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Emotional responses during communicational comfort: the effect of personality through the prism of process communication model

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ABSTRACT

The present study investigated the link between personality and emotional response modulation during an interview. Ninety participants were filmed responding to different processes of communication: they were asked to respond to questions that required them to answer with either facts or opinions. Emotionally-tinged and complicit exchanges were proposed and directive ways of communicating were offered so as to get them into action or to appeal to their imagination. Their skin conductance responses were recorded at the same time. Personality traits were assessed through process communication model (PCM) questionnaire. The results suggested that everybody could receive each process[1], nevertheless, emotional responses varied according to PCM Base Type. Although only Persister Base participants showed significant differences from all other Base Types, we observed that participants' emotional responses were modulated according to the different processes sent: offering a connection through opinions generated a high emotional response, as did create intimacy, while participants had a low emotional response when asked to visualise a situation by projecting themselves. These results reinforce the idea that adapting one's communication to one's interlocutor personality enables easier exchanges in dual communication situations. What's more, respecting inter-individual differences fosters greater tolerance, while increasing everyone's relational agility.

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KEYWORDS
Emotion; skin conductance response; process communication model; personality; interview

1. Introduction

Emotion has been a subject of research interest for over a century. It has been extensively studied, leading to a split of the emotional response into three main components: cognitive/subjective, behavioural and physiological (Barrett et al., 2011; Bradley & Lang, 2000; Kleinginna & Kleinginna, 1981; Moors, 2009). The cognitive/subjective component corresponds to the changes in the mental state linked to the emotion felt at a given moment and when the person evaluates the event that triggered the emotion (appraisal, Sander & Scherer, 2019). The behavioural component refers to all the behavioural and expressive manifestations of an emotion (postures, tones, gestures, etc.). The most studied is facial expression (Ekman & Friesen, 1978), considered as a major channel for emotional communication, since it is a source of contact with others. Finally, the somatic or physiological component of emotion involves all the peripheral and central physiological manifestations concomitant with an emotional event.

Appraisal theories of emotion are the most represented in the literature especially the components process model (CPM, Scherer, 2003). They define emotion as a temporal synchronisation of changes

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within several components. CPM states that it is the way a person interprets a situation – rather than the situation itself – that gives rise to one emotion rather than another emotion or no emotion at all (Siemer et al., 2007): consequently, CPM predicts that different appraisals of the same situation will be sufficient to result in different emotional responses.

The behavioural component of emotions in inter-individual exchanges has aroused the interest of researchers, particularly the impact of non-verbal content compared with verbal content (Mehrabian, 2017). Even today, most research into oral communication still considers that understanding the message conveyed by the other person is based mainly on the semantic processing of verbal content (Kotz & Paulmann, 2007). However, there is a whole body of literature that highlights the impact of non-verbal elements, such as emotional prosody, on the understanding and production of language (Beaucousin et al., 2007). The latter reflects the speaker's emotional state (Ross, 2000). The processing and understanding of emotions in interpersonal interactions involve the integration of multiple modalities, including auditory, facial, and body cues (de Gelder & Vroomen, 2000; Klasen et al., 2014). The authors conclude that the way in which the speaker says something, or the form of the message is as important, if not more so, than the verbal content of the speech (Beaucousin et al., 2007; Birdwhistell, 1970; Guyer et al., 2019; Kahler & Capers, 1974; Mehrabian, 2017).

In addition, several studies in which different types of material were presented to participants showed that personality traits can modulate the link between an emotional situation and a participants' emotional responsiveness, for instance, the fragile inner self personality trait (Joo et al., 2012), individuals high in hostility (Suarez & Williams, 1989), high-harm avoidance trait (Mardaga et al., 2006) or neuroticism (Norris et al., 2007). Indeed, people with a high neuroticism score show more negative emotions than people with a low neuroticism score. They also show greater reactivity to everyday interpersonal conflicts. Consequently, personality traits facilitate or inhibit certain types of stimulus appraisal.

We were interested in communicative comfort during an interview, i.e. the emotional responses generated by a communication situation, using the process communication model (PCM)©. PCM was created in the 1970s and has gained visibility thanks to its intensive use within NASA, during the selection and training of astronauts (Kahler, 2008; McGuire, 2022). Since the 70s, PCM has been applied in many other fields and helps to facilitate interpersonal relations in different ecological situations (for instance, in education (Gilbert, 2014), health and surgery sector and other healthcare professionals (Andrew et al., 2021; Pauley & Pauley, 2012), in the world of high-level sport (Fernande Ortega, 2023), in management (Defaye & Piron, 2024), in coaching (Collignon & Legrand, 2021), in academic research (Lefebvre & Beaucousin, 2023; Lefebvre & Camarda, 2024)). Within this model, the Personality Structure is represented by the metaphor of a Condominium compound with 6 Floors (Kahler, 2008). The 1st Floor is the Base Type, the most developed Personality Type from birth, the one with which people prefer to communicate with and where Character Strengths are strongest. Once this Base is set, it remains stable over time (Stansbury, 1990). The other Floors are layered above the Base: people can communicate from any Floor at any given time, during a given period. The time spent on each Floor differs for each person, and each individual can increase their ease of communication throughout their life by developing the time they spend on each of their Floors. The best way to get in contact with someone is always to connect with their Base Type. Each of us has a Personality Structure made up of the six Personality Types in a different order: Thinker, Persister, Harmonizer, Rebel, Imaginer, Promoter. We have a Personality Type on each Floor. We exhibit the characteristics of all of them. Each Type has its own Character Strengths[2] (Dufourneaud & Heffta, 2022); see (Lefebvre & Beaucousin, 2023), for a complete description of the character strengths.

Using this model can facilitate interpersonal relationships by understanding the other person's perceptual framework in order to adapt to it and reduce the occurrence of conflicts. Kahler has shown that an adapted connection to each interlocutor makes relationships more fluid, with fewer misunderstandings and conflicts (Ware, 2006). In his 1979–1982 work (Personality pattern inventory), Kahler discovered significant correlations between the six Personality Types and Perceptions. A key aspect of PCM is the role of Perceptions in the way individuals interpret and respond to messages. Perceptions as personal filters strongly influence the reception and understanding of information. According to this model, a person's primary Perception is that of their strongest Personality Type (i.e. their Base Type) so it has recommended that the speaker uses the Perception of

the other person's Base Type to communicate (Kahler, 2008). Everyone can perceive the world in six different ways: through Perception of Thoughts at the Thinker Floor, Opinions at the Persister Floor, Emotions at the Harmonizer Floor, Inactions (Reflections) at the Imaginer Floor, Reactions (Likes/Dislikes) at the Rebel floor and Actions at the Promoter Floor (Kahler & Capers, 1974; Ware, 1983). Each Personality Type has a special way of perceiving its environment. These perceptions can be apprehended through the words used by our interlocutor, particularly verbs.

To optimise communication, the process is the sender that adapts the communication offer to the receiver's Base Type by sending the right Process: the right Channel of Communication with the right Perception. A Channel is a communication register used in a positive position (+/+) this means that the relationship is fluid between the two people, each lending value to the other as much as they lend value to themselves. The Channel of Communication consists of a sending Part of Personality (offer) intended for a receiving Part of Personality (acceptance of the offer). The Sender has to embody the message by showing the Part of Personality i.e. the combined and coherent set of 5 cues (words, tones, gestures, postures and facial expressions) in +/+, representing a Perception (Dufourneaud & Heffta, 2022). The receiver's behavioural reaction, observed through the Part of Personality that he embodies, enables the sender to ensure that the communication is effective. If 3 out of the 5 cues are observed in the receiver's behaviour, the sender knows that the connection has been made (Kahler, 2008). Alignment between the Communication Channel and the Perception used to connect with someone favours better reception of the message so that it is interpreted optimally. Depending on PCM, it is advisable to offer the right Process to connect with another person: a Directive Channel to Promoter Base people with Actions (DCA); a Directive Channel with Inactions (Reflections) (DCI) to Imaginer Base people; a Requestive Channel with Thoughts (RCT) to Thinker Base people; a Requestive Channel with Opinions (RCO) to Persister Base people; a Nurturative Channel with Emotions (NCE) to Harmonizer Base people; and an Emotive Channel with Reactions (Likes and Dislikes) (ECR) to Rebel Base people (Gilbert, 2014).

