Spanish Strategy for Science, Technology and Innovation. The main goal of this project is to look for tools capable of improving the quality of life and care of the ageing adult who continues living at home by choice. This has to be achieved through the creation/use of Ambient Intelligence and smart emotion regulation devices. Indeed, we believe that the ability to monitor changes in the emotional state of a person in his/her own context allows implementing regulatory strategies for reducing negative affect. In some specific goals, we want to:

1. Develop a system capable of detecting emotions through facial expression and physiological response, and adapt the system for use with elderlies.
2. Develop an emotion regulation system by using stimuli like colour, lighting, sound landscape, music or autobiographical memories, among others, and adapt the system for use with ageing adults.

To get all of this, cameras and body sensors are used for monitoring the older people’s facial and gestural expression, activity and behaviour, as well as relevant physiological data [6, 7]. This way, the older people’s emotions are inferred and recognised. Music, colour and light are the means of stimulation to regulate their emotions towards a positive and pleasant mood [8, 9]. The present research focuses on the use of films as method to detect basic emotions.

## 2 Films and Emotion Recognition

For research it is essential to have effective screening models of emotions that allow their application in the field of emotion regulation. On the one hand, mood induction procedures (MIPs) are making a great contribution to our understanding of the relationship between what we feel, what we think and what we do, to our understanding the links between emotion, cognition and behaviour in normal and clinical populations [10]. On the other hand, Psychology has studied a large number of these methods to provoke emotions differentially, or what is the same, there are different ways to manipulate emotional states in experimental research designs as pictures, music, imagination, Velten elicitation or films [11]. For the purpose of our work, we have selected a set of films that should act as stimuli capable of eliciting the basic emotions (anger, fear, amusement, affection, sadness and disgust) besides of the neutral state [12].

Induction by films consists in watching a brief set of fragments which usually come from commercial films. These fragments have an intense content of positive or negative emotions. At present it is one of the most widely used techniques due to films have a greater ecological validity because they promote a dynamic context with auditory and visual stimuli similar to those that can be seen in real life. In addition, they are a standardized method that does not require individual adaptations as other as hypnosis or imagination procedures which involving subjective techniques [13]. It has also been shown that the use of film scenes for induction does not require large attentional effort and that when the instructions to evaluate them are not too direct, the potential problem that subjects respond differently because it is an experimental context decreases (demand effect).

Films are a method and there exists an evidence that they elicit the activations across many of the response systems associated with emotions. Indeed, films can elicit discrete emotions unlike other methods as music or smells that can only differentiate between pleasant and unpleasant [7, 13–15]. They are also preferred due to their degree of standardization and the possibility to use them with relatively low levels of demand [13, 14, 16]. Moreover, films allow an accurate selection of the stimuli according to their position in the affective space defined by the dimensions of valence, arousal and dominance. In the current study, these variables are evaluated from their physiological and psychological responses.

To measure the subjective responses, we use different psychological tests:

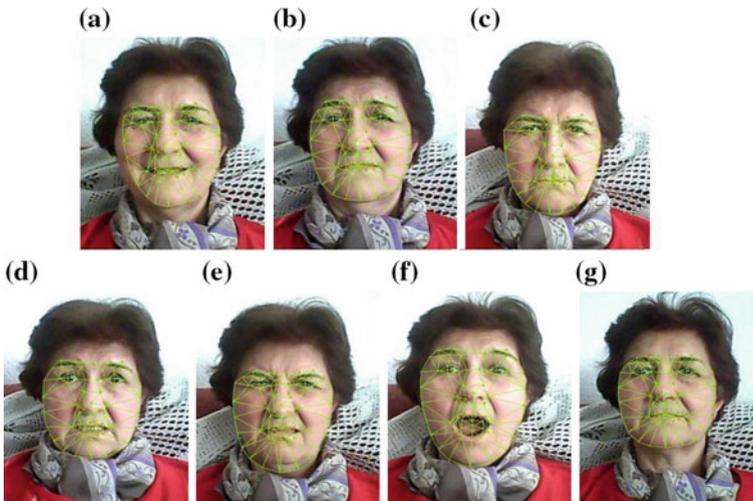
- *Self Assessment Manikin* (SAM) [17]: This test evaluates the dimensions of valence, arousal and dominance through five figures or manikins by every dimension (Likert scale 1–9).
- *Discrete Emotions Questionnaire* (CED) (Spanish version) [14]: There are 18 items with emotional labels (Likert scale 1–7): fun, rage/anger, anxiety, confusion, satisfaction, disgust, fear, guilt, happiness, interest, joy, love/affection, pride, sadness, shame, surprise, unhappiness and embarrassment.

