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VALIDITY OF NON-INVASIVE METHODS FOR MEASURING BEHAVIOURAL AND PHYSIOLOGICAL CHANGES IN DECEPTION DETECTION

Summary of doctoral thesis

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Olomouc
2025

CONTENT

INTRODUCTION

Deception is a complex part of human interaction. It occurs not only in everyday conversations, but also in contexts where the stakes are high, such as legal proceedings, personnel selection, etc. Although honesty is considered a social norm, people often engage in deceptive behaviours ranging from outright lies to subtle omissions, depending on the situation, intention and desired outcome. Despite extensive research on aspects of deception, accurately detecting it remains a major challenge with important implications.

This thesis addresses this challenge by focusing on two main areas of deception detection: physiological and behavioural. *Physiological methods* such as functional infrared thermal imaging (fITI) and remote photo-plethysmography (rPPG) allow non-invasive monitoring of facial temperature and heart rate, which can reflect cognitive load or emotional arousal. *Behavioural methods*, including facial expression analysis and eye-tracking, target subtle cues in gaze patterns, emotional valence and arousal. The study also considers the moderating role of attachment avoidance. By integrating multiple methods and accounting for personality, this study highlights the complexity of deception and the need for context-sensitive detection methods.

1 THEORETICAL PART

1.1. Meaning of dishonesty on human interaction

Human communication is fundamentally based on the assumption of honesty, where deception is the anomaly (Kalbfleisch & Docan-Morgan, 2019). Philosophical traditions offer different perspectives on when, if ever, deception can be justified. The Aristotelian view condemns all lies as damaging to individual character and social trust (Zembaty, 1993), while Kantian view truth as a categorical imperative that makes all deception morally unacceptable (Ikuenobe, 2002). In contrast, Plato allows the "noble lie" if it serves the greater good, emphasising the importance of context and intention (Baima & Paytas, 2020). This complexity informs modern ethical and psychological taxonomies. Deception is broadly defined as the intent to mislead (DePaulo et al., 2003) extending beyond lies to include omission, manipulation, and exaggeration (Englehardt & Pritchard, 2019; Levine, 2014). Understanding the types of lies, the behaviour of liars and the methods of detection would be beneficial not only for the individual but for society in general (Granhag et al., 2015).

1.2. Deception detection

Research consistently shows that humans are generally poor lie detectors, with average accuracy close to chance (Bond & DePaulo, 2006). The main reason is because deception is not associated with a single, universal trait, and individual differences, cognitive load, or motivation can mask deceptive cues (Vrij & Ganis, 2014). Vrij and Ganis (2014) outline four general approaches to lie detection: physiological, behavioural,

verbal and neural. Each approach attempts to link an internal deceptive state to measurable indicators, although none provide perfect accuracy due to overlap between deceptive and non-deceptive processes. *Physiological approaches* track various physiological changes, such as heart rate (e.g., Speth et al., 2021; Vance et al., 2022) or facial temperature (e.g., Gálvez-García et al., 2021; Hypšová et al., 2024; Moliné et al., 2017, 2018; Panasiti et al., 2016), *behavioural approaches* examine non-verbal cues (e.g., Hypšová et al., 2024; Matsumoto & Hwang, 2018; Nam et al., 2023), *verbal analyses* examine inconsistencies in narrative (e.g., Deeb et al., 2023, 2024; Vrij et al., 2022), and *neuro-imaging studies* identify deception-specific brain activity (e.g., Delgado-Herrera et al., 2021; Zheltyakova et al., 2020).

1.2.1. Physiological deception detection

Physiological approaches to lie detection are based on the idea that deception triggers measurable changes in the activity of the autonomic nervous system. Historically, these changes were monitored using the polygraph, which records variables such as heart rate, blood pressure, respiration and skin conductance (Meijer & Verschuere, 2014). Commonly used polygraphs methods include the Comparison Question Test (CQT), and the Concealed Information Test (CIT), which measure physiological reactions to relevant or familiar stimuli (Meijer & Verschuere, 2014). Although both methods perform better than chance, they have been criticised for their contact-based character (Ben-Shakhar, 2008).