Another essential PCM component to be taken into account in the Personality Structure is the concept of Phase, Phasing and Phase Change (Gilbert & Donlan, 2016; Kahler, 2008). Originally, our Base is also our Phase: the Psychological Needs that we must positively satisfy are those of our Phase, otherwise, we will unconsciously satisfy them negatively, which will be observable through our Distress behaviour. Phase Change is a change of Psychological Needs and therefore related Sequence of Distress and motivation following the resolution of the previous Floor's Phase Issue. Phasing is the period during which a person has been confronted with his or her current Phase Issue and manifests itself through frequent and intense Distress behaviours. About two out of three people in the United States and Europe experience what is called a Phase Change one or more times during their lives (Kahler, 2008). This Phase Change explains why people yet have new motivational desires (Psychological Needs) and a new associated Distress Sequence. A Phase Change occurs most often when an individual is presented in life with an emotionally important event that triggers a Phase-related, unresolved, early childhood Issue. Resolving this results leads to frequent and intense distress. This distressed period is known as "Phasing". After working through this by experiencing the often painful, but healthy under-lying feeling, a person will have a new Phase – that of the next Floor of his or her Condominium. The Personality Type of that next Floor will become that person's Phase Type, which in turn determines what the new Psychological Needs are as well as new corresponding Distress Sequence.

In previous articles, we showed that visuospatial attention is modulated by the participants' Base (Lefebvre & Beaucousin, 2023) as well as creative ideation (Lefebvre & Camarda, 2024). In the present study, we sought to analyse the emotional influence of the communication according to the participants' Base Type. If we consider the theories of emotion appraisal through the prism of PCM, the same situation such as sending a Process (Channel of Communication associated with a Perception) will elicit different emotional responses that can be observed at the physiological level depending on how it is evaluated by the participants. The hypothesis that appraisals are sufficient to elicit emotions predicts that if a person has a specific configuration of appraisal they will have differences in their emotional response.

In order to study emotional response through the prism of personality in an interview context, we studied the physiological component of emotions. In psychophysiological literature, it has been

evidenced that emotional arousal of the listeners is typically accompanied by changes at the level of the autonomic nervous system such as heart rate, breathing and electrodermal activity (Banse & Scherer, 1996; Hardacre Cerqueira, 2015). Within the personality and individual differences context, skin conductance response represents a classical index of stress and aversive stimuli processing as related to trait-anxiety or specific phobias (Dresler et al., 2009; Hofmann et al., 2006; Öhman & Soares, 1994). Some studies have examined the influence of personality on autonomic emotional responses, but many of these focus on emotional responses recorded during the presentation of images (Mardaga et al., 2006; Yoshino et al., 2005) or movie sequences (Kolodziev et al., 2019). It is difficult to link the various articles because the tools used to assess personality traits also differ from one article to another using for instance the Marlowe-Crowne Social Desirability scale (Crowne & Marlowe, 1960); the SCR lability (Tomaka et al., 1992), or the personality traits studied are not the same (extraversion and neuroticism (De Pascalis & Speranza, 2000; Norris et al., 2007); anxiety and impulsivity (De Pascalis et al., 2004)). However, literature in psychophysiology has successfully linked changes in heart rate and skin conductance to certain behaviours and emotions (Tassinary et al., 2000). In the literature, this has been assessed using various methods. Skin Conductance Response (SCR) is one of the earliest known methods for measuring the level of emotional excitement (Benedek & Kaernbach, 2010; Boucsein, 2012). It is based on the human body's property of causing a continuous variation in the electrical characteristics of the skin. The method is easy to use especially in an ecological situation or a situation close to everyday life: interaction/ communication. The signal is disturbed and influenced by several factors. As demonstrated in many studies, the peripheral nervous system regulates the sweating of eccrine glands of the human skin (Fowles et al., 1981). The changes in the level of sweat secretion in response to emotional stimuli change the value of the skin electrical resistance (Bach et al., 2010). Therefore, electrodermal activity is considered as a measure of the sympathetic nervous system's activity allowing to register the motivational response and increase emotional activation or arousal (Potter & Bolls, 2011).

In the present research, we, therefore, studied two components of emotional response in the context of an inter-individual interaction: the physiological and behavioural components. We measured the physiological component and filmed the participants during the sending of the Channel of Communication including their preferred Perception according to their Base Type and also during the sending of the other Channels of Communication associated with other Perceptions. We wanted to find out whether the Processes sent by the sender modulated the receiver's physiological and behavioural emotional response according to the latter's PCM Base Type. We hypothesised that sending the perceiver's preferred Process (to connect to its Base Type) would induce less physiological and behavioural reactivity than sending others Processes. We also assumed that sending NCE or ECR that were Processes that aimed at connecting emotionally with the other person (i.e. with the Emoter Part) would generate a higher emotional response than sending intellectual Processes that connected with Computer Part, i.e. RCT, RCO and DCI. By extension, we assumed that participants with an intellectualised Base Type (Thinker, Imaginer and Persister Base) would have lower physiological emotional responses than those with an emotional Base Type (Harmonizer and Rebel Base).

2. Method

2.1. Participants

This study included 90 participants (54 women and 36 men, $M = 40.2$ years, $SD = 10.7$, numbers of years studies = 3.7). Among the 90 participants, 16 had a Thinker Base Type, 15 a Persister Base Type, 15 a Harmonizer Base Type, 14 a Rebel Base Type, 15 an Imaginer Base Type and 15 a Promoter Base Type. An a priori power analysis using G*Power 3.1(Faul et al., 2007) was conducted with a mixed 6×6 design with one between-subject factor (the participant's Base Type: Thinker Base, Persister Base, Harmonizer Base, Rebel Base, Imaginer Base, Promoter Base) and one within-subject factor (Process: Directive Channel with Actions (DCA); Directive Channel with Inactions (Reflections) (DCI); Requestive Channel with Thoughts (RCT); Requestive Channel with Opinions (RCO); Nurturative Channel with Emotions (NCE); Emotive Channel with Reactions (Likes and Dislikes) (ECR)) indicated that a sample size of 30 participants (5 per group) would be sufficient to detect a medium effect size ($f = .25$) with a power of .80 and an alpha of .05.

None of the participants reported neurological or neuropsychiatric disorders or the use of psychoactive

drugs. To exclude psychological difficulties, participants had to answer several questions about inclusion criteria: they had to complete the Beck Depression Inventory (Beck et al., 1961) and the State-Trait Anxiety Inventory (Spielberger et al., 1999).

They had normal or corrected-to-normal vision and hearing, and also reported a normal night's sleep. All participants provided written informed consent in accordance with the Declaration of Helsinki (World Medical Association, 2013). The whole procedure was approved by the local ethics committee (CCE n°2022-09-A). We recruited participants via advertisements on Linkedin and internal Rouen University communication channels.

2.2. Experimental procedure

Before the inclusion, the participants were asked to complete at home the Process Communication Model (PCM) questionnaire (Kahler, 1996) consisting of 45 multiple-choice questions. For each question, the six choices representing the six Personality Type characteristics were proposed. The participant could select a maximum of 5 choices and had to rank the answers in order of importance, from the first "most important" choice to the fifth "least important" choice. The participant's Base Type was deduced from their responses to the questionnaire.

Then, in a laboratory environment, the participants were comfortably seated on a chair. There was a table between the researcher and the participant to respect the proxemic.

During the interview, two cameras were used: one filming the participant and the other one filming the interviewer (SL). Before the interview, the researcher showed the Emotional Freedom Technique (EFT) sequence that the participant had to reproduce with his free hand (for review, see. Clond, 2016), in order to reduce anxiety and/or stress.