- Control questions (YES/NO): The participant is asked to answer some question sometime during some fragment, and whether he/she has ever seen the film previously.

To measure the objective responses, we evaluate different physiological responses with cameras and sensors. In particular, a wristband is used that includes:

- *Electrodermal activity* (EDA): The spontaneous skin conductance (SSC) is the result of an increasing activity in the sympathetic nervous system [18], and the basal skin conductance (BSC) is related both with the sympathetic nervous system and the dermal characteristics of skin [19]. Different markers that evaluate the intensity and duration of the events are computed [20].
- *Heart activity*: It is caused by the autonomous nervous system. Heart rate variability (HRV), showing the alterations of heart rhythm, is usually computed to evaluate the arousal level of an individual [21].
- *Temperature*: If human body is under stress, his/her temperature drops due to the contraction of blood vessels [22].

Also, *facial emotion detection* is provided. We use a real-time facial expression recognition system based on geometric features. This system works by detecting facial points associated with emotions and making a classification for each emotional category [23, 24] (see Fig. 2).



**Fig. 2** Example of webcam capture where the detected emotion is **a** Joy. **b** Sadness. **c** Anger. **d** Fear. **e** Disgust. **f** Surprise. **g** Neutral

### 3 Participants and Procedure for Emotion Elicitation by Films

The participants consisted of fifteen persons (seven females and eight males). They participated voluntarily and received no financial compensation. All participants were between the ages 18 and 83 years. Young subjects were people under 35 years old ( $M = 20.16$ ), participants between 35 and 59 years old were considered middle-age ( $M = 46.83$ ) and subjects over than 60 years of age were considered elderly ( $M = 71.66$ ), as you can appreciate in Table 1. All participants were recruited from Universidad de Castilla-La Mancha (students and workers) and from University of Experience (academic courses for elderly). The three age groups had similar years of education. No participants suffered from severe chronic illness, neurological and/or mood disorders according to the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) criteria. Moreover, none of the participants were taking any medication that could affect the process or task results.

The experiment is performed in a small room equipped with a comfortable arm-chair and a 27-inches screen monitor TV. Upon arrival of the participants, they are welcomed by offering an overview of the experiment and the sign a written consent. Before starting the experimental session, Beck Depression Inventory (BDI) [25], and Positive and Negative Affect Schedule (PANAS) [26], are administered to know the participant’s current emotional state. Moreover, if the participant is older than 60, Mini-Mental State Examination (MMSE) [27] is administered to rule out any cognitive impairment.

The experimental task has an average duration of 50 min depending on the test participant who may answer the complete questionnaire quicker or slower. The experiment has been designed with software E-Prime 2.0, which includes, for each event, the instructions for the experiment, the bank of audiovisual stimuli composed of 55

**Table 1** Means (and standard deviations) of valence, arousal and dominance ratings from the Self Assessment Manikin (SAM) for the neutral, negative and positive films

SAM (n = 15)	Valence M (SD)	Significance p	Arousal M (SD)	Significance p	Dominance M (SD)	Significance p
(Rank 1–9)						
Neutral	6.20 (1.61)		3.90 (2.30)		6.86 (2.00)	
Anger	1.93 (1.87)	0.000	6.67 (2.16)	0.000	4.33 (2.25)	0.006
Sadness	3.93 (2.86)	0.011	5.93 (1.98)	0.004	5.60 (2.38)	0.186
Fear	2.67 (1.71)	0.000	6.53 (2.20)	0.000	5.33 (1.29)	0.032
Disgust	2.27 (2.12)	0.000	5.87 (2.20)	0.000	5.67 (1.91)	0.124
Affection	6.73 (2.28)	0.310	5.07 (2.18)	0.012	5.33 (2.28)	0.093
Amusement	7.73 (1.83)	0.020	5.07 (2.28)	0.029	6.20 (1.78)	0.232

*Note* T-TEST (Significance): statistically significant differences between the neutral films and other emotional categories. Critical value of  $p < 0.050$

