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**Lie for me: how empathy, alexithymia and emotional intelligence influence the ability to conform facial expression to a prosocial untrue verbal message**

**Menti per me: come l'empatia, l'alessitimia e l'intelligenza emotiva influenzano la capacità di adattare le espressioni facciali quando si pronuncia una bugia prosociale**

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## Abstract

The aim of this work was to investigate the association between emotional variables (empathy, emotional intelligence, alexithymia) and lying skills. The hypothesis was that a higher emotional competence was associated to a better ability to lie. In an experimental setting, thirty-four participants were videotaped in two separate sessions: the first in which they were telling the truth and the second in which, motivated by a social and empathical intention, they were lying about some emotionally arousing images they viewed. Moreover, all participants filled three self-report questionnaires: The 20-Item Toronto Alexithymia Scale, The Interpersonal Reactivity Index and The Trait Emotional Intelligence Questionnaire Short Form. The coding of facial responses was carried out using the Facial Action Coding System. The findings suggested that emotional competence is associated with the ability to lie and to conform facial expression to a prosocial untrue statement. Conversely, individuals with higher levels of alexithymia and lower emotional ability manifested more markers of discomfort as facial manipulators in lying, other than inconsistencies in verbal/nonverbal messages even telling the truth, probably due to their difficulties to identify and express emotions.

**Keywords:** facial expression; alexithymia; empathy; emotional intelligence; white lie; prosocial behavior.

## Riassunto

Lo scopo di questo lavoro era di indagare l'associazione tra specifiche variabili emotive (empatia, intelligenza emotiva, alessitimia) e l'abilità di mentire. L'ipotesi era che una maggiore competenza emotiva fosse associata a una migliore capacità di mentire. La procedura sperimentale prevedeva che i trentaquattro partecipanti fossero video-ripresi in due sessioni separate: la prima in cui rispondevano sinceramente e la seconda in cui, motivati da un'intenzione sociale ed empatica, mentivano in merito ad alcune immagini a contenuto emotivo che hanno visto in precedenza. Inoltre, ai partecipanti sono stati somministrati la Toronto Alexithymia Scale-20, l'Interpersonal Reactivity Index e il Trait Emotional Intelligence Questionnaire Short Form. La video codifica delle espressioni facciali è stata effettuata utilizzando il Facial Action Coding System. I risultati suggerivano che un'elevata competenza emotiva sia associata alla capacità di mentire e di conformare l'espressione facciale durante una menzogna prosociale. Al contrario, durante la menzogna, gli individui con livelli più alti di alessitimia e più bassa capacità emotiva hanno manifestato più elementi di disagio non verbale; mentre durante la situazione di verità mostravano più incoerenze tra i messaggi verbali e non verbali, probabilmente a causa della specifica difficoltà a identificare ed esprimere le emozioni.

**Parole chiave:** espressione facciale; alessitimia; empatia; intelligenza emotiva; bugia bianca; comportamento prosociale.

## Introduction

Since Palo Alto group listed their axioms of communication (Watzlawick, Beavin, Jackson, 1967), literature acknowledged the fundamental role of nonverbal messages in confirming or not what we say: these are implicit affective and emotional information given from facial expression, gestures and voice (Knapp & Hall, 2005). Several cross-cultural studies have led to the recognition of facial expressions of emotion, demonstrating the universality of seven emotions (anger, contempt, disgust, fear, happiness, sadness and surprise) expressed through rapid muscular contractions on the face (Ekman, Sorenson & Friesen, 1969; Ekman, 1973; Izard, 1971). People acquire vital information by recognizing others' facial expressions. Accurate identification of this visual information allows individuals to predict incoming social events and respond to them (Isaacowitz et al., 2007). The important capability to infer others' emotions affects the social behavior (Guarnera et al., 2015). The ability to infer other's emotions is a part of the emotional intelligence (Goleman, 1995), known as the ability to monitor one's own and others' sensations, discriminate between emotions and use them in order to guide thoughts and actions (Salovey & Mayer 1990) and it represents a key factor in understanding the variety and complexity of the individual's behaviors, in several contexts (Rullo et al, 2015). Researches have often focused on the role of empathy and emotional intelligence in producing social behaviors, such as in increasing the ability to detect lie (DesJardins & Hodges, 2015; O'Sullivan, 2005; Wojciechowski, Stolarski & Matthews, 2014). However, the effect of the emotional competences on lying skills is poorly investigated. There is a close evolutionary link between empathy and deception (de Waal, 1992; Bubandt, 2015; Porter et al., 2011). Deception, defined as the projection – to own or other's advantage – of an inaccurate or false image into others, requires basic forms of empathy to imagine how others see and experience the world (Bubandt, 2015; Talwar & Lee, 2008) and it is an important evolutive socio-cognitive achievement during the child development (Baron-Cohen et al., 2005). A recent study showed that having more empathy and compassion increase prosocial lying (Lupoli et al., 2017). Expressive and socially tactful subjects are more successful deceivers than socially anxious ones (Riggio et al., 1987), and both emotional intelligence and psychopathy were associated with the ability to lie (Porter et al., 2011). People highly empathic, able to read others' emotions, may have greater control over their own expressions. Specifically, individuals with higher levels of emotional intelligence feigned emotions more convincingly and maintain these displays for longer than others (Porter et al., 2011). On the other hand, the inability to experiencing, processing and manifesting own emotions could be associated with difficulties in recognizing others' emotional facial expressions (Lane et al., 1996; Parker et al. 1993; Grynberg et al., 2012) and with poor nonverbal expressivity (Troisi et al., 1996). Taylor, Bagby, and Parker (1997) used the term alexithymia (ethimologically meaning “no words for mood”) to describe this subclinical difficulty, characterized by impairments in identifying and expressing feelings and externally oriented thinking. A previous study reported that there is an inverse correlation between alexithymia and