The researcher interacted with each participant during a filmed interview lasting between 45 min and 1 h 20 min, during which it was initially planned to send 36 Processes in +/+ i.e. 6 times each Process (DCA, DCI, RCT, RCO, NCE, ECR, see Annexe 1 for examples of Processes sent).

The researcher modified and adapted the order of presentation to each participant's behavioural and emotional responses so as to maintain the relationship in a +/+ position, and to avoid a drift into the physiological response. 3 participants were excluded due to a technical problem with the SCR recordings and 1 other for poor quality of recordings. In addition, the length of the interview varied for each participant, those who were very talkative had interacted for more than 1 h 20 min. SL had to stop the interview even though all the 36 Processes had not been sent.

2.3. Video analysis

Before analysing the physiological responses, a video analysis was undertaken to ensure that the Processes were correctly sent by SL and that there was consistency between the participant's observable Base Type and that identified by the PCM questionnaire.

Concerning the video of the interviewer, tones, postures, gestures, facial expressions and words were analysed to identify whether the Processes offered were respected by SL. After SL had decoded all the filmed interviews, inter-rater reliability was ensured by comparing the decoding carried out by SL with that of a Master Trainer, a PCM specialist. Both judges ensured that each Process was sent correctly, noting in a file whether at least three of the five clues were identifiable.

The second-by-second video decoding was carried out on all 90 filmed interviews for the 18 Processes that were kept for each filmed interview (three times for each Channel of Communication plus Perception).

Then, for each participant, SL analysed the interview in its entirety to confirm the latter's PCM Base Type. The Master Trainer was not informed of the participant' Profile beforehand. He had to watch 30% of each video to make the hypothesis of the participant's Base Type. His analysis was pooled with that of SL. The two went back and forth to discuss their analysis. Only the analysis that corresponded to 80% of the agreement was kept. SL applied the rules for the rest of the interview. Two participants whose Base Type in their PCM Profile was not consistent with what SL and the Master Trainer had observed were recontacted for another interview by videoconferencing so as to determine their Base Type, by answering questions and to identify the context in which they had answered the questionnaire. When the participant and SL agreed on the Base Type, this new Base Type was kept for further/statistical analysis.

2.4. Physiological data

We recorded the SCR with the GSR Amp (ADInstruments®) at 2 kHz, amplified and low-pass filtered

online at 10 Hz. We used electrodes with adhesive collars and sticky tape attached to the medial phalanges of digits II and IV of the left hand. The Ag-AgCl electrodes had a contact area of 25 × 25 mm. The signal was stored on a computer using a data acquisition (Powerlab 16/35 and GSRAmp) and analysis system (LabChart 8.1).

Due to continuous recordings during an interaction, several recordings were noisy including noisy baseline (artefacts due to movements), we manually excluded segments with such artefacts or noisy baseline (i.e. SCR increased 500 ms before the beginning of a Process). Half of the recordings were analysed. The SCR in response to each Process was defined as five temporal windows of 2 s following the beginning of the Process as compared to the baseline level corresponding to 500 ms before the Process (Boucsein, 2012; Dawson et al., 2007). After a logarithmic transformation, a *z*-score was calculated for each participant. Then the mean value of the baseline (500 ms) was subtracted.

After checking for the homogeneity of variance (Levene's test) and normality assumptions (Shapiro–Wilk test), we carried out a two factors repeated-measures analysis of variance (ANOVA) with the Base Type as the between-subject factor (Thinker, Persister, Harmonizer, Rebel, Imaginer, Promoter) and a within-subject factor (Process: DCA, DCI, NCE, ECR, RCT, RCO) on physiological data.

3. Results

Regarding the 1–2 s time window, the Shapiro–Wilk test showed that the distribution of data in all conditions was not different from a Gaussian distribution (all p's > .05) except for ECR. In addition, the homogeneity of variance could be assumed in all conditions (Levene's test, all p's > .05), except ECR. The ANOVA[3] showed a significant effect of Process ($F(5,25) = 3.69$, p .003, $\eta^2_p = 0.042$; Figure 1), the participants had a reduced emotional response when they received DCI rather than ECR, DCA, RCO and NCE whatever their Base Type. They had also a reduced emotional response when they received RCT than RCO and NCE (see annexe 2 for statistical values).

Regarding the 3–4 s time window: the Shapiro–Wilk test showed that the distribution of data in all conditions was not different from a Gaussian distribution (all p's > .05). In addition, the homogeneity of variance could be assumed in all conditions (Levene's test, all p's > .05). The ANOVA showed again a significant effect of Process ($F(5,25) = 2,89$, p .0014, $\eta^2_p = 0.033$; Figure 2). As for the previous 1–2 s time window, the participants had the highest emotional response when they received emotional Processes NCE and ECR, and the least emotional response for DCI and then RCT. There was still a significant difference between DCI and the following Processes ECR, NCE and RCO. There was still a

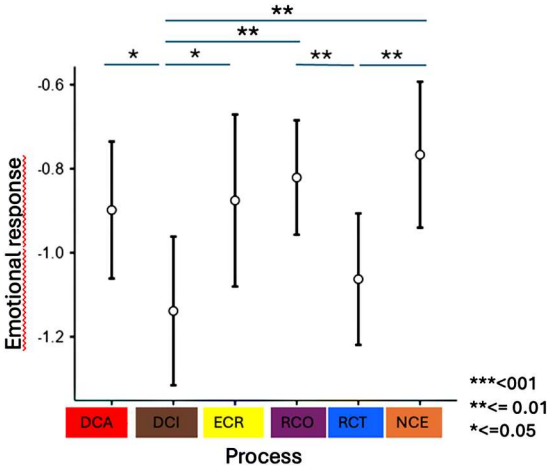

Figure 1. Mean GSR (µS) to Process offered during the 1–2 s time window whatever the Base of the participant. DCA: Directive Channel with Actions; DCI: Directive Channel with Inactions (Reflections); RCT: Requestive Channel with Thoughts; RCO: Requestive Channel with Opinions; NCE: Nurturative Channel with Emotions; ECR: Emotive Channel with Reactions.

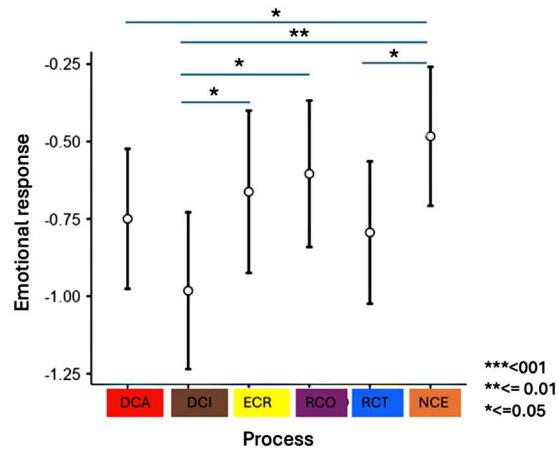

Figure 2. Mean GSR (µS) to Process offered during the 3–4 s time window whatever the Base of the participant. DCA: Directive Channel with Actions; DCI: Directive Channel with Inactions (Reflections); RCT: Requestive Channel with Thoughts; RCO: Requestive Channel with Opinions; NCE: Nurturative Channel with Emotions; ECR: Emotive Channel with Reactions.

higher emotional response for NCE as compared to RCT, nevertheless, there was in this time window a significant difference between NCE and DCA whatever their Base Type. There was no more difference between DCI and DCA neither between RCT and RCO (see annexe 3 for statistical values).

During the 5–6 s time window, the Shapiro–Wilk test showed that the distribution of data in all conditions was not different from a Gaussian distribution (all p's > .05). In addition, the homogeneity of variance could be assumed in all conditions (Levene's test, all p's > .05). The ANOVA showed a significant effect of Process ($F(5,25) = 5.50$, $p = . < 001$, $\eta^2_p = 0.061$; Figure 3), meaning a modulation of the emotional response characterised again by a reduced emotional response when participants received a DCI compared with all other Processes. There was also a significant difference between participants' emotional responses with a reduced one receiving RCT compared with DCA, with RCO and with ECR. Participants had a higher emotional response when they received ECR, NCE and RCO than DCI and RCT, whatever their Base Type (see annexe 4 for statistical values).