Advances in technology have led to the development of non-contact tools, such as fITI, which detects subtle changes in facial temperature (Ioannou, Gallese, et al., 2014), and rPPG to measure heart rate via skin colour changes (Benedetto et al., 2019). Research shows region-specific thermal changes during deception, such as a decrease in nasal temperature due to stress-induced vasoconstriction and an increase in cheek temperature related to impression management (Gálvez-García et al., 2021; Moliné et al., 2017; Panasiti et al., 2016). The forehead usually shows only minimal thermal changes, although some increases occur under cognitive stress (Zhu et al., 2007). Heart rate, a key indicator of autonomic activity, (Berntson et al., 2017), also reflect deception. Specifically, deceptive responses often show an initial acceleration in heart rate due to increased vigilance and mental load, followed by a deceleration related to evaluative processing and attentional control (Gamer et al., 2006; Verschuere et al., 2009).

1.2.2. Facial emotion (micro)expressions and deception detection

Facial expressions, especially micro-expressions, are thought to reveal emotions that liars try to suppress, such as fear, guilt or anxiety (Ekman, 2009; Matsumoto & Hwang, 2018). These rapid, involuntary movements are analysed using the Facial Action Coding System (FACS), which identifies muscle movements known as action units (AUs). Certain AUs, such as AU4, AU12, and AU45, have been associated with deception (Avola et al., 2019). In addition, emotional valence and arousal help capture subtle, mixed emotional states and are more

consistent with neuroscience by reflecting both emotional and physiological responses (Posner et al., 2005).

1.2.3. Eye-tracking and deception detection

Research shows that liars generally exhibit fewer fixations, often avoiding the interviewer's face (Hypšová et al., 2024). In addition, people often try to appear more convincing through direct eye contact (DePaulo et al., 2003; Mann et al., 2013), especially during prepared deception with lower cognitive demands (Hypšová et al., 2024). However, the opposite was observed in spontaneous deception, with participants being less fixated on the interviewer's eyes (Hypšová et al., 2024), likely due to the increased cognitive load associated with spontaneous lying, which requires considerable executive control (Warmelink et al., 2019; Yin et al., 2016).

1.3. Moderation between attachment avoidance, deceiver's behaviour and physiology

Attachment theory helps to explain how individuals regulate their emotions during deception. Avoidant-attached individuals rely on deactivating emotion regulation strategies that suppress the expression of emotions especially in stressful situations (Frías et al., 2014; Mikulincer & Shaver, 2019). However, this external calm does not mean that they show no internal reactions. Studies show that they often experience increased physiological activation – such as increased heart rate and skin conductance – even though they appear calm (Diamond et al., 2006; Ehrenthal et al., 2011).

1.4. Ethical aspects of deception detection research

Deception research raises ethical concerns, especially with methods such as fITI, rPPG and eye-tracking, which capture involuntary responses outside the participants' awareness (Fischer, 2020). These instruments should be seen as indicators and not as definitive lie detectors. To protect autonomy and privacy, researchers must clearly communicate this distinction. According to APA standards, informed consent, full disclosure of procedures and risks, and IRB approval are essential to address ethical issues before research begins.

2 EMPIRICAL PART

2.1. Research problem and research objectives

Deception is a common aspect of human communication and ranges from harmless white lies to those with serious legal or personal consequences (DePaulo et al., 1996; Vrij & Ganis, 2014). Traditional methods of lie detection such as polygraphs have been criticised for their low ecological validity, vulnerability to countermeasures and invasiveness (Synnott et al., 2015; Vrij & Ganis, 2014). In response, researchers have turned to non-invasive techniques such as fITI, rPPG, eye-tracking and expression analysis to enable more flexible detection (Borza et al., 2018; Hypšová et al., 2024; Moliné et al., 2017; Speth et al., 2021; Vance et al., 2022). However, each modality has its limitations. Studies on fITI often lack standardised protocols, clear ROI definitions and selection. Emotion analysis suffers from a reliance on weak ground truths, and eye-tracking research rarely addresses the effects of cognitive load on gaze behaviour. Few studies have compared spontaneous and rehearsed deception or investigated how different cognitive loads affect non-invasive deception detection.

