**Investigation article**

Effect of facial expression on decision making

Efecto de la expresión facial en la toma de decisiones

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Abstract

Sometimes we advise others persons on the decisions they should make, and we accept risks that would be modulated by cognitive and emotional variables. In order to analyze the role of the expressed emotion in this type of interactions, it was conducted an experiment in which the type of emotion (facial expression: joy vs. sadness) and the type of advice (health vs. financial) were manipulated in order to analyze their impact on risk-taking and confidence in the response. The subjects accepted less risk when the facial expression was sadness (vs. happiness) in the financial situations. The findings are discussed as part of the reciprocity process in social interaction, where emotional information could play an important modulating role.

Keywords: financial advice; emotion; facial expression; health advice; decision-making.

Resumen

En algunas ocasiones aconsejamos a otras personas sobre las decisiones que deben tomar y aceptamos riesgos que se verían modulados por variables cognitivas y emocionales. Con el objetivo de analizar el papel de la emoción expresada en este tipo de interacciones, se realizó un experimento en el que se manipuló el tipo de emoción (expresión facial: alegría vs. tristeza) y el tipo de consejo (salud vs. financiero) con el objetivo de analizar su

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impacto sobre el riesgo asumido y la confianza en la respuesta. Los participantes aceptaron menos riesgo cuando la expresión facial fue de tristeza (vs. alegría) en las situaciones financieras. Los resultados se discuten como parte del proceso de reciprocidad en la interacción social, en la que la información emocional podría desempeñar un papel modulador importante.

Palabras clave: consejos económicos; consejos de salud; emoción; expresión facial; toma de decisiones.

Introduction

The relationship between emotion and decision-making has been addressed from multiple perspectives ranging from philosophy (Solomon, 1993) through to neuroscience (Phelps et al., 2014). A study has been conducted of the neuronal and cognitive mechanisms that underpin this relationship within a social context in which decision-making involves mutual reciprocity; in other words, the options chosen within the context of social interaction are the consequence or antecedent of choices made by other people, thereby revealing the relationships between the brain and behaviour (Shaw et al., 2019). The ultimatum game is a good example of this kind of interaction and of the significant role emotions play (Tamarit & Sánchez, 2016). This game involves two individuals that have to split a sum of money. One of them decides the amount to be shared with the other, with the condition being that if the one receiving the offer does not accept, then neither of them will be given the money. The most obvious step is that the individual splitting the money will seek to take the bigger share; for example, by offering only 10% of the amount and keeping the rest. On the other hand, it seems equally obvious to expect that the person receiving the offer prefers to keep the 10% rather than refuse and be left with nothing. This may seem obvious, yet the results stray fairly significantly from these predictions; on the one hand, the most frequent offers are those that hover around parity (60%/40% or 50%/50%), and on the other, people receiving unequal proposals (90%/10%) tend to reject them (e.g., Debove et al., 2016). Some studies have reported the impact that an emotional expression has on these kinds of interactions. When the participants express their emotions at the same time as they propose how to split the money, there are fewer rejections than when they have to hide their emotions (Xiao & Houser, 2005). These studies therefore suggest that the expression of emotions plays a significant role by modulating human behaviour within the context of social interaction.

Attention has been paid in recent years to the risk assumed when we advise or make decisions for other people (e.g., Andersson et al., 2014; Vieider et al., 2016). On the one hand, making decisions for others involves deciding directly for other people. In this case, fewer risks are assumed than when making decisions for oneself, both in financial matters (Eriksen et al., 2020), and in healthcare (Batteux et al., 2019a). In turn, regarding the scenario in which the decision is to be made (loss or gain), fewer risks are assumed when we make decisions for other people in scenarios in which there is a probability of loss, even though they may be accompanied by gains (Batteux et al., 2019b).

On the other hand, giving advise means influencing the decision that someone else will make, with this type of interaction being very common in social relationships (Yaniv, 2004). Whenever we give advice, the risk assumed is determined by a series of variables, such as psychological distance and the subjective space we maintain with the recipient (Pronin et al., 2008). This psychological distance may be modulated by emotional intensity (Van Boven et al., 2010), which would in turn be affected by the nature of the decision (Batteux et al., 2019b); in other words, whether the recipient of the decision is an acquaintance or a stranger, a child or an adult, or a medical situation, where the consequences might endanger life, as opposed to a financial decision, in which social status might be jeopardised.