Considering the 7–8 s time window: the Shapiro–Wilk test showed that the distribution of data in all conditions was not different from a Gaussian distribution (all p's > .05). In addition, the homogeneity of variance could be assumed in all conditions (Levene's test, all p's > .05). The results showed a significant effect of Process whatever the Base Type ($F(5,25) = 5.46$, $p = . < 001$, $\eta^2_p = 0.061$; Figure 4). Emotional responses were quite the same than during the 5–6 s time window, nevertheless, we noticed two differences: there was a significant difference between RCT and NCE during this period of time and there was no difference anymore between DCI and RCT. Emotional response continued to increase (see annexe 5 for statistical values).

Regarding the 9–10 second time window: the Shapiro–Wilk test showed that the distribution of data in all conditions was not different from a Gaussian distribution (all p's > .05). In addition, the homogeneity of variance could be assumed in all conditions (Levene's test, all p's > .05). The results showed a significant effect of Process ($F(5,25) = 4.00$, p .001, $\eta^2_p = 0.045$; Figure 5) with the same pattern of results than during the 7–8 s time window. Emotional response continued to increase (see annexe 6 for statistical values).

In parallel with the evolution of the participants' emotional response as a function of the Process sent, we observed a significant effect of Base Type ($F(5,84) = 2.55$, p .034, $\eta^2_p = 0.132$; Figure 6) during the 3–4 s time window. Persister Base participants showed a reduced emotional response compared with the other participants, while Rebel Base participants and Imaginer Base participants showed the highest emotional responses. There was a significant difference between Persister Base participants and Imaginer Base

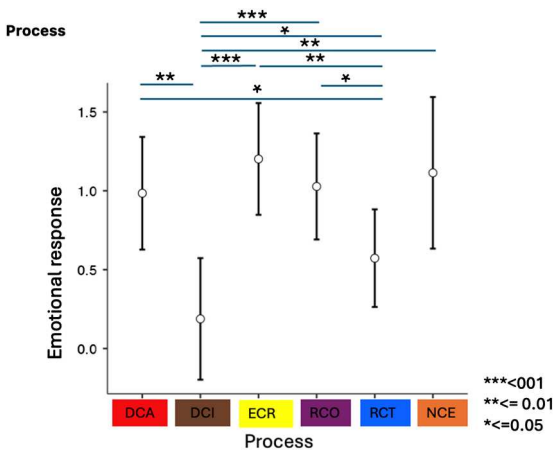

Figure 3. Mean GSR (µS) to Process offered during the 5–6 s time window whatever the Base of the participant. DCA: Directive Channel with Actions; DCI: Directive Channel with Inactions (Reflections); RCT: Requestive Channel with Thoughts; RCO: Requestive Channel with Opinions; NCE: Nurturative Channel with Emotions; ECR: Emotive Channel with Reactions.

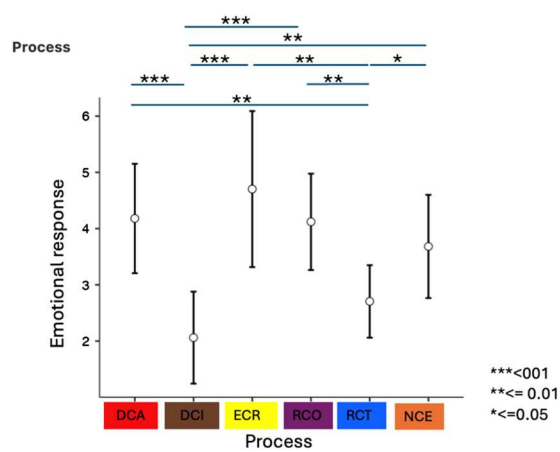

Figure 4. Mean GSR (µS) to Process offered during the 7–8 s time window whatever the Base of the participant. DCA: Directive Channel with Actions; DCI: Directive Channel with Inactions (Reflections); RCT: Requestive Channel with Thoughts; RCO: Requestive Channel with Opinions; NCE: Nurturative Channel with Emotions; ECR: Emotive Channel with Reactions.

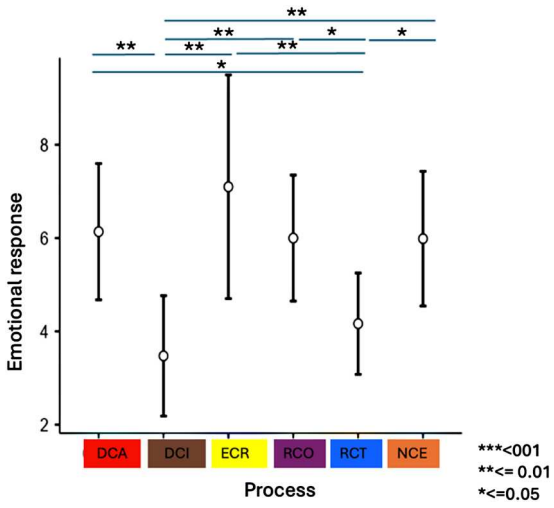

Figure 5. Mean GSR (µS) to Process offered during the 9–10 second time window whatever the Base of the participant. DCA: Directive Channel with Actions; DCI: Directive Channel with Inactions (Reflections); RCT: Requestive Channel with Thoughts; RCO: Requestive Channel with Opinions; NCE: Nurturative Channel with Emotions; ECR: Emotive Channel with Reactions.

participants, also between Persister Base participants and Rebel Base participants (see annexe 7 for statistical values).

During the 5–6 s time window, there was also a significant effect of Base Type, (F (5,84) = 3.25, p.010, η_p^2 = 0.162; Figure 7), characterised this time by a significant difference between Persister Base participants' emotional responses and all other Base Types participants. Regardless of the Process sent, Persister Base participants presented the lowest emotional response compared with other Base Types (see annexe 8 for statistical values).

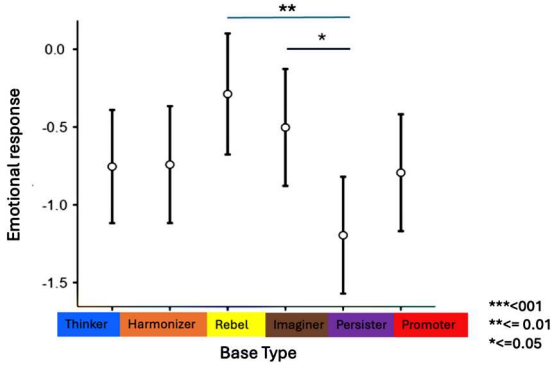

Figure 6. Mean GSR (µS) according to the Base Type during the 3–4 s time window whatever the Process sent.

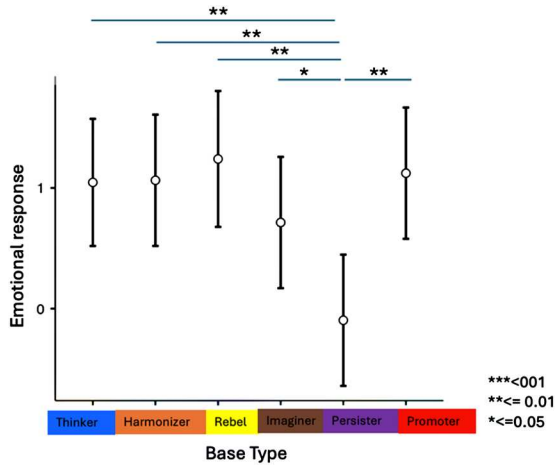

Figure 7. Mean GSR (µS) according to the Base Type during the 5–6 s time window whatever the Process sent.