An unexplored but important factor is the role of individual differences, such as attachment avoidance. Avoidantly attached individuals suppress the expression of emotions (Mikulincer & Shaver, 2019) and often appear calm, but physiological studies show increased physiological reactions (Diamond et al., 2006; Kim, 2006).

This dissertation therefore aims: (1) to evaluate the individual predictive value of four non-invasive modalities (fITI, rPPG, facial expression analysis and eye-tracking) in distinguishing between truthful and deceptive responses; and (2) to investigate how different levels of cognitive load (rehearsed truth, rehearsed lie, spontaneous truth, and spontaneous lie) influence deception detection accuracy for each modality. A secondary aim is to develop and test a customised software tool for pre-processing thermal data. Finally, the study investigates whether individual differences in attachment avoidance moderate the relationship between behavioural and physiological responses and deception detection accuracy, separately assessing moderation effects for each modality. Although all measurements were conducted in controlled laboratory environment, the setting was designed to resemble everyday interpersonal communication.

2.2. Methods and conducted studies

The research followed a stepwise process that began with an initial case study that formed the basis for two pilot studies aimed at refining experimental designs and validating measurement instruments. The findings from these studies were then integrated into the final design of the main study.

2.2.1. Ethics

All participants gave written informed consent, and the individuals depicted in several figures in the thesis consented to its publication. The study followed the ethical guidelines of the APA (APA, 2017) and was approved by the IRB of Palacký University (FF UP Ethics Panel for Research, Ref. No. 03/2023).

2.2.2. Case study

The first case study (Hypšová & Seitl, 2022) tested the feasibility of combining fITI, rPPG and automatic facial expression analysis with FaceReader. The participant engaged in both rehearsed and spontaneous truth and lie scenarios with a simulated interviewer (Ma et al., 2015). Spontaneous lies were associated with a lower nasal temperature, a slight warming of the cheeks, an increased heart rate and more expressions of fear and surprise, indicating greater emotional and physiological arousal during spontaneous lies. Furthermore, the results emphasised the need for automated processing of fITI data.

2.2.3. Pilot Study 1

This study (Hypšová et al., 2024), funded by the Czech Ministry of Education (IGA_FF_2022_035), involved 15 participants and introduced methodological advances, including the first implementation of automated tool for processing thermal images, developed specifically in collaboration with RNDr. Stanislav Popelka, Ph.D. (Department of Geonformatics, UP). The study investigated the differences in facial temperature and eye fixations under conditions with different cognitive load (rehearsed-spontaneous) and veracity (truth/lie).

Results showed no significant differences in facial temperature between deception and truth, but spontaneity was associated with significantly higher forehead and cheek temperatures, likely reflecting increased cognitive load. However, eye fixations showed stronger effects: participants

fixated the interviewer's eyes more frequently during rehearsed deception than during spontaneous, supporting the idea that liars intentionally use gaze to control impressions (DePaulo et al., 2003; Mann et al., 2013) when cognitive resources are available (Vrij & Granhag, 2012). Spontaneous lies, which place higher demands on the executive, led to lower eye contact, consistent with the hypothesis that cognitive load inhibits gaze behaviour (Doherty-Sneddon & Phelps, 2005). A significant interaction between rehearsal and veracity on gaze behaviour indicated that behavioural cues to deception are highly context-dependent and influenced by cognitive availability (Hypšová et al., 2024).

2.2.4. Pilot study 2

In this study (Hypšová et al., in review), funded by the Czech Ministry of Education research grant IGA_FF_2023_035, ecological validity was increased by using a real interviewer in a simulated job interview with a four-condition structure. A MATLAB-based framework developed together with Ing. Jan Kubíček, Ph.D. (Technical University of Ostrava) was successfully used to automatically extract and track thermal features in videos, allowing continuous ROI tracking despite head movements. The study investigated the differences in facial temperature under conditions with different cognitive load (rehearsed-spontaneous) and veracity (truth/lie).