prosocial behaviors. Specifically, students with higher levels of alexithymia seem to present themselves in less socially desirable ways, probably because their difficulty in identifying the own and the other's emotions (Messina et al., 2010). Previous studies reported that alexithymic people showed also poor non-verbal expressivity (Wagner and Lee, 2008; Troisi et al., 1996), less emotional intelligence (Lumley et al., 2005) and less empathy (Grynberg et al., 2010; Moriguchi et al. 2007).

Generally, when people lie, the facial cues may not match the meaning of the pronounced words (Porter & ten Brinke, 2008). The liar can simulate facial expressions, mask an emotion felt with a different emotional expression or try to neutralize an emotion felt with a neutral expression (Ekman & Friesen, 1971). Darwin's (1872) inhibition hypothesis suggested that facial actions may be produced involuntarily even if the individual is trying to control them. Whereas macro expressions last from ½ to 4 seconds and involve the entire face without reason to be concealed, micro expressions are so fast (less than ½ second) that most people cannot recognize them in real time, and occur for a conscious effort of dissimulation or as a product of repression if the subject is not aware of the emotion he is experiencing (Ekman, 2003). New researches distinguished subtle expressions from micro expressions, because these could be a more accurate tool in detecting deception (Warren, Schertler & Bull, 2009). Ekman (1985) has firstly argued that the deceptive emotional information is leaked by micro expressions, and through them is possible to indirectly detect the hidden emotions (Caso et al., 2019). Even though this intuition has been very popular, there is a lack of scientific research that proves its validity (Vrij et al, 2019). Micro expressions are not characterized by duration, but by asymmetry and low intensity. It is interesting that the ability to feigned emotions more convincingly, shown by people with high levels of empathy, did not eliminate emotional *leakage*: although they are better at simulating false emotions, they were not better at concealing felt emotions (Porter et al., 2011). The *leakage* of the real emotion commonly appears only in the upper part of the face (Porter et al., 2011): for example, false smile could not involve muscles around the eyes (Mondal et al., 2016). Emotional and doubt inconsistencies may occur as clues of deception, probably due to the real emotions coming up through micro expressions, before the individual become fully aware of them and can squelch them (Ekman & Friesen, 1969) or mask them (Warren, Schertler & Bull, 2009; Ekman & Friesen, 1969). Other clues of emotional activation can emerge in facial expressions, but also in motor gestural and postural movements, betraying discomfort about the deception (Ekman, 2004): these major forms of *leakage* are known as manipulators. Manipulators are face and body movements as pressing, licking, sucking, or holding, touching, and serve the purpose of self-reassurance (Ekamn & Friesen, 1969). However, manipulators only indicate an emotional activation, but do not define the type of emotion. The people differ in their favorite manipulator and in the frequency with which they show it (Larrazabal & Perez Miranda, 2004). Previous studies reported that participants scoring high on empathy displayed longer manipulators during deceptive emotions (Porter et al., 2011; Malterer et al., 2008).

The purpose of the present study was to investigate the association between the emotional competences (empathy, emotional intelligence, alexithymia) and the lying skills, in a

condition of prosocial lie. The lying skills are considered as the ability in controlling facial activity, resulting in inconsistencies in verbal/nonverbal messages and manifestations of discomfort due to deception (manipulators). The hypothesis was that a higher emotional competence was associated to a better ability to lie; therefore, a higher level of empathy and emotional intelligence and lower levels of alexithymia were expected to be associated to a higher presence of manipulators and lower inconsistencies in verbal/non-verbal messages.

## Method

### *Participants*

Forty-one subjects: 34 completed the study protocol following all the requested steps, 2 of them decide to not to lie when requested, 5 of them understood the study aim. Six men and twenty-eight women were enrolled. The mean age was 20 to 34 years ( $M=23.37$ ;  $SD=2.68$ ). Participants were undergraduate students of the faculty of Psychology and Nursing Science, Sapienza University of Rome. The inclusion criteria were age > 18; absence of neurological, psychiatric and cognitive diseases; absence of any scar affecting the emotional expressions; and absence of drugs intaking. Participants were enrolled on voluntary and informed participation.

### *Procedure*

The present study was approved by Ethical Committee of Dynamic and Clinical Psychology Department, Sapienza - University of Rome. The experimental procedure was carried out as follows:

The experimenter 1 (master's degree student) welcomed the participant in the experimental room and administered the three psychological questionnaire (*Toronto Alexithymia Scale-20*; *Interpersonal Reactivity Index*; *Trait Emotional Intelligence Questionnaire Short Form*) to the her/him before to start the experimental task. After that, the experimenter 1 introduced the experimenter 2 to the participant, clearly clarifying the role of the experimenter 2 as senior research assistant.

Subsequently, the experimenter 2 went out from the room and the experimenter 1 invited the participant to sit in front of a laptop. A power point task, consisting of 5 images (lasting 5 second each) with negative emotional content (sadness and disgust), were presented. Those images were chosen from the International affective Picture System (Lang et al., 2005).