The emotion experienced when giving advice may also affect the risk assumed. Specifically, positive emotions lead to a global and heuristic processing of information, while negative emotions generate a more detailed and systematic processing (affect-as-information hypothesis; Schwarz & Clore, 1983; Clore, 1992). When someone experiences an emotional state of happiness, they will tend to base their decisions on the nature of the source emitting the message, and when they experience a feeling of sadness, they will focus more on the message's content.

All these studies find that we assume greater or lesser risk in the advice we give depending on different variables, such as the degree of involvement in the decision, psychological distance, subjective space, and the emotion experienced; nevertheless, there has not been any analysis to date on the effect that an emotional facial expression has on the risk assumed in giving advice. Within a process of social interplay in which one person advises another, the expression of happiness or sadness of the one asking for advice would lead to the imitation of that facial expression in the person perceiving it and gives to the advice (facial mimicry). This mimicry helps the person to experience that emotion (facial feedback hypothesis), conditioning one or other type of processing of the information (Heuristic-Systematic). Finally, the type of processing might condition the risk assumed in the advice.

The emotional expression would be imitated and experienced to some or other extent by the perceiver. For example, the perception of a smile on another person's face might trigger an image of the situation generating that emotion, which includes the affective experience, the physiological response, and the activation of the facial muscles (e.g., Achaibou et al., 2008; Likowski et al., 2012). As noted, this phenomenon is referred to as "facial mimicry" (Hess & Fischer, 2014). One of facial mimicry's functions involves understanding emotions (e.g., Niedenthal et al., 2001), whose explanation is rooted in the facial feedback hypothesis (Tomkins, 1962; Izard, 1990). When a facial expression is detected in another person, there is an involuntary tendency to mimic it. Such imitation has a significant impact on a person's affective state (facial feedback hypothesis).

The facial feedback hypothesis considers that the face's muscular feedback leads to the emotion that becomes conscious when the activation of the facial muscles sends sensorial feedback to the brain. It is thereby assumed that the facial muscles' sensorial feedback could significantly alter the emotional experience (Tomkins, 1962; Izard, 1990), with a minor effect (Coles et al., 2019). This assumption has been confirmed by subsequent studies (Mori & Mori, 2007, 2009), even when the emotional expression is inhibited or changed (Davis et al., 2009). According to this perspective, when we smile at someone, we may be inducing in them an expression of happiness (facial mimicry), and at the same time prompting an emotional experience of happiness though the facial musculature's feedback to the brain (facial feedback hypothesis; Adelmann & Zajonc, 1989). This process would be related to empathy, as the ability to understand other people's emotions (Drimalla et al., 2019).

According to this approach, if the person asking us for advice is smiling (should I invest in this business? Should I undergo this medical treatment?), the perceiver will feel happy, processing the information in a global and heuristic manner. The focus will be more on the source's characteristics, ignoring the message's content (the possible risks involved in the investment or medical treatment). By contrast, if the expression is one of sadness, the perceiver will feel sad and process the information in a more detailed and systematic manner, focusing on the message's content (weighing up the potential risks more carefully).

A further variable to be considered involves the trust in the decision made, because it has been linked to future confidence in similar decisions (Boldt et al., 2019). Accordingly, the detailed and systematic processing prompted by negative (vs positive) emotions is expected to give rise to a greater degree of certainty in the response, as the options are assessed in more depth. Based on the above, the facial expression of the person receiving the decision (advice) could play a significant role as a transmitter of emotion, contextualising the decision making, and may also condition the decision made (assumed risk). This assumption was tested by conducting an experiment in which the type of facial expression was altered (happiness vs. sadness), along with the type of issue (health or financial) upon which individuals should provide advice based on a series of options ranging from lesser to greater risk. The following hypothesis was formulated: H1: Less risk is assumed with more confidence in the response when the facial expression is one of sadness (vs. happiness), in both health and financial matters. These hypotheses are explained by the type of information processing (heuristic vs systematic) that the facial expression generates (happiness vs sadness) in contexts of uncertainty and risk (financial and health).

Method

Participants
The sample consisted of 210 participants aged between 18 and 60 (M = 26.72, SD = 11.63, 71.7 % women). The sample was selected by convenience sampling among the students in the

first years of the Psychology Degree. The snowball sampling technique was used to ensure the cohort was large enough and involved students in their first years, who were studying psychology at the Zaragoza Faculty of Higher Studies (Mexico).

Instruments

Eight photographs expressing happiness and sadness were used (four models, two men and two women) obtained from the NimStim Face Stimulus Set database (Tottenham et al., 2009). Four of the photographs expressed happiness, and four sadness. Two situations were conformed on which subjects should issue advice. One of the situations was about health, and the other about money (financial).