Mixed model analysis showed no significant overall effect of faking, $F(1, 398) = 3.40$, $p = .066$, $\eta_p^2 = .008$. However, there was a significant main effect of rehearsal, $F(1, 398) = 13.09$, $p < .001$, $\eta_p^2 = .032$, and a significant

interaction between all conditions and ROI, $F(12, 494) = 1.934$, $p < .05$, $\eta_p^2 = .045$. Nasal temperature was significantly higher at baseline than during spontaneous truth ($M_{diff} = 0.361$, $SE = 0.066$, $p < .001$), and higher in both rehearsed lie ($M_{diff} = 0.272$, $SE = 0.066$, $p < .001$) and rehearsed truth ($M_{diff} = 0.318$, $SE = 0.066$, $p < .001$) compared to spontaneous truth. Spontaneous lies also showed higher nasal temperature than spontaneous truths ($M_{diff} = 0.193$, $SE = 0.066$, $p < .05$), indicating the nasal region's sensitivity to cognitive and emotional demands in spontaneous responses. In forehead and cheeks, no significant differences were found between any conditions, including rehearsed and spontaneous responses.

Our findings suggest that spontaneous responses, whether true or deceptive, elicit higher nasal thermal reactivity, which is likely due to increased anxiety or uncertainty (Gálvez-García et al., 2021; Moliné et al., 2017). The spontaneous truth caused the nasal temperature to drop the most, possibly reflecting the fear of not being believed. This is consistent with polygraph research, where innocent participants may respond more strongly to relevant questions (National Research Council, 2003). Future studies should therefore investigate variability within truthful responses as an important source of thermal change.

2.2.5. Main study

The main study had three objectives: a) to individually investigate deception detection using fITI, FaceReader, rPPG and eye-tracking; b) to evaluate its effectiveness under different cognitive load conditions (rehearsed and

spontaneous truth and lie); and c) to test if attachment avoidance moderates the deception detection.

To achieve the above objectives, a within-subject experimental design was conducted with 100[1] participants (aged 18 – 35; 64 % female) using three technologies: Fluke Ti450 Pro thermal camera for facial temperature (n = 96), FaceReader 9.0 for emotional expression and heart rate via rPPG (n = 97) and Tobii Pro Spectrum 300 eye-tracker for gaze behaviour (n = 55). Attachment avoidance was measured by 36-items long Czech version of the Experiences in Close Relationships questionnaire (Lečbych & Pospíšilíková, 2012).

The procedure involved initial small talk condition which served to help participants build rapport, and collect baseline physiological and behavioural data in a neutral conversational context. The experimental interview than involved equally counterbalanced rehearsed and spontaneous truth and deception conditions. In rehearsed conditions, participants prepared truthful and deceptive answers over 7 days. In the spontaneous conditions, they completed two tasks prior to the experiment and then provided a truthful and a deceptive response about these recent activities. A possibility to win €158 was introduced to increase motivation.

Linear mixed-effects models were the primary method used, accounting for fixed and random effects and repeated measures. This approach suited the data across conditions.

[1] **Note.** However, because the main study was conducted using three different technologies, each with its own measurement protocols which need to be followed, the final number of participants for each analysis differed.

Cluster analysis explored individual differences in nasal thermal reactivity, and a moderation analysis tested the impact of attachment avoidance on physiological and behavioural responses to deception.

No consistent deception-specific effects were found for facial temperature, but nasal temperature was found to be the most sensitive marker – not for deception itself. A linear mixed-effects model showed a significant effect of condition, $F(4, 352) = 11.56$, $p < .001$, $\eta_p^2 = .12$; post-hoc tests showed baseline nasal temperature (M = 32.4°C, SE = 0.22) was significantly higher than in all experimental conditions (e.g., spontaneous lie: M_{diff} = 0.19°C, SE = 0.04, $p < .001$). A cluster analysis also showed that the deception-induced nasal cooling possibly only occurred in physiologically reactive subgroups although not significantly. Attachment avoidance was also associated with thermal responses: a significant region × avoidance interaction was found, $F(4, 1785.04) = 3.47$, $p < .05$, $\eta_p^2 = .008$, especially between low and high avoidance in the nose (M = –0.742, SE = 0.352, $p < .05$) and right cheek (M = –0.825, SE = 0.352, $p < .05$) temperature. These effects did not remain significant after Bonferroni correction.