Then, the experimenter 1 invited the participant to sit in front of a camera focused on his/her face to be recorded during an interview (Interview 1 – Truth context). The participant was asked to classify all the images previously presented on a bipolar 7-point scale (from -7 to +7 and 0 as neutral value) of opposite emotions (anguish/serenity, sadness/happiness, negativity/positivity, disgust/pleasure) and to report a qualitative description of the images and of the emotions felt during the images presentation.

Successively, experimenter 2 came into the experimental room asking to experimenter 1 whether the participant had seen the power point “set 1” about positive images, making his voice clearly audible to the participant and with a decisive tone. The experimenter 1 answered positively and the experimenter 2, after advising the participant he would come back in five minutes for a second interview, left the room. At this point, the experimenter 1 remained alone with the participant and told to her/him the following sentence: “probably I made a mistake, could you declare in the interview with the experimenter 2 that you have seen positive images instead negative ones?” (This part of the project was carried out in order to make the participants available to lie for prosocial purposes). After receiving the participant's answer, the experimenter 1 apologized again for the inconvenience and left the room.

Three minutes later, the experimenter 2 entered into the room to ask the participant to fill the bipolar 7-point scale and to answer to the same questions about the power point images as the first interview (qualitative description of the images and of the emotions felt in viewing them). The use of the same interview protocol was explained to the participant as necessary in order to assess his emotional state after 5 minutes (Interview 2 – Lie context). In this phase, the participants could decide to lie selflessly (telling experimenter 2 they have seen positive images), or to not to lie (telling the experimenter 2 they have seen negative images). All this phase was recorded focusing the camera on the participant face. At the end of the experimental procedure, the participant was conducted in another room and the experimenters revealed and explained the aim of the research. This part was carefully carried out by the experimenter 2 who was a qualified psychologist.

### *Emotional expression analysis*

The emotional expressions were analyzed using the Facial Action Coding System (FACS; Ekman & Friesen, 1978; Ekman, Friesen, & Hager, 2002) and the Emotion Facial Action Coding System (EMFACS, Ekman & Friesen, 1982). The FACS is a system of coding for the facial movements, while EMFACS describes expressions of essential emotions.

*Facial Action Coding System (FACS)*. The FACS is a classification system that measures the facial activity according to the anatomical and physiological components and it can be used when an emotion is so fleeting that individuals may not be conscious of it (micro expressions), or when they try to hide the real emotion producing subtle expressions (Cowell & Ayesh, 2004), as well as when they are conscious of own facial emotional expressions (macro expressions). This method is designed to measure all of the units of action (AUs) that the facial muscles can produce (Tian et al., 2003). The AUs may occur singly or in combination (configurations of facial expression). 7000 of these combinations, have been observed (Scherer and Ekman, 1982) and each of them has both a numerical and verbal label and specific anatomical basis in one or more facial muscles. Combinations of AUs that occur may be additive or non-additive. In the additive combinations the AUs are independent: AUs do not interfere with each other. In the non-additive combinations one AUs

interfere with the appearance of the other AUs. For the AUs, the description of muscle movements is done by dividing the face into two parts: the upper and the lower one, from the nose to the chin. For each AUs, it is possible to indicate the duration, intensity and asymmetry or bilateral action. It is also considered the start, the peak and the end. The intensity of each AU is shown on a 5-point scale from A (trace) to E (maximum) (Ekman, 1978), and the letter must be put after the number (for example 12A).

In the present study were considered only the AUs combinations present in each frame ( $\pm 0.04$  s) and when more than one AU was present, they have been listed in ascending order.

In Table 1 are shown the AUs considered useful to investigate the hypothesis of the present study.

Tab. 1. Action Units (AUs) used in the present study (adapted from Ekman, Friesen and Hager, 2002)

AU	Name	Muscular Basis
1	Inner Brow Raiser	Frontalis, Pars Medialis
2	Outer Brow Raiser	Frontalis, Pars Lateralis
4	Brow Lowerer	Depressor Glabellae, Depressor Supercilli, Corrugator
5	Upper Lid Raiser	Levator Palpebrae Superioris
6	Cheek Raiser	Orbicularis Oculi, Pars Orbitalis
7	Lid Tightener	Orbicularis Oculi, Pars Palpebralis
8	Lips Toward Each Other	Orbicularis Oris
9	Nose Wrinkler	Levator Labii Superioris, Alaeque Nasi
10	Upper Lip Raiser	Levator Labii Superioris, Caput Infraorbitalis
11	Nasolabial Furrow Deepener	Zygomatic Minor
12	Lip Corner Puller	Zygomatic Major
13	Cheek Puffet	Caninus
14	Dimpler	Buccinator
15	Lip Corner Depressor	Triangularis
16	Lower Lip Depressor	Depressor Labii
17	Chin Raiser	Mentalis
18	Lip Puckerer	Incisivii Labii Superioris; Incisivii Labii inferioris
20	Lip Stretcher	Risorius
22	Lip Funneler	Orbicularis Oris
23	Lip Tightner	Orbicularis Oris
24	Lip Pressor	Orbicularis Oris
25	Lips Part	Depressor Labii, or Relaxation of mentalis or Orbicularis Oris
26	Jaw Drop	Maseter, Temporal and Internal Pterygoid Relaxed
27	Mouth stretch	Pterygoids, Digastric

AU	Name	Muscular Basis
28	Lip Suck	Orbicularis Oris
38	Nostril Dilator	Nasalis, Pars Alaris
39	Nostril Compressor	Nasalis, Pars Transversa and Depressor Septi Nasi
43	Eyes Closed	Relaxation of Levator Palpebrae Superioris
45	Blink	Relaxation of Levator Palpebrae and Contraction of Orbicularis Oculi, Pars Palpebralis
46	Wink	Orbicularis Oculi

Furthermore, the FACS considers also the Action Description (AD), actions that do not configure specific identifiable behavior. The combinations of AU and AD allow to code the *manipulators*. Manipulators are face and body movements in some pressing, licking, sucking etc., that serve the purpose of self-reassurance (Ekman & Friesen, 1969). These gestures are not an indication of lies because only indicate the presence of an emotional activation, but do not define the type of emotion (DePaulo et al., 2003). People differ in their favored manipulator and in the frequency with which they show these behaviors (Larrazabal and Perez Miranda, 2004).