Procedure

The task was conducted through the Google survey platform. Previously, all participants were informed in class about the environmental conditions required for the experiment. Specifically, they were told that they had to answer the questionnaire in a place where there was as little noise as possible and that they had to do it without interruptions. Participants should give advice on two situations that were presented to them, and that referred to a couple (a man and a woman), whose photographs appeared at the same time as the situation was presented in writing (at the top). The situations were counterbalanced by participant. The same photographs appeared in both conditions; however, in one condition the facial expressions were of sadness, and in the other the expressions were of happiness. All participants had to answer the two situations, which varied in the order of presentation in each participant. The situations and options are presented below (Figure 1).

Health advice (expressions of happiness vs. sadness)

One of de members of this couple has to undergo surgey. Doctors have proposed six types of procedures with a series of associated risk. What would you advise them? Choose one of the options that we present in the drop-down.

A: 60% probability of dying during surgey and 40% successful living up to 5 more years
B: 65% probability of dying during surgey and 35% successful living up to 10 more years
C: 70% probability of dying during surgey and 30% successful living up to 15 more years
D: 75% probability of dying during surgey and 25% successful living up to 20 more years
E: 80% probability of dying during surgey and 20% successful living up to 25 more years
F: 85% probability of dying during surgey and 15% successful living up to 30 more years

To what degree are you sure of your advice?
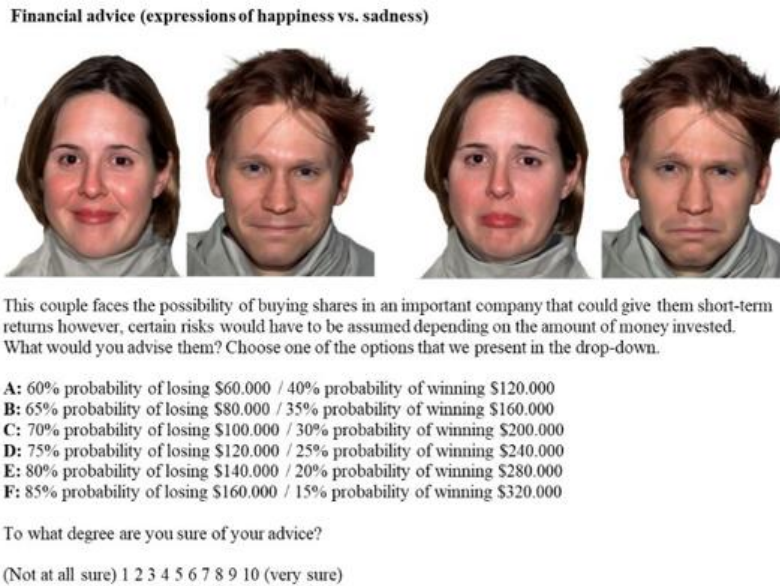
(Not at all sure) 1 2 3 4 5 6 7 8 9 10 (very sure)

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Figure 1. Situations and options used in the experimental procedure.

Ethical Approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical. Prior to their participation in the study, all respondents provided informed consent.

Data analysis

First, descriptive analyses were performed of the variables 'assumed risk' and 'confidence in the response' for the groups (happiness vs. sadness). Subsequently, an exploratory analysis was performed on the distribution of the data, and the normality criteria were not met (Kolmogorov-Smirnov, $p < .05$), so a non-parametric analysis was performed, specifically applying the Mann-Whitney U test to analyse the differences between the groups (happiness vs. sadness), and the Wilcoxon signed-rank test to analyse the differences within the groups. No differences were found between the groups (facial expressions of happiness vs. sadness) in age ($z = -.55$, $p = .580$, $r = .04$) and gender ($X^2 = .60$, $p = .438$, $V = .05$).

Results

Descriptive analysis

Analyses show high values for response confidence (> 6.5), and low values for assumed risk (< 3) (see Table 1 and Figure 2) in both condition of happiness and sadness.

Table 1. Descriptive of the experimental conditions.