Heart rate data showed a clearer pattern: lying led to significantly higher rates than truth-telling, $F(1, 290.15) = 10.67$, $p < .001$, $\eta_p^2 = .04$ ($M_{deception}$ = 87.52 bpm; M_{truth} = 85.56 bpm). The highest rates occurred during spontaneous lies (M = 88.0 bpm), followed by rehearsed lies (M = 87.1 bpm), with condition-specific differences significant, $F(4,385,04) = 9.84$, $p < .001$, $\eta_p^2 = .09$. A significant effect of attachment avoidance was also found, $F(1, 82.12) = 4.42$,

p < .05, η_p^2 = .05, indicating that higher avoidance was linked to elevated heart rates across conditions. The condition × avoidance interaction was not significant, F(4, 325.30) = 1.39, p = .238, η_p^2 = .02.

The FaceReader data did not show a significant effect of veracity on arousal, F(1, 290.43) = 0.003, p = .953, η_p^2 = <.001 or valence, F(1, 290.39) = 0.83, p = .362, η_p^2 = .003, However, rehearsal significantly influenced both: spontaneous responses led to higher arousal, F(1, 290.35) = 73.92, p < .001, η_p^2 = .20 and more positive valence, F(4, 325.17) = 24.25, p < .001, η_p^2 = .23, especially compared to rehearsed lies. Attachment avoidance had no significant effect on valence, F(1, 82.23) = 0.41, p = .526, η_p^2 = .005, or arousal, F(1, 82.31) = 0.47, p = .497, η_p^2 < .01, nor did it interact significantly with condition for each measure.

Eye fixation data showed no deception-specific gaze differences. Across conditions, participants focused more on the lower face than eyes or background, F(2, 37.38) = 34.48, p < .001, η_p^2 = .65., unaffected by deception or rehearsal. However, avoidance significantly influenced gaze patterns (F(2, 321.82) = 8.53, p < .001, η_p^2 = .05): higher avoidance was associated with less focus on the lower face and more focus on the background and the upper face.

2.3. General discussion

The aim of this dissertation was to investigate deception detection using a non-invasive approach (fITI, FaceReader, rPPG, eye-tracking) and to consider the

moderating role of attachment avoidance and cognitive load (spontaneity vs. rehearsal). Despite strong theoretical grounding and a case study and two pilot studies, most of the hypotheses were not supported.

First facial temperature did not reliably distinguish between truth and deception, contrasting with previous studies (Gálvez-García et al., 2021; Moliné et al., 2017, 2018; Panasiti et al., 2016; Zhu et al., 2007). This could be due to the low stakes of the task, which probably did not elicit sufficient emotional arousal for strong autonomic responses. While neither deception nor rehearsal affected temperature, nasal cooling occurred in all conditions, likely reflecting overall task-related stress. Furthermore, our use of linear mixed-effects models, which are more robust to individual variability – may have explained the lack of significant effects found in previous studies using repeated-measures ANOVA, which may have overestimated deception-induced thermal changes.

Heart rate proved to be a more robust physiological indicator, with higher bpm during deception, supporting theories that lying increases autonomic arousal due to cognitive and emotional demands. No significant difference was found between rehearsed and spontaneous responses, possibly because under rehearsal participants remained cognitively preoccupied with maintaining rehearsed role (Vrij et al., 2011). Heart rate was elevated also during the rehearsed truths, suggesting a more general physiological response to the complexity of the task, the attentional demands (Andreassi, 2010), and social evaluation (Dickerson & Kemeny, 2004), rather than the deception alone.

From a behavioural perspective, emotional valence and arousal did not differ between lies and truths, contradicting theories such as leakage theory (Ekman & Friesen, 1969) or self-presentation theory (DePaulo, 1992). Spontaneous responses showed higher arousal and more positive valence than rehearsed ones, likely due to greater emotional engagement and lower suppression – consistent with theories of emotion regulation, and impression management (Zloteanu et al., 2021). Interestingly, arousal was highest during small talk, likely due to anticipatory anxiety and stress (Buller & Burgoon, 1996) emphasising the importance of baseline choice in deception research (Ioannou, Morris, et al., 2014).