In the present study, in order to coding the manipulators, were considered only four AD, in association with three Action Units (AUs): AD 32 (Lip bite), AD 28 (Lip suck), AD 37 (Lips wipe), AD 36 (Tounge bulge), AU 23 (Lip tightener), AU 24 (Lip pressor), AU 14 (Dimpler). Scratching body parts with fingernails or fingertips (head, neck or arms) it is not considered as a manipulator, because this behavior is coded with other AUs and is interpreted as social contempt and not as manipulator.

Furthermore, in the present study the coding of the expression was focused on the incongruent movements between the verbal and the nonverbal behavior. The presence of incongruities was codified each time when verbal expression was in opposition with the face and/or body expression. Conversely, in the congruent message the communication channels (nonverbal and verbal) are in the same direction. For such purpose, in the present study, in addition to the face expressions the verbal message has been considered, highlighting *emotional inconsistencies*, *incongruities of doubt* and total incongruities.

The *emotional incongruities* were codified when the emotional expression was not congruent with the verbal expression. For example, the participant says (verbal expression) to experimenter: "The images represent happiness" and in the meantime on his face there is a combination of AU1+4+15+17 (non-verbal face expression) that represents the sadness.

The *incongruities of doubt* were scored when the facial expression of uncertainty is not justified by the verbal expression (for example, there were facial expression of uncertainty, but the participant does not pronounce any word of doubt, e.g. "I do not know" – "Maybe" – "Probably").

The *total inconsistencies* variable was obtained arithmetical adding the *incongruities of doubt* with the *emotional incongruities*.

*Emotion Facial Action Coding System (EMFACS)*. The EMFACS is a coding system based on FACS for scoring

expressions (Ekman and Friesen, 1986), in which are described only the events of the face (AU or combinations of AUs) that are important to encode emotion. The EMFACS describes expressions of six families of emotions: happiness, sadness, anger, disgust, surprise and fear. Each emotion could result from different combination of AUs (e.g. sadness = 1+4+11+15B with or without 54+64).

### Video analysis

For the analysis of the video recordings, the Elan 4.6.2 software was used. Two certified FACS coders, blinded to the research hypothesis, examined each frame (duration 0.04 s) of Interview 1 and Interview 2 videotaped clips, to detect presence, duration, intensity and symmetry of every movement in the upper/lower facial regions. Each coder performed the FACS coding training, gathering the 90% of concordance with the FACS supervisor. All the frames were codified simultaneously by both the coders, reaching an agreement related to each frame.

181.800 frames were coded. Attention was paid to code micro and subtle expressions as inconsistencies in verbal and in nonverbal messages (90 inconsistencies were found in Interview 1 and 131 in Interview 2). Facial manipulators

were captured and reported (83 in Interview 1 and 85 in Interview 2).

### Measures

The participants were also asked to complete three self-report questionnaires:

The Italian version of *Toronto Alexithymia Scale-20* (TAS-20), a self-report instrument rated on a 5-point Likert-type scale that provides an index of alexithymia (Bagby et al., 1994; Bressi et al., 1996). The TAS-20 measure also 3 factors of the construct: difficulty identifying feelings (F1); difficulty describing feelings (F2); and externally oriented thinking (F3).

The Italian version of the *Interpersonal Reactivity Index* (IRI; Davis, 1980, 1983; Albiro et al., 2006). The questionnaire is composed by 28-items based on a 5-point Likert scale. The subscales represent facets of empathy: Perspective Taking, Fantasy, Empathic Concern, Personal Distress.

The Italian version of *Trait Emotional Intelligence Questionnaire Short Form* (TEIQue-SF – Petrides & Furnham, 2006; Di Fabio & Palazzeschi, 2011), short form of TEIQue (Petrides, 2001). TEIQue-SF is a 30-items questionnaire characterized by 7-point Likert-type scale measuring trait emotional intelligence tapping four factors: well-being, self-control, emotionality and sociability.