	Happiness (*n* = 105)			Sadness (*n* = 105)		
	M	**SD**	**CI (95%)**	**M**	**SD**	**CI (95%)**
Health_Assumed risk	2.84	1.67	2.52-3.16	2.70	1.62	2.32-3.02
Health_Confidence	6.85	2.27	6.41-7.29	6.80	2.14	6.39-7.21
Financial_Assumed risk	1.88	1.40	1.61-2.15	1.48	1.07	1.27-1.68
Financial_Confidence	7.10	2.21	6.67-7.52	7.55	2.13	7.14-7.96
Total_Assumed risk	2.36	1.15	2.13-2.58	1.35	2.06	6.57-7.37
Total_Confidence	6.98	1.10	1.88-2.30	7.18	1.92	6.81-7.55
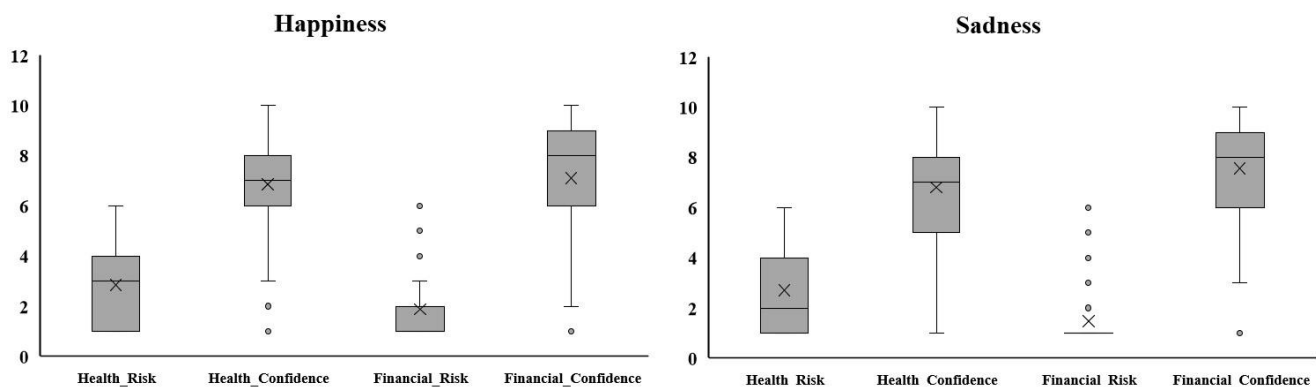
Figure 2. Distribution of the values in the different experimental conditions.

Experimental analysis

In general terms, taking into account the average values of the two situations presented, no differences appeared between the condition of happiness and sadness in the assumed risk (z = -1.84, p = .066, r = .13). Considering the situations separately, no differences were observed in the assumed risk in the health situation between the expressions of happiness and sadness (z = -.56, p = .573, r = .04), but yes in the financial one (z = -2.31, p = .021, r = .16). Differences were also found between the risk assumed in the health situation with respect to the financial one (z = -7.64, p < .001, r = .53). The results show that, the subjects assume less risk in their advice when the facial expression is one of sadness, compared to when it is of happiness in the financial situation (see Figure 3).

In general terms, taking into account the average values of the two situations presented, no differences appeared between the condition of happiness and sadness in the confidence in the response (z = -.58, p = .564, r = .04). Considering the situations separately, no differences were observed in the assumed risk in the health situation between the expressions of happiness and sadness (z = -.31, p = .758, r = .02), and financial one (z = -21.60, p = .110, r = .11). and in the confidence in the response (z = -4.31, p < .001, r = .30).

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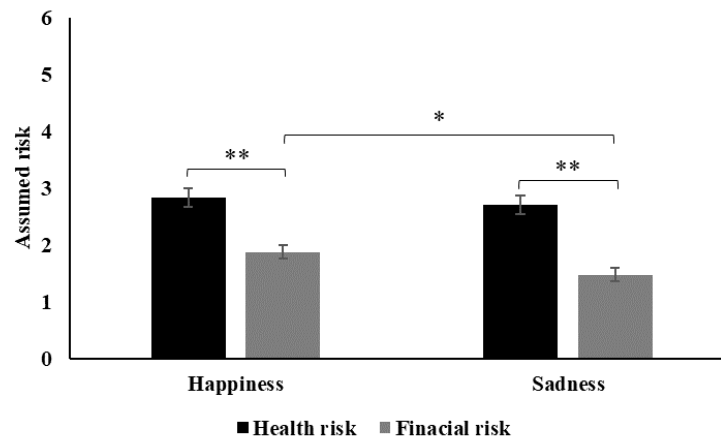
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Figure 3. Differences in the risk assumed in the interaction between situation (Heath, Financial) and group (happiness, sadness). *$p < .05$, **$p < .001$.