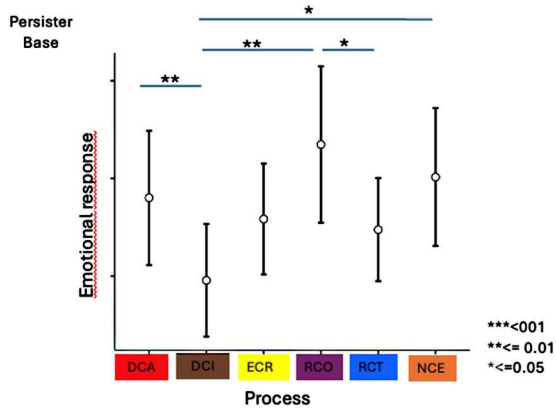

Figure 8. Mean Persistant Base participants' GSR (µS) to Process offered during the 1–10 second time window. DCA: Directive Channel with Actions; DCI: Directive Channel with Inactions (Reflections); RCT: Requestive Channel with Thoughts; RCO: Requestive Channel with Opinions; NCE: Nurturative Channel with Emotions; ECR: Emotive Channel with Reactions.

We also analysed the mean emotional response from 1 to 10 s according to each Base Type: the only Base Type which showed a significant Process effect F (5,70 = 3.14, p .013, η_p^2 = 0.183; Figure 8) and an interaction time course x Process F (20, 280 = 2.35, p = .001, η_p^2 = 0.144; Figure 9) was Persister Base Type with a significant difference between DCI and DCA, DCI and RCO, DCI and NCE. There was also a difference between RCO and RCT. There was no significant difference between DCI and ECR. Compared to other analyses, RCO was the highest, ECR and NCE were above (see annexe 9 for statistical values).

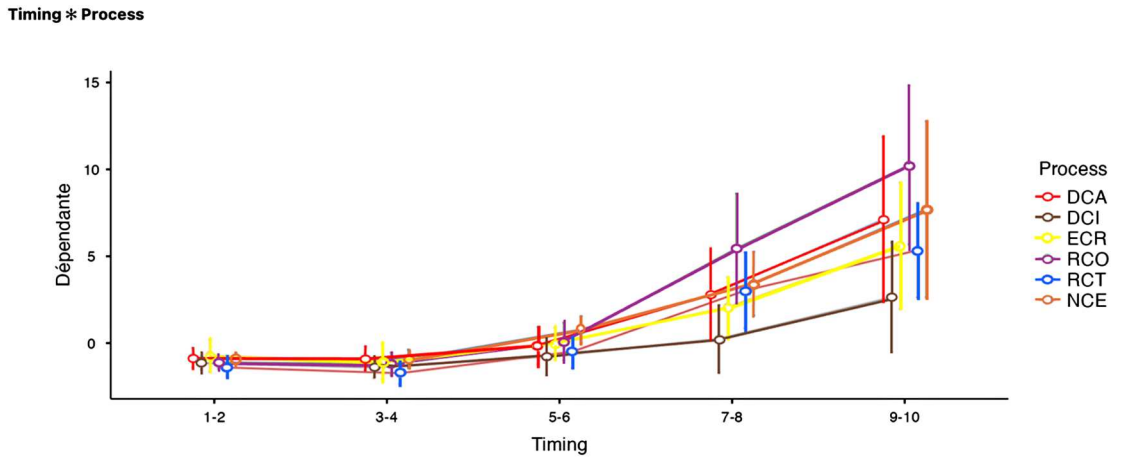

Figure 9. Modulation of the mean Persister Base participants' GSR (μS) according to each time window and according to the Processes sent. DCA: Directive Channel with Actions; DCI: Directive Channel with Inactions (Reflections); RCT: Requestive Channel with Thoughts; RCO: Requestive Channel with Opinions; NCE: Nurturative Channel with Emotions; ECR: Emotive Channel with Reactions.

4. Discussion

The aim of this research was to identify emotional manifestations according to the participants' Base Type when they received different communication Processes. We will discuss first the results for each Process and then the results for each Base Type. According to PCM, we expected to evidence that sending a NCE and an ECR, aiming to connect with the participants' Emoter Part of Personality, would induce the highest participants' emotional response. The other Processes, sent to connect with the participants' Computer Part of Personality could lead to a lesser emotional reactivity. The present results were in line with the exploratively proposed hypotheses.

We also assumed that participants with an intellectualised Base Type (Thinker, Imaginer and Persister Base Type) would have a lower physiological emotional response than those with an emotional Base Type (Harmonizer Base and Rebel Base). Our exploratory hypothesis was validated with Persister Base participants only.

4.1. Processes sent

Regarding mean emotional response, whatever participants' Base Type, we observed that receiving NCE generated the highest Participants' emotional response in the first 4 s. PCM described NCE as the best way to establish a warm connection to nurture the relationship, connecting with Harmonizer Base participants and/or in emotionally charged situations to offer compassion when people are feeling down. This is the way to connect with intimacy, and it can only happen when the sender sincerely feels a positive emotion that he or she shares with the other person, or shows compassion towards them. The intention must be positive, otherwise the message cannot be accepted. In PCM, when one offers NCE to another one, he embodies the message from its Comforter Part of Personality using words that nurture the relationship, a soothing tone of voice, opened gestures and posture, warm and smiling facial expressions. When the offer is accepted, the other person receives in its Emoter Part, i.e. its own authentic emotions reacting by using spontaneous words, in a high or enthusiastic tone of voice depending on the emotion experienced, animated gestures, a lax posture and a twinkly facial expression. When offering a NCE as expected, we evidenced that participants experienced the highest emotional response whatever their Base Type. After 5 s, participants' emotional response began to decrease compared to ECR, as if once the intimacy had been made the emotional response could calm down.

From the 5–6 s time window, participants' emotional response to ECR increased and exceeded their emotional response to receiving an NCE from 7 s onwards. In PCM, the ECR is used to create complicity and fun; it is useful for lightening the mood telling jokes, reacting to our environment by liking or disliking things. The ECR will allow the sender to connect preferably to Rebel Base people or to the Rebel Floor of his interlocutor when the context lends

itself to it. In contrast to the NCE sent from one's Comforter Part, an ECR is sent from one's Emoter Part of Personality and received from the Receiver's Emoter Part of Personality. Consequently, accepting the Process in participants' Emoter Part is theoretically the same as receiving an NCE, yet physiologically we observed a difference in terms of emotional response. It appeared that the maximal emotional responses arising in intimacy preceded those of complicity; nevertheless, both were related to emotional Processes transmitted, and their intensity was higher than that of Processes that connected with participants' Computer Part of Personality i.e. his or her intellect. Our results are consistent with theories of emotional contagion (Hatfield et al., 1992) that focuses on the mechanism through which emotions can be transmitted from one person to another, particularly thanks to emotional prosody. We had initially hypothesised that sending emotional Processes such as ECR and NCE, aimed at establishing a link with the Rebel and Harmonizer Floors, would generate a higher emotional response than connecting with the Thinker, Imaginer or Persister Floors (i.e the Computer part of Personality), our results seem to support this exploratory hypothesis, we noticed.

DCI consists of connecting to each person's imagination using the Perception Inactions (Reflections) according to PCM. DCI is used to connect with Imaginer Base participants or to reflect by projecting oneself into a situation. DCI is offered from the sender' Director Part of Personality, giving a direction to muse something. Words used are verbs in the imperative form, the tone of voice is firm, non-threatening, with few gestures, an erect posture and a determined facial expression. The process is effective when the offer is accepted by one's Computer Part of Personality i.e. the thinking, intellectual part of each person. 80% of people have their Imaginer Floor on the 5th or 6th Floor, and they regularly mention difficulties connecting to and from this Floor by accessing mental images. As explained earlier, the offer of a DCI is used to connect to the receiver's Computer Part of Personality at his or her Imaginer Floor, so it seems consistent with PCM that the mean emotional response was lower compared to ECR and NCE whatever the Base Type.