**Tab. 2.** Descriptive analyses (mean±standard deviation) and correlational analyses (Pearson's *r*) among all the variables (Toronto Alexithymia Scale 20-TAS-20; Interpersonal Reactivity Index-IRI; Trait Emotional Intelligence Questionnaire Short Form- TEIQue-SF). (n=32)

	M±SD	1	2	3	4	5	6	7	8	9	10	11	12	13
1.TAS-20-F1	13.2±5.1		.58***	.03	.86***	.08	.17	-.17	.55***	-.34	-.49**	-.34	-.23	-.48**
2.TAS-20-F2	11.1±4.3	.58***		-.07	.79***	.34	.08	-.07	.61***	-.14	-.17	-.57***	-.30	-.41*
3.TAS-20-F3	14.1±3.1	.02	-.07		.34	-.18	-.10	-.16	.25	-.07	-.30	-.46**	-.37*	-.36*
4.TAS-20-Tot	38.3±8.8	.86***	.79***	.34		.15	.10	-.19	.70***	-.28	-.48**	-.64***	-.41*	-.61***
5.IRI-F	18.6±4.0	.08	.34	-.18	.15		.50**	.02	.17	.06	.11	.08	.04	.08
6.IRI-EC	21.4±3.5	.17	.08	-.10	.10	.50**		-.02	.15	-.14	-.18	.15	.02	-.003
7.IRI-PT	20.1±2.8	-.17	-.07	-.16	-.19	.02	-.02		-.29	.41*	.29	.30	.24	.42*
8.IRI-PD	11.6±4.1	.55***	.61***	.25	.70***	.17	.15	-.29		-.38*	-.52**	-.55***	-.50**	-.65***
9.TEIQue-WB	5.6± 0.9	-.34	-.14	-.07	-.28	.06	-.14	.41*	-.38*		.34*	.29	.43**	.69***
10.TEIQue-SC	4.3± 1.1	-.49**	-.17	-.30	-.48**	.11	-.18	.29	-.52**	.34*		.40*	.56***	.74***
11.TEIQue-E	5.6± 0.7	-.34	-.57***	-.46**	-.64***	.08	.15	.30	-.55***	.29	.40*		.53**	.72***
12.TEIQue-S	4.5± 1.1	-.23	-.30	-.37*	-.41*	.03	.02	.24	-.50**	.43*	.56***	.53**		.83***
13.TEIQue-Tot	5.1± 0.7	-.48**	-.41*	-.36*	-.61***	.08	-.00	.42*	-.65***	.69***	.74***	.72***	.83***	

*Note.* \* *p*-value<.05; \*\* *p*-value<.01; \*\*\**p*-value<.001. TAS-20: F1= difficulty identifying feelings; F2= difficulty describing feelings; F3= externally oriented thinking; IRI: F=Fantasy; EC=Empathic Concern; PT=Perspective taking; PD=Personal distress; TEIQue: WB=Wellbeing; SC=Self-Control; E=Emotionality; S=Sociability

### Data analysis

In order to assess the difference between the two conditions (situation of truth and situation of lie), the analyses of variance (ANOVAs) Condition (Situation of Lie *vs.* Situation of Truth) for each manifestations of discomfort (Inconsistencies doubt; Inconsistencies emotions; Manipulators) on each variable (Toronto Alexithymia Scale-20 (TAS-20); Interpersonal Reactivity Index (IRI); Trait Emotional Intelligence Questionnaire Short Form (TEIQue-SF)) have been performed.

Correlations (*Pearson r*) were performed in order to test the association between psychological characteristics (alexithymia, emotional intelligence, empathy) and inconsistencies of verbal and nonverbal language in the situation of truth (first interview). Correlations (*Pearson r*) were also performed in order to test the association between psychological characteristics (alexithymia, emotional intelligence, empathy) and inconsistencies of verbal and nonverbal language in the situation of lie (second interview). In order to avoid type 1 error, Bonferroni correction on correlational analyses was performed; accepted *p*-value for each correlational analysis on TAS-20 and on IRI was  $p < .01$  (0,05 divided *per* four subscale + one manifestation of discomfort); accepted *p*-value for each correlational analysis on TEIQue-SF was  $p < .008$  (0,05 divided *per* five subscale + one manifestation of discomfort).

The analyses were performed using software Statistica Statsoft (1995), version 5.1.

## Results

In Table 2 are reported the descriptive analyses and the correlational analyses (*Pearson's r*) among all the variables (Toronto Alexithymia Scale 20-TAS-20; Interpersonal Reactivity

Index-IRI; Trait Emotional Intelligence Questionnaire Short Form- TEIQue-SF.

In Table 3 are reported the descriptive analyses of the manifestations of discomfort (inconsistencies and manipulators) on the final sample ( $n=32$ ), during the situation of truth and the situations of lie.

Table 4 showed that the manifestations of discomfort due to deception were significantly different between the situation of truth and the situation of lie. Specifically, there were more inconsistencies doubt (on all the subscale of TAS-20, IRI and on the subscale “well-being” of the TEIQue-SF), more inconsistencies emotions (on the subscale “externally oriented thinking” and on the total of the TAS-20, and on the subscales “Fantasy” and “Empathic concern” of the IRI) and more manipulators (on all the subscale of TAS-20; on the subscales “Fantasy”, “Empathic concern”, “Perspective taking” of the IRI, and on the subscale “Emotionality” of the TEIQue-SF) in the situation of lie compared to the situation of truth.

As shown in Table 5, in the Truth Context, positive correlations between TAS-20-difficulty identifying feelings (TAS-20 F1) and Inconsistencies\_doubt ( $r=.055$ ;  $p=.001$ ), Inconsistencies\_emotions ( $r=.56$ ;  $p=.001$ ), Inconsistencies\_total ( $r=.59$ ;  $p=.000$ ) were found. Positive correlations between TAS-20-Total and Inconsistencies\_emotions ( $r=.53$ ;  $p=.001$ ), Inconsistencies\_total ( $r=.48$ ;  $p=.005$ ) were found.

As shown in Table 6, in the Lie Context, negative correlations between IRI-Fantasy and Inconsistencies\_emotions ( $r=-.51$ ;  $p=.002$ ); IRI-Empathic Concern and Inconsistencies\_emotions ( $r=-.47$ ;  $p=.006$ ) were found.