Discussion

This research set out to analyse the effect of a facial expression (happiness vs. sadness) on the decision-making process (advice) in two situations (health and financial). The results obtained led to the parcial acceptance of the hypothesis, inasmuch as the participants' facial expression of sadness (vs. happiness) meant they assumed fewer risks in the decision-making process only in the case of financial advice, and not regarding health. The advice provided on health is not affected by the type of facial expression. This probably involves variables that condition the sensitivity each one of them has to the effects found, such as the level of seriousness, uncertainty, and activation or emotionality that the situation's actual content generates. The decisions made within a healthcare context tend to entail a significant risk to wellbeing, which could lead to a certain dismissal of emotional signals, which would explain why facial expressions in this study do not affect the risk assumed in health-related advice.

In this sense, the scientific literature shows that in the health context, doctors show greater risk aversion when they make decisions for other people (patients), compared to when they make them for themselves (García-Retamero et al., 2012; Zikmund-Fisher et al., 2006). However, in the financial context the results are less consistent. Some research shows greater risk aversion in the financial context when decisions are made by others (e.g., Eriksen, 2010; Fernandez-Duque & Wifall, 2010), while other research finds the opposite (e.g., Ziegler & Tunney, 2015; Pollmann et al., 2014), or show no differences (Benjamin & Robbins, 2007; Stone et al., 2002). The results obtained in this research show that fewer risks are assumed in a financial context when the facial expression is sad (vs. happy). This evidence the modulating role of emotional expression when advising another person.

This research's findings reflect the interaction between reason and emotion in decision making, which has a clear neural substrate. The involvement of two brain systems has been considered in decision-making; one based on emotions, which would be the precursor in evolutionary terms, and a second system involving reasoning (Rolls, 2019). The interaction between both systems would be determining the decision's final outcome. This research addresses the first of these two systems when it alters the variable of emotional facial expression, and the second one when it considers situations in which the individual has to choose between several options that vary in terms of the level of risk assumed. The results show that emotional expression could be modulating the risk assumed by the person giving the advice.

This study has limitations: Firstly, the research's internal control needs to be reinforced, with face-to-face data gathering, and include control groups (neutral expression and no facial expression). Moreover, the situations used need to have been validated beforehand and controlled levels set in the grading of the options in the levels of risk, with controlled differences in the seriousness of the situations presented. In addition, the number of stimuli (facial expressions) should be increased to attenuate the effects of the morphological characteristics of the face on the results. Finally, given an emotional state's importance in the interpretation of the results, measures need to be applied to the participants regarding their emotional state in order to analyse this variable's explanatory power over the results. All these limitations must be taken into account to interpret the results, because they can modify the emotion experienced by the participant when giving advice. This is relevant because the emotion experienced is the explanatory basis of the effects found.

Conclusions

Our findings prompt the following conclusions: a) Non-verbal variables, such as facial expression, could play a significant role in social decisions that involve a direct relationship between people; b) This effect could be mediated by the impact of the emotion expressed on the emotional experience of the person giving the advice (facial mimicry and facial feedback); c) The type of advice is a key variable that requires studies to determine the variables in a given situation that condition its effect on the recommended decision (e.g., level of seriousness, level of uncertainty, type of situation, number of options, direction of the options, and psychological distance); d) In situations in which the information's content is clear and provides sufficient information for choosing the most advantageous option, the emotionality expressed might not have a significant impact on the decision-making; nevertheless, ambiguity and uncertainty might prevail when we ask another person for advice, whereby the emotionality expressed would play the part of seeking consistency between the emotional preference of the person seeking the advice and the advice given; e) Instances of health advice seem to be less sensitive to the effects of emotional expression; f) the scientific literature does not clearly distinguish between the terms "making decisions for others" and "giving advice". The differences lie in the individual's involvement in the consequences of the decision. This involvement will be greater when decisions are made for other people (vs giving advice). The modulating role of variables

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such as psychological distance and subjective space may therefore differ; g) finally, the results have a clear impact in financial matters, inasmuch as the rationality required when assessing different options may be affected by the emotional expression of someone asking for financial advice.

Future lines of research Emotion's effect on advice may well be modulated by the variables mentioned earlier, such as psychological distance and subjective space (Batteux et al., 2019b; Pronin et al., 2008). Although this research has focused on facial expressions and the nature of the context, future studies should seek to integrate all these variables into an explanatory model that predicts the direction and intensity of advice in such complex matters as finances and health. Finally, it would be pertinent to analyse the effect of a facial expression (happiness, sadness, fear, anger, disgust, surprise), with different levels of intensity (low, medium, high), on processes of financial interplay, such as the one involved in the ultimatum game. In this game, the paths of heuristic and systematic processing generated by the facial expression may be determining the risk assumed, and therefore conditioning the financial interplay.

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