DCA is used to put someone into action here and now with an identified benefit, by connecting with Promoter Base people or one's Promoter Floor. Even if the Channel of Communication is Directive, it's not used for the same purpose of putting someone in action or appealing to their imagination. There was a difference from the test between both during the 1–2 s time window, then from 5 s till the end. According to PCM, DCI is used to connect directly with imagination viewing a picture, to do so the receiver has to connect to its Computer Part of Personality that is supposed to calm down to muse. Moreover, there was a difference between NCE and DCA during the 3–4 s time window. DCA was related to gain a benefit, from someone who challenged someone else. It seemed that participants' emotional response to intimacy appeared faster and higher than feeling the challenge or processing the direction given. Indeed, whereas NCE is accepted from the participants' Emoter Part, DCA is received in the Computer Part of Personality, because people must first understand and accept the given action so as to put himself or herself in action. Furthermore, there was a difference between DCA and RCT, even if both were accepted by the receiver in its Computer Part of Personality, DCA generated a higher emotional response than RCT, that was consistent with preparing to be in action. This difference was observed from 5 to 10 s and had the same pattern profile than DCA and DCI, confirming that RCT and DCI were used to connect with one's intellectual part, thinking or musing.

RCT is also used to connect with a Computer Part of Personality. The sender has to embody the message from its Computer Part of Personality with non-emotional words, inquiring questions or giving information, with a monotone tone of voice, few gestures, a steady posture and a neutral facial expression. The Computer Part is particularly productive whenever information has to be exchanged or conveyed. The Process is effective if the other person receives also in his or her Computer Part, giving data, opinions or creative ideation. The difference is that RCT is used to connect with Thinker Base people or to share information and data with others from one's Thinker Floor. Whatever the time window and whatever the Base Type, participants' mean emotional response to RCT was always higher than DCI, and lower than RCO. Once again, a low emotional response seemed to be consistent with PCM.

RCO is preferentially used when interacting with Persister Base participants or debating with people about their beliefs from their Persister Floor. Whatever their Base Type, participants showed a higher emotional response from 1 to 5 s receiving RCO than ECR. This was also observable from 1 to 10 s

when they had received an invitation to discuss social issues with an RCO compared to any other Process also inducing a connection with their Computer Part of Personality, but involving another Perception (Thoughts or Inactions/Reflections). Offering an RCO provides an opportunity to ask questions about topical issues in our society that may arouse emotions in some people, by sharing their Opinions. Regardless of the Base Type, participants showed an emotional difference between receiving an RCT and an RCO, even though both prompted answers to the question, but not in the same way: precise answers with facts on the one hand, or a response prompting an opinion on the other hand. We observed a significant difference in participants' emotional responses receiving RCT and RCO very early, from the very first second; however, the difference was no longer noticeable between 3 and 4 s, but reappeared from 5 to 10 s.

4.2. Base Types

Now we will consider the Base Type, beginning with the time window 3–4 s. Persister Base participants showed the lowest emotional response compared to every other Base Types, and a significant difference with Rebel Base participants and Imaginer Base participants, whatever the Process sent. One explanation could be that Rebel Base participants are people-oriented according to PCM. They are known to perceive the world through Reactions; they react spontaneously to their environment, being creative and playful. Whereas Persister Base is known to be observant, conscientious and committed. They filter the world through their Opinions, and ask themselves a rule of good social behaviour, in line with their values. Their emotional response was the highest when they received an RCO, that is known to be their preferential Process to communicate. They are initially withdrawn from the relationship, judging their environment by observing it through the prism of their values and communicating Opinions from their Computer Part. Imaginer Base Type people are also known to be withdrawn from the relationship, allowing them to connect with their imagination. They are calm, Imaginative and Reflective and one hypothesis to explain the significant difference in terms of emotional response, even if they communicate Inactions (Reflections) also from their Computer Part, is that imagining the infinite field of possibilities could be emotionally charged, all the more so when the images they perceived had emotional connotations.

We observed that Persister Base participants were the only participants that showed a significant interaction time course x Process. The more time that went by, the more they mastered their skills and maintained their attitude by connecting with their values and processing information through their Opinions. Indeed, regarding with the 5–6 s time window they continued to stand out, but during this period we noticed a significant difference with all the other Base Types including Thinker and Imaginer Base people. Even if Thinker Base and Imaginer Base people both connected from their Computer Part of Personality, they didn't filter their environment using the same preferential Perception. Consequently, offering Opinions with a Requestive Channel to Persister Base participants could modulate their emotional response. Indeed, the Opinions of people with a Persister Base were intellectualised, which have been built up over a long time, which was not the case for other participants who had another Base Type. Even though all other participants had access to their Persister Floor, moreover, when they perceived the world through their Opinions they were more emotionally connoted.

4.3. Phase change

We noticed an atypical emotional trace, very flat for 4 participants with Persister Base and Phase. One of these Persister Base participant was a long-standing Mix Martial Arts champion, his behavioural and physiological components were perfectly controlled, no artefact was observed. Three participants with a Persister Base and Rebel Phase were excluded because their physiological response exceeded the high-pass filter (the cut-off was 45 µS). Initially attributed to a technical problem, the video analysis showed no special discomfort for the three participants apart from a slight blushing of the cheekbones. The tone of voice, postures, gestures, words and facial expressions had not changed. As a result, we saw dissociations between physical reactions and verbalisation for them. We did not expect this type of result, and we will be able to take it into account when using the model in the future. According to Scherer's CPM (Scherer, 2003), behavioural, physical and subjective markers can be independent. Such predictions are consistent with the current observation of these three participants. At present, no model can predict a set of reactions in each of these two components that are convergent and that can be categorised as

one and the same reaction (e.g. anger manifests itself like this, with such and such a marker … .).

4.4. Limit and perspectives

We hypothesised that sending the perceiver's preferred process would induce less physiological and behavioural reactivity than sending others' processes. This experimental situation did not reveal any identifiable pattern of emotional response from a physiological point of view linked to a process sent according to the Base Type of participants. Empirically, when we use PCM at work and at home, we observe on a daily basis that it is easier to connect in a dual relationship when we send the preferential process to our interlocutor's Base Type. Our results did not show any significant interaction between the participants' Base Type and Process on emotional response meaning that although each person had a preference, depending on their Base Type, for the way in which their environment communicated with them, each could receive all processes. This could be explained by the fact that each individual could receive every Channel of Communication and filter the world through a perception for a more or less short period of time available to the targeted Floor when sending the Process. For some people the Process could not be applied stricto sensu: it could also be linked to the fact that many people experienced a Phase Change, and some at several occasions. Phasing is a period during which people go through a period of great Distress. Once this period is over, the previous Floor is called a "Stage", they may have acquired new skills and new coping strategies. Phase Change could be considered as a form of natural development and a resilience requirement that increases the ability to adapt. However, PCM do not encourage to change Phase, Phasing is situational. Nevertheless, we may wonder whether the results would have been different if we had only interviewed participants whose Base and Phase were identical. We will examine this hypothesis in future research.

Process is situational: NCE is used for intimacy, ECR for complicity, RCT is used to share information, RCO to share opinions, DCI is used to tap into a person's ideational capacities and get them to say what's on their mind, and DCA to put someone into action. Anyone can receive them, and the emotional manifestations that indicate potential comfort also depend on the type of relationship created with the interlocutor and the context (in this case, the laboratory).

Even if the gateway to communication is made by connecting with the participant' Base Type, by offering the right Process, we do not note any remarkable modulation on emotional response, in daily life speech. Indeed, our protocol does not allow us to account for ecological interactions, because in reality in a dual interaction situation, the protagonists exchange information fluidly without changing Channels of Communication as often and do not systematically use all the Processes. Our protocol did not represent fluid dual communication, but rather guided interactional exchanges. Moreover, considering our results sending an NCE thus creating intimacy in a laboratory context can modulate the participants' emotional response, feeling a lack of authenticity. This is also the case for Harmonizer Base participants with a professional whom they do not know. These results should be replicated in future studies to strengthen their validity (Ioannidis, 2014).