Table 7 showed results of the multiple regression models on the inconsistencies and manipulators in both the interviews with the psychological questionnaire as predictors. In the situation of truth, the models were significant for all the inconsistencies, while in the situation of lie, the model was significant only for the inconsistencies emotions.

**Tab. 3.** Descriptive analyses of the manifestations of discomfort (inconsistencies and manipulators) during the situation of truth and the situations of lie

	Mean±S.D.	Min	Max	Skewness	Kurtosis
Situation of Truth					
Inconsistencies doubt	1,03±1,44	0,00	7,65	3,30	14,49
Inconsistencies emotions	0,23±0,65	0,00	3,52	4,47	22,23
Inconsistencies_total (doubt+emotions)	1,26±1,97	0,00	11,18	4,34	22,03
Manipulators	1,12±1,00	0,00	4,70	1,65	4,06
Situation of Lie					
Inconsistencies doubt	2,43±2,02	0,00	7,71	1,00	0,41
Inconsistencies emotions	0,56±0,76	0,00	2,14	1,02	-0,47
Inconsistencies_total (doubt+emotions)	2,94±2,17	0,00	7,71	0,57	-0,67
Manipulators	1,87±1,47	0,00	6,66	1,09	2,11

**Tab. 4.** Analyses of variance (ANOVAs) Condition (Situation of Lie vs. Situation of Truth) for each manifestations of discomfort (Inconsistencies doubt; Inconsistencies emotions; Manipulators) on each variable (Toronto Alexithymia Scale-20 (TAS-20); Interpersonal Reactivity Index (IRI); Trait Emotional Intelligence Questionnaire Short Form (TEIQue-SF))

	Inconsistencies doubt	Post hoc	Inconsistencies emotions	Post hoc	Manipulators	Post hoc
TAS-20 Total	F(1,10)=16.81; p=.002	Lie>Truth	F(1,10)=12.45; p=.005	Lie>Truth	F(1,10)=9.31; p=.01	Lie>Truth
TAS-20 difficulty identifying feelings	F(1,19)=8.08; p=.01	Lie>Truth	F(1,19)=.08; p=.77		F(1,19)=7.36; p=.007	Lie>Truth
TAS-20 difficulty describing feelings	F(1,17)=7.62; p=.01	Lie>Truth	F(1,17)=.24; p=.63		F(1,17)=26.22; p=.00008	Lie>Truth
TAS-20 externally oriented thinking	F(1,20)=13.07; p=.002	Lie>Truth	F(1,20)=6.17; p=.02	Lie>Truth	F(1,20)=9.06; p=.007	Lie>Truth
IRI Fantasy	F(1,16)=9.96; p=.006	Lie>Truth	F(1,16)=11.26; p=.004	Lie>Truth	F(1,16)=6.65; p=.02	Lie>Truth
IRI Empathic concern	F(1,20)=10.51; p=.004	Lie>Truth	F(1,20)=12.22; p=.002	Lie>Truth	F(1,20)=9.07; p=.007	Lie>Truth
IRI Perspective taking	F(1,21)=11.08; p=.003	Lie>Truth	F(1,21)=1.64; p=.21		F(1,21)=6.90; p=.02	Lie>Truth
IRI Personal distress	F(1,18)=11.56; p=.003	Lie>Truth	F(1,18)=3.90; p=.06		F(1,18)=3.73; p=.07	
TEIQue-SF Total	F(1,30)=2.62; p=.12		F(1,30)=1.52; p=.23		F(1,30)=2.02; p=.16	
TEIQue-SF Well-being	F(1,30)=13.54; p=.006	Lie>Truth	F(1,30)=0.66; p=.42		F(1,30)=0.10; p=.75	
TEIQue-SF Self-control	F(1,30)=0.82; p=.37		F(1,30)=0.07; p=.79		F(1,30)=0.91; p=.35	
TEIQue-SF Emotionality	F(1,30)=2.02; p=.17		F(1,30)=3.44; p=.07		F(1,30)=9.24; p=.005	Lie>Truth
TEIQue-SF Sociability	F(1,30)=2.29; p=.14		F(1,30)=2.53; p=.12		F(1,30)=1.86; p=.18	

**Tab. 5.** Correlations (Pearson  $r$ ) between variables (Toronto Alexithymia Scale-20 (TAS-20); Interpersonal Reactivity Index (IRI); Trait Emotional Intelligence Questionnaire Short Form (TEIQue-SF) and inconsistencies and manipulators in the first interview (Situation of Truth)

	Inconsistencies_doubt: Situation of Truth	Inconsistencies_emotions: Situation of Truth	Inconsistencies_total (doubt+emotions): Situation of Truth	Manipulators: Situation of Truth
TAS-20 Total	$r = .42$	$r = .53^{**}$	$r = .48^*$	$r = .1856$
TAS-20 difficulty identifying feelings	$r = .55^{**}$	$r = .56^{**}$	$r = .59^{**}$	$r = .39$
TAS-20 difficulty describing feelings	$r = .20$	$r = .38$	$r = .28$	$r = -.07$
TAS-20 externally oriented thinking	$r = -.02$	$r = .04$	$r = -.00$	$r = -.01$
IRI Fantasy	$r = .06$	$r = .10$	$r = .08$	$r = -.04$
IRI Empathic concern	$r = -.02$	$r = .05$	$r = .00$	$r = .16$
IRI Perspective taking	$r = .01$	$r = .05$	$r = .02$	$r = -.11$
IRI Personal distress	$r = .15$	$r = .31$	$r = .21$	$r = .11$
TEIQue-SF Total	$r = -.17$	$r = -.06$	$r = -.15$	$r = -.03$
TEIQue-SF Well-being	$r = -.07$	$r = .09$	$r = -.01$	$r = -.09$
TEIQue-SF Self-control	$r = -.25$	$r = -.25$	$r = -.27$	$r = -.27$
TEIQue-SF Emotionality	$r = -.11$	$r = -.02$	$r = -.09$	$r = .12$
TEIQue-SF Sociability	$r = -.07$	$r = .02$	$r = -.04$	$r = .05$