NEUTRAL	AMUSEMENT	AFFECTION	DISGUST	ANGER	FEAR	SADNESS
Blue (1)	When Harry met Sally	La vita è bella (2)	Pink Flamingos	Schindler's list (2)	Scream (2)	City of angels
Blue (2)	There's Something About Mary (1)	La vita è bella (3)	Trainspotting (2)	Schindler's list (3)	The Blair witch project	The Champ
L' amant	There's Something About Mary (2)	La vita è bella (4)	Hellraiser	American History X	The exorcist	Schindler's list (1)
	The dinner game	Forrest Gump	Seven (3)	In the name of the father	The silence of the lambs (2)	Dangerous minds
	Dumb and Dumber	When a Man Loves a Woman	The dentist	Leaving Las Vegas	Seven (2)	A perfect world
	Benny Joone	Dead Poets Society (2)	27 days	Cry freedom	The shining	La vita è bella (1)
	Les visiteurs	Leon	Saving private Ryan	Sleepers	Misery	Philadelphia
	A fish called Wanda	E.T	The silence of the lambs(1)	Seven (1)	Copycat	La vie revée des anges
		Ghost		The piano		Dead man walking
						Dead Poets Society (1)

Fig. 3 Classification of films according to discrete emotions

films (ranging between 24 s, and 6 min and 4 s) [13, 14, 27] relevant questionnaires and a distracting task. The films used to the experiment are listed in Fig. 3.

At the beginning of the experiment, the electrodes are positioned and the camera is activated while the experiment procedure is explained. First, the computer presents basic instructions for starting the experiment. Next, two neutral film clips are presented so that the participant can practice with the task. As he/she is relaxed, we get a baseline of the different physiological parameters. After seeing a scene, the participant must complete the SAM and the CED questionnaires for each scene [12–14] and perform a distracting task for one minute. The distracting task is the emergence of a geometric figure on the screen for 5000 ms. When the figure is a circle the participant must press 1, and when a different figure is shown on the screen the participant must press 2. This task is offered to prevent the cumulative effect of one emotion to another. In total, every subject watches a set of 9 films including 7 emotional fragments that appear in a counterbalanced way.

At the end of the session, another neutral clip is presented to recover a relaxing state. Physiological parameters and facial expressions can be evaluated at the same time that the participants watch each film clip, and the subjective emotional response is evaluated immediately after each film clip. A example of an event sequence is shown in Fig. 4.

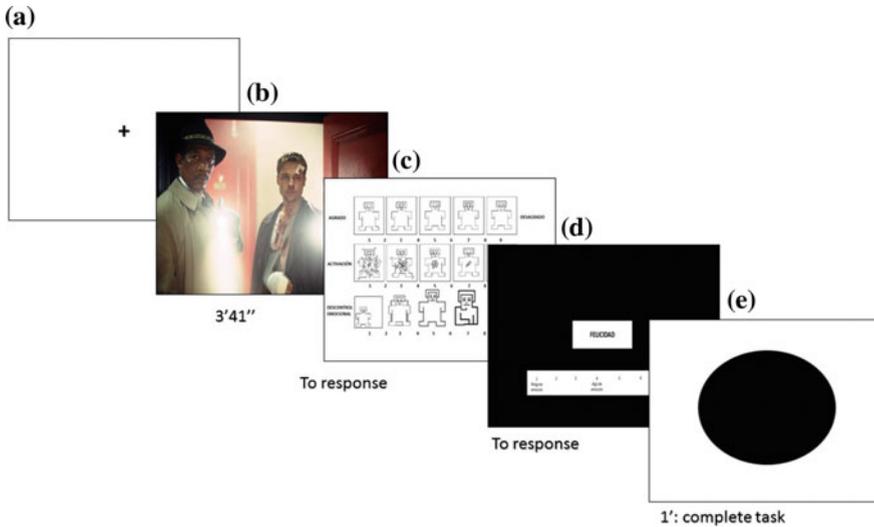


Fig. 4 Sequence of one event

## 4 Initial Results and Conclusions

As described before, fifteen volunteers were recruited at Albacete School of Medicine, Universidad de Castilla-La Mancha, Spain, to take part in the pilot test. The initial results suggest that films are a good method to elicit different emotion states. Also, the wristband and the camera are good tools to measure key parameters in basic emotions. Although the number of participants is small to draw clear conclusions, we believe that there is some evidence about general tendencies related to the results obtained from physiological and psychological responses.

This article has described the first steps in the use of films to induce emotions. The objective of this study is to find solutions for regulating affect and thus improving the quality of life and care of ageing adults living at home. The initial results are complying with the goals of our running project related to the improvement of the elderly quality of life. For further progress, it is expected to significantly increase both the sample size and the inclusion of older people in the near future.

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