We also faced great difficulty recruiting certain Base Type participants. Nevertheless, this research showed similarities with the initial distribution of Base Types percentage indicated by Taibi Kahler's in North America. We had to call on social networks five times to find participants with Imaginer Base Type, Persister Base Type (they represent each 10% of the population in Kahler's research) and Promoter Base Type (5% of the population). Despite the difficulty to fine those Base Types volunteers, the number of participants for each Base Type was consistent with the power analysis.

5. Conclusion

Our results highlight the fact that, as the receiver of a message, participants activated different emotional responses according to the Process they received. Rudrauf and collaborators (Rudrauf et al., 2023) suggested that people do not passively receive information from their environment; rather than simply receiving external information, they play a dynamic role in constructing their emotional perception of the world on the basis of their intentions, needs and past experiences. Thus, emotions are not simple reactions to events, but complex internal processes in which the individual interprets, values and attributes meaning to situations according to his or her own criteria, making each emotional experience unique and shaped by the agent's active engagement with the world around him or her. The enactive approach emphasises emotional co-regulation in social interactions. Emotions are not merely internal phenomena

but rather emerge and evolve within the context of mutual social engagement. This perspective explains why inter-individual differences can arise in how individuals express and interpret emotions during interactions. These variations are often shaped by dynamics specific to each exchange.

In conclusion, the present experimental study provided the first evidence that sending different Processes, using an electophysiological method, could have an influence on the receiver's emotional response according to the prediction of PCM.

Notes

1. Capitalized terms are those defined in PCM.
2. three significant aspects of each Personality Type that support and reinforce the Perception of that Type.
3. We have carried out linear mixed model analysis (GAMLj3 module in JAMOVI) for all time-windows taking into account a random effect (the participants). We found the same effects, except for window 7–8 sec where we also found a Base Type effect.

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Author contributions

SL: conceptualisation, formal analysis, methodology, writing – original draft, writing – review & editing. VB: conceptualisation, – formal analysis, methodology – review & editing.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Availability of data

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Ethics approval statement

All participants provided written informed consent in accordance with the Declaration of Helsinki (World Medical Association. 2013). The whole procedure was approved by the local ethics committee (CCE n°2022-09-A).

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References

Andrew, M. I., Wilkinson, S., Wylie, N., & Salter, A. (2021). Evaluation of process communication model training for surgeons and other healthcare professionals : A survey. *ANZ Journal of Surgery*, *91*(4), 487–488. https://doi.org/10.1111/ans.16351

Bach, D. R., Friston, K. J., & Dolan, R. J. (2010). Analytic measures for quantification of arousal from spontaneous skin conductance fluctuations. *International Journal of Psychophysiology*, *76*(1), 52–55. https://doi.org/10.1016/j.ijpsycho.2010.01.011

Banse, R., & Scherer, K. R. (1996). Acoustic profiles in vocal emotion expression. *Journal of Personality and Social Psychology*, *70*(3), 614–636. https://doi.org/10.1037/0022-3514.70.3.614

Barrett, L. F., Mesquita, B., & Gendron, M. (2011). Context in emotion perception. *Current Directions in Psychological Science*, *20*(5), 286–290. https://doi.org/10.1177/0963721411422522

Beaucousin, V., Turbelin, M.-R., & Tzourio-Mazoyer, N. (2007). Le rôle de l'hémisphère droit dans la compréhension du langage : Exemple de la prosodie affective. *Revue de Neuropsychologie*, *17*(2), 1.

Beck, A. T., Ward, C. H., Mendelson, M., Mock, J., & Erbaugh, J. (1961). An inventory for measuring depression. *Archives of General Psychiatry*, *4*(6), 561–571. https://doi.org/10.1001/archpsyc.1961.01710120031004

Benedek, M., & Kaernbach, C. (2010). A continuous measure of phasic electrodermal activity. *Journal of Neuroscience Methods*, *190*(1), 80–91. https://doi.org/10.1016/j.jneumeth.2010.04.028

Birdwhistell, R. L. (1970). *Kinesics and context : Essays on body motion communication*. University of Pennsylvania Press. https://www.jstor.org/stable/j.ctt3fhk73

Boucsein, W. (2012). Applications of electrodermal recording. In W. Boucsein (Ed.), *Electrodermal activity* (pp. 259–523). Springer US. https://doi.org/10.1007/978-1-4614-1126-0_3.

Bradley, M. M., & Lang, P. J. (2000). Affective reactions to acoustic stimuli. *Psychophysiology*, *37*(2), 204–215. https://doi.org/10.1111/1469-8986.3720204

Clond, M. (2016). Emotional freedom techniques for anxiety: A systematic review with meta-analysis. *Journal of Nervous & Mental Disease*, *204*(5), 388–395. https://doi.org/10.1097/NMD.0000000000000483

Collignon, G., & Legrand, P. (2021). *Coacher avec la process communication ; le process com coaching* (InterEditions).

Crowne, D. P., & Marlowe, D. (1960). A new scale of social desirability independent of psychopathology. *Journal of Consulting Psychology*, *24*(4), 349–354. https://doi.org/10.1037/h0047358

Dawson, M. E., Schell, A. M., & Filion, D. L. (Eds.). (2007). The electrodermal system. In *Handbook of psychophysiology* (3rd. Ed., pp. 159–181). Cambridge University Press.

Defaye, L., & Piron, A. (2024). *Pour un onboarding réussi avec Process Communication Model®*. Dunod.

de Gelder, B., & Vroomen, J. (2000). The perception of emotions by ear and by eye. *Cognition & Emotion*, *14*(3), 289–311. https://doi.org/10.1080/026999300378824

De Pascalis, V., & Speranza, O. (2000). Personality effects on attentional shifts to emotional charged cues : ERP, behavioural and HR data. *Personality and Individual Differences*, *29*(2), 217–238. https://doi.org/10.1016/S0191-8869(99)00189-0

De Pascalis, V., Strippoli, E., Riccardi, P., & Vergari, F. (2004). Personality, event-related potential (ERP) and heart rate (HR) in emotional word processing. *Personality and Individual Differences*, *36*(4), 873–891. https://doi.org/10.1016/S0191-8869(03)00159-4

Dresler, T., Mériau, K., Heekeren, H. R., & van der Meer, E. (2009). Emotional Stroop task : Effect of word arousal and subject anxiety on emotional interference. *Psychological Research PRPF*, *73*(3), 364–371. https://doi.org/10.1007/s00426-008-0154-6

Dufourneaud, M., & Heffta, D. (2022). *PCM en interaction : Se connecter à soi-même et aux autres*. InterEditions.

Ekman, P., & Friesen, W. V. (1978). *Facial Action Coding System (FACS)*.

Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G*power 3 : A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, *39*(2), 175–191. https://doi.org/10.3758/BF03193146

Fernande Ortega, D. (2023). *Améliorer la performance sportive avec Process Communication Model*. Dunod.

Fowles, D. C., Christie, M. J., Edelberg, R., Grings, W. W., Lykken, D. T., & Venables, P. H. (1981). Publication recommendations for electrodermal measurements. *Psychophysiology*, *18*(3), 232–239. https://doi.org/10.1111/j.1469-8986.1981.tb03024.x

Gilbert, M. (2014). Different strokes for different folks : Connecting with students for academic success. *International Journal of Education*, *6*(4), 1. https://doi.org/10.5296/ije.v6i4.6269

Gilbert, M., & Donlan, R. (2016). *Personality pattern inventory*. In V. Zeigler-Hill & T. Shackelford (Eds.), *Encyclopedia of personality and individual differences* (pp. 1–5). Springer. https://doi.org/10.1007/978-3-319-28099-8_60-1

Guyer, J., Briñol, P., Petty, R., & Horcajo, J. (2019). Nonverbal behavior of persuasive sources : A multiple process analysis. *Journal of Nonverbal Behavior*, *43*(2), 203–231. https://doi.org/10.1007/s10919-018-00291-x

Hardacre Cerqueira, B. (2015). *Behavioral and psychophysiological correlates of conversation*. UCLA.