Note. \*  $p$ -value<.01; \*\*  $p$ -value<.001

**Tab. 6.** Correlations (Pearson  $r$ ) between variables (Toronto Alexithymia Scale-20 (TAS-20); Interpersonal Reactivity Index (IRI); Trait Emotional Intelligence Questionnaire Short Form (TEIQue-SF) and inconsistencies and manipulators in the second interview (Situation of Lie)

	Inconsistencies_doubt: Situation of Lie	Inconsistencies_emotions: Situation of Lie	Inconsistencies_total (emotional + doubt): Situation of Lie	Manipulators: Situation of Lie
TAS-20 Total	$r = .16$	$r = .13$	$r = .1926$	$r = .47^*$
TAS-20 difficulty identifying feelings	$r = .21$	$r = .08$	$r = .2143$	$r = .48^*$
TAS-20 difficulty describing feelings	$r = -.00$	$r = .02$	$r = -.0100$	$r = .45^*$
TAS-20 externally oriented thinking	$r = .14$	$r = .20$	$r = .2118$	$r = -.11$
IRI Fantasy	$r = -.02$	$r = -.51^*$	$r = -.1738$	$r = .25$
IRI Empathic concern	$r = -.13$	$r = -.47^*$	$r = -.3016$	$r = .10$
IRI Perspective taking	$r = -.14$	$r = .01$	$r = -.1339$	$r = -.09$
IRI Personal distress	$r = -.01$	$r = .02$	$r = -.0129$	$r = .36$
TEIQue-SF Total	$r = -.29$	$r = -.24$	$r = -.3604$	$r = -.19$
TEIQue-SF Well-being	$r = -.40$	$r = -.01$	$r = -.3710$	$r = .06$
TEIQue-SF Self-control	$r = -.16$	$r = -.16$	$r = -.2253$	$r = -.22$
TEIQue-SF Emotionality	$r = -.23$	$r = -.33$	$r = -.3164$	$r = -.31$
TEIQue-SF Sociability	$r = -.14$	$r = -.20$	$r = -.2104$	$r = -.07$

Note. \*  $p$ -value < .01; \*\*  $p$ -value < .001

## Discussion

The main result of the present study is that people with high level of empathy and emotional intelligence showed less incongruences between pronounced words and the facial expression when they are asked to tell a prosocial lie. Referring to the theory of mind, this result could be explained by the higher ability of empathetical individuals in recognizing and understanding the others' state of mind, including their beliefs, desires and particularly emotions (Baron-Cohen et al., 2001). Emotional competence allows individuals to better know and recognize facial expressions of feelings and to manage them also when they are asked to reproduce them during a lie. Moreover, the negative correlations between IRI-Fantasy and the inconsistencies of the emotions found in the present study during the lie condition suggests that the emotional competences consent to imagine the expectations of the interlocutor and to act accordingly with them. It seems that a good level of empathy leads people to imagine and actually "feel" the emotions they are talking about (Moran, 1994). Furthermore, it could be that the prosocial motivation made the participant more prone to be helpful to another person, trying harder to lie congruently (Lupoli et al., 2017). The findings about the empathetic abilities were sustained also by the negative association between the emotional intelligence and the incongruence during the lie condition, confirming that having higher capacities in managing emotions and feelings could allow people to manage and mendaciously reproduce them.

Furthermore, high levels of alexithymia and personal distress in the *Interpersonal Reactivity Index* scale were associated with more manipulators in the lying situation. It could be possible that alexithymic peoples' difficulty in differentiating emotions affect the ability to produce them through facial expression, especially in a deceptive contest in which the person is not feeling the emotion but is asked to only image it. The positive association between the personal distress and the manipulators could be expression of the feelings of personal anxiety and tension in the interpersonal settings (Davis, 1980).

On the other hand, coherently with previous studies (Wagner and Lee, 2008; Troisi et al., 1996), the results showed that the difficulty in identifying feelings was positively associated with the incongruences when people is telling the true (Wagner and Lee, 2008). This finding could suggest that alexithymic traits interfere, not only with processing of emotion, but also with interpersonal behavior (Troisi et al., 1996). As found by Troisi and colleagues (1996), during a clinical interview, people who have more difficulties in identifying their feelings showed poor non-verbal expressivity, despite signs of anxiety and stress were expressed by self-directed behavioral patterns. It could be that when people with alexithymic symptoms are asked about their own feelings, they become distressed and less able to manage the expressive corollary of emotions.

The present study has some limitations. Firstly, the sample numerosness is small, therefore, these findings could be considered as preliminary. Moreover, as previously argued, the



**Tab. 7.** Multiple regression models on inconsistencies and manipulators in the first (Situation of Truth) and second interview (Situation of Lie) as dependent variable and the psychological questionnaire (Toronto Alexithymia Scale-20 (TAS-20); Interpersonal Reactivity Index (IRI); Trait Emotional Intelligence Questionnaire Short Form (TEIQue-SF)) as independent variables.

	Situation of Truth			Situation of Lie		
	<b>Inconsistencies doubt</b>					
	R= .61; R <sup>2</sup> = .37 Adjusted R <sup>2</sup> = .24 F(5,26)=3.01 p=.03			R= .36; R <sup>2</sup> = .13; Adjusted R <sup>2</sup> = -.038 F(5,26)=.77 p=.58		
	$\beta$	t(26)	p-value	$\beta$	t(26)	p-value
TAS-20-F1	.74	2.26	.03	0,21	0,54	0,59
TAS-20-F2	-.025	-.85	.40	-0,42	-1,20	0,24
TAS-20 Total	-.03	-.06	.95	0,32	0,61	0,54
IRI Fantasy	.20	1.01	.32	0,18	0,76	0,45
IRI Empathic concern	-.23	-1.21	.24	-0,26	-1,19	0,24
	<b>Inconsistencies emotions</b>					
	R= .58; R <sup>2</sup> = .34; Adjusted R <sup>2</sup> = .21 F(5,26)=2.68 p=.04			R= .62; R <sup>2</sup> = .38; Adjusted R <sup>2</sup> = .27 F(5,26)=3,25 p=.02		
	$\beta$	t(26)	p-value	$\beta$	t(26)	p-value
TAS-20-F1	0.43	1.28	0.21	-0,13	-0,39	0,70
TAS-20-F2	-0.05	-0.17	0.87	-0,03	-0,12	0,91
TAS-20 Total	0.20	0.45	0.65	0,36	0,84	0,41
IRI Fantasy	0.10	0.51	0.62	-0,41	-2,05	0,05
IRI Empathic concern	-0.09	-0.48	0.63	-0,28	-1,52	0,14
	<b>Inconsistencies_total (doubt+emotions)</b>					
	R= .62; R <sup>2</sup> = .39; Adjusted R <sup>2</sup> = .27 F(5,26)=3,32 p=.02			R= .47; R <sup>2</sup> = .22; Adjusted R <sup>2</sup> = .07 F(5,26)=1,49 p=.22		
	$\beta$	t(26)	p-value	$\beta$	t(26)	p-value
TAS-20-F1	0,69	2,12	0,04	0,14	0,39	0,70
TAS-20-F2	-0,20	-0,69	0,50	-0,46	-1,40	0,17
TAS-20 Total	0,05	0,11	0,91	0,46	0,94	0,35
IRI Fantasy	0,18	0,93	0,36	0,10	0,44	0,66
IRI Empathic concern	-0,20	-1,07	0,30	-0,39	-1,85	0,08
	<b>Manipulators</b>					
	R= .55; R <sup>2</sup> = .30; Adjusted R <sup>2</sup> = .17 F(5,26)=2,24 p=.08			R= .56; R <sup>2</sup> = .31; Adjusted R <sup>2</sup> = .18 F(5,26)=2,36 p=.07		
	$\beta$	t(26)	p-value	$\beta$	t(26)	p-value
TAS-20-F1	0,77	2,07	0,05	0,45	1,32	0,20
TAS-20-F2	-0,40	-1,30	0,21	0,22	0,73	0,47
TAS-20 Total	-0,12	-0,26	0,79	-0,11	-0,25	0,80
IRI Fantasy	0,01	0,05	0,96	0,20	0,95	0,35
IRI Empathic concern	0,08	0,38	0,70	-0,08	-0,41	0,68

prosocial situation could enable individuals with high emotional competence to become better liars. However, the motivation behind the prosocial intent is usually very strong and that specific socially oriented intensity of motivation could confound the relationship between empathy, alexithymia and facial expression. Future studies should focus on other kind of motivations to lying, with the same strength, such as some own benefit or avoidance of punishment, contributing to more specifically study the role of empathy and emotional intelligence in conforming facial expression to a deceptive statement. Secondly, as suggested by Porter et al. (2011), undergraduate participants may be less skilled than experienced deceivers: follow-up research with criminal or actors' populations can be useful. Finally, due to the low representation of males in our sample, we were unable to examine the effect of gender. A recent meta-analysis showed that males are significantly more likely than females to tell both black and altruistic white lies (Capraro, 2018).

This study can be a starting point for future research, that could enroll more gender differentiated participants with high levels of alexithymia and use other measurements of alexithymia, such as the Levels of Emotional Awareness Scale (Lane et al., 1990) or the Toronto Structured Interview for Alexithymia (TSIA) (Bagby et al., 2006). Moreover, verbal index (i.e., Criteria Based Content Analysis – CBCA) can complement FACS to investigate how emotional competence can also modulate speech with grammatical, lexical and verbal features in lying.

Despite these limitations, it appears that the ability to simulate convincing facial expressions is mediated by the emotional competences. These findings support the strong interrelationship between empathic abilities, prosocial attitudes and the capability to lie; the present results are also interesting and relevant to deeply enlighten that lying skills are not only prerogative of histrionic, psychopathic and Machiavellian individuals (Geis & Moon, 1981; DePaulo & Rosenthal, 1979; Jonason et al., 2014), as often reported, but concern also particularly emotional and empathetical individuals, especially with a prosocial motivation.

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#### Compliance with Ethical Standards

#### Conflict of interest

The authors declare that they have no competing interests.

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#### 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 standards.

#### Informed Consent

Each participant dealt with the process of informed consent.

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