Hatfield, E., Cacioppo, J. T., & Rapson, R. L. (1992). Primitive emotional contagion. In M. S. Clark (Ed.), *Emotion and social behavior*. Sage publications.

Hofmann, S. G., Moscovitch, D. A., & Kim, H.-J. (2006). Autonomic correlates of social anxiety and embarrassment in shy and non-shy individuals. *International Journal of Psychophysiology*, *61*(2), 134–142. https://doi.org/10.1016/j.ijpsycho.2005.09.003

Ioannidis, J. P. (2014). How to make more published research true. *PLoS Medicine*, *11*(10), e1001747. https://doi.org/10.1371/journal.pmed.1001747

Joo, H. J., Yeon, B., & Lee, K. U. (2012). The impact of personality traits on emotional responses to interpersonal stress. *Clinical Psychopharmacology and Neuroscience*, *10*(1), 54–58. https://doi.org/10.9758/cpn.2012.10.1.54

Kahler, T. (1996). *Personality pattern inventory (revised)*. Kahler Communication, Inc.

Kahler, T. (2008). *The process therapy model : The six personality types with adaptations*. Taibi Kahler Associates, Incorporated.

Kahler, T., & Capers, H. (1974). The miniscript. *Transactional Analysis Bulletin*, *4*(1), 26–42. https://doi.org/10.1177/036215377400400110

Klasen, M., Kreifelts, B., Chen, Y.-H., Seubert, J., & Mathiak, K. (2014). Neural processing of emotion in multimodal settings. *Frontiers in Human Neuroscience*, *8*, 1–4. https://doi.org/10.3389/fnhum.2014.00822

Kleinginna, P. R., & Kleinginna, A. M. (1981). A categorized list of emotion definitions, with suggestions for a consensual definition. *Motivation and Emotion*, *5*(4), 345–379. https://doi.org/10.1007/BF00992553

Kolodziev, M., Tarnowski, P., Majkowski, A., & Rak, R. J. (2019). Electrodermal activity measurements for detection of emotional arousal. *Bulletin of the Polish Academy of Sciences Technical Sciences*, *67*(4), 813–826. https://doi.org/10.24425/bpasts.2019.130190

Kotz, S. A., & Paulmann, S. (2007). When emotional prosody and semantics dance cheek to cheek : ERP evidence. *Brain Research*, *1151*, 107–118. https://doi.org/10.1016/j.brainres.2007.03.015

Lefebvre, S., & Beaucousin, V. (2023). Seeing the forest or the tree depends on personality : Evidence from process communication model during global/local visual search task. *PLoS ONE*, *18*(4), e0284596. https://doi.org/10.1371/journal.pone.0284596

Lefebvre, S., & Camarda, A. (2024). Creative ideas generation and personality : Evidence from process communication model. *Frontiers in Psychology*, *15*, 1–6. https://doi.org/10.3389/fpsyg.2024.1403714

Mardaga, S., Laloyaux, O., & Hansenne, M. (2006). Personality traits modulate skin conductance response to emotional pictures: An investigation with Cloninger's model of personality. *Personality and Individual Differences*, *40*(8), 1603–1614. https://doi.org/10.1016/j.paid.2005.12.006

McGuire, T. F. (2022, décembre 6). *Astronauts; reflections on current selection methodology, astronaut personality, and the space station PART I*.

Mehrabian, A. (2017). *Nonverbal communication (first edition 1972)*. Routledge. https://doi.org/10.4324/9781351308724.

Moors, A. (2009). Theories of emotion causation : A review. *Cognition & Emotion*, *23*(4), 625–662. https://doi.org/10.1080/02699930802645739

Norris, C. J., Larsen, J. T., & Cacioppo, J. T. (2007). Neuroticism is associated with larger and more prolonged electrodermal responses to emotionally evocative pictures. *Psychophysiology*, *44*(5), 823–826. https://doi.org/10.1111/j.1469-8986.2007.00551.x

Öhman, A., & Soares, J. J. F. (1994). "Unconscious anxiety": Phobic responses to masked stimuli. *Journal of Abnormal Psychology*, *103*(2), 231–240. https://doi.org/10.1037/0021-843X.103.2.231

Pauley, J. A., & Pauley, J. F. (2012). *Establishing a culture of patient safety : Improving communication, building relationships, and using quality tools*. Quality Press.

Potter, R. F., & Bolls, P. (2011). *Psychophysiological measurement and meaning : Cognitive and emotional processing of media*. Routledge. https://doi.org/10.4324/9780203181027.

Ross, E. D. (2000). Affective prosody and the aprosodias. In M. Mesulam (Ed.), *Principles of behavioral and cognitive neurology* (pp. 316–331). Oxford University Press.

Rudrauf, D., Lutz, A., Cosmelli, D., Lachaux, J. P., & Le Van Quyen, M. (2023). From autopoiesis to neurophenomenology : Francisco Varela's exploration of the biophysics of being. *Biological Research*, *36*(1), 27–65.

Sander, D., & Scherer, K. R. (Eds.). (2019). Chapitre 1. La psychologie des émotions : Survol des théories et débats essentiels. In *Traité de psychologie des émotions* (pp. 1–39). Dunod. https://doi.org/10.3917/dunod.sande.2019.01.0001

Scherer, K. R. (2003). Vocal expression of emotion: A review of research paradigms. *Speech Communication*, *40*(1-2), 227–256. https://doi.org/10.1016/S0167-6393(02)00084-5

Siemer, M., Mauss, I., & Gross, J. J. (2007). Same situation–Different emotions : How appraisals shape our emotions. *Emotion*, *7*(3), 592–600. https://doi.org/10.1037/1528-3542.7.3.592

Spielberger, C. D., Sydeman, S. J., Owen, A. E., & Marsh, B. J. (1999). Measuring anxiety and anger with the State-Trait Anxiety Inventory (STAI) and the State-Trait Anger Expression Inventory (STAXI). In M. E. Maruish (Ed.), *The use of psychological testing for treatment planning and outcomes assessment* (2nd ed., pp. 993–1021). Lawrence Erlbaum Associates Publishers.

Stansbury, P. (1990, juillet). *Abridged test-retest reliability for the PPI. In Report of adherence to theory discovered when the personality pattern Inventory™ was administered to subjects twice.* Report commissioned by and delivered to Dr. Taibi Kahler.

Suarez, E. C., & Williams, R. B. (1989). Situational determinants of cardiovascular and emotional reactivity in high and low hostile men. *Psychosomatic Medicine*, *51*(4), 404–418. https://doi.org/10.1097/00006842-198907000-00004

Tassinary, L. G., Cacioppo, J . T., & Vanman, E. J. (2000). The skeletomotor system: Surface electromyography. In J. T. Cacioppo, L. G. Tassinary, & G. G. Bernston (Eds.), *Handbook of psychophysiology* (2nd ed., pp. 163–199). Cambridge University Press.

Tomaka, J., Blascovich, J., & Kelsey, R. M. (1992). Effects of self-deception, social desirability, and repressive coping on psychophysiological reactivity to stress. *Personality and Social Psychology Bulletin*, *18*(5), 616–624. https://doi.org/10.1177/0146167292185012

Ware, P. (1983). Personality adaptations : (Doors to therapy). *Transactional Analysis Journal*, *13*(1), 11–19. https://doi.org/10.1177/036215378301300104

Ware, P. (2006). *The process communication model and the art of communication : A guide to effective interactions.* pp. 45–58.

World Medical Association. (2013). https://www.wma.net/fr/policies-post/declaration-dhelsinki-de-lamm-principes-ethiques-applicables-a-la-recherche-medicale-impliquant-des-etres-humains/

Yoshino, A., Kimura, Y., Yoshida, T., Takahashi, Y., & Nomura, S. (2005). Relationships between temperament dimensions in personality and unconscious emotional responses. *Biological Psychiatry*, *57*(1), 1–6. https://doi.org/10.1016/j.biopsych.2004.09.027