The analysis of attachment avoidance as a moderator showed a consistent link to increased physiological responses, although no visible behavioural signs were present. This supports theories of emotion regulation that suggest that avoidantly attached individuals suppress external expression while experiencing heightened physiological activation (Diamond et al., 2006).

The eye-tracking data showed no deception-specific gaze patterns. In all conditions, participants focused more on the lower face, likely due to speech monitoring (Buchan et al., 2008; Rosenblum et al., 2007) or due to the interviewer's affective demeanour (Beaudry et al., 2014; Calvo et al., 2018; Hunnius et al., 2011), and less on the eyes or background. However, avoidance significantly influenced gaze behaviour: highly avoidant individuals consistently fixated less at emotionally salient areas (e.g., the mouth) and more at neutral

or peripheral regions such as the background and upper face. This is consistent with theories of emotional deactivation in which avoidant individuals emotionally withdraw while observing the reactions of others (Uccula et al., 2022). Their focus on the upper face may have reflected a strategy of observation without emotional involvement (Török-Suri et al., 2025).

This dissertation acknowledges several key limitations. The spontaneous truth condition may have increased cognitive load, blurring the line between honesty and deception. Valence/arousal measures lacked sensitivity to subtle expressions. Heart rate analysis was limited by reliance on rPPG and absence of HRV data, while manual AOI coding in eye-tracking risked bias. Future research should adopt automated dynamic analyses and advanced models like GLMM and SDT. Interdisciplinary collaboration will be vital to refine deception detection, integrating pupillometry, AU-level facial analysis, and machine learning for broader, person-centred deception detection.

Overall, this dissertation challenges the idea of universal indicators of deception by emphasising the role of context, cognitive load and attachment avoidance. While the effects of deception were weaker than expected, the consistent patterns related to cognitive and personality factors demonstrate the complexity of deceptive behaviour. The study also provided two frameworks for automated thermal data pre-processing, providing tools for future research and application.

LITERATURE

Andreassi, J. L. (2010). *Psychophysiology* (0 ed.). Psychology Press. https://doi.org/10.4324/9780203880340

Avola, D., Cinque, L., Foresti, G. L., & Pannone, D. (2019). Automatic Deception Detection in RGB videos using Facial Action Units. *Proceedings of the 13th International Conference on Distributed Smart Cameras*, 1–6. https://doi.org/10.1145/3349801.3349806

Baima, N. R., & Paytas, T. (2020). True in Word and Deed: Plato on the Impossibility of Divine Deception. *Journal of the History of Philosophy*, *58*(2), 193–214. https://doi.org/10.1353/hph.2020.0036

Beaudry, O., Roy-Charland, A., Perron, M., Cormier, I., & Tapp, R. (2014). Featural processing in recognition of emotional facial expressions. *Cognition and Emotion*, *28*(3), 416–432. https://doi.org/10.1080/02699931.2013.833500

Benedetto, S., Caldato, C., Greenwood, D. C., Bartoli, N., Pensabene, V., & Actis, P. (2019). Remote heart rate monitoring—Assessment of the Facereader rPPg by Noldus. *PLOS ONE*, *14*(11), e0225592. https://doi.org/10.1371/journal.pone.0225592

Ben-Shakhar, G. (2008). The case against the use of polygraph examinations to monitor post-conviction sex offenders. *Legal and Criminological Psychology*, *13*(2), 191–207. https://doi.org/10.1348/135532508X298577

Berntson, G. G., Quigley, K. S., Norman, G. J., & Lozano, D. L. (2017). Cardiovascular psychophysiology. In *Handbook of psychophysiology, 4th ed* (pp. 183–216). Cambridge University Press.

Bond, C. F., & DePaulo, B. M. (2006). Accuracy of Deception Judgments. *Personality and Social Psychology Review*, *10*(3), 214–234. https://doi.org/10.1207/s15327957pspr1003_2

Borza, D., Itu, R., & Danescu, R. (2018). In the Eye of the Deceiver: Analyzing Eye Movements as a Cue to Deception. *Journal of Imaging*, *4*(10), 120. https://doi.org/10.3390/jimaging4100120

Buchan, J. N., Paré, M., & Munhall, K. G. (2008). The effect of varying talker identity and listening conditions on gaze behavior during audiovisual speech perception. *Brain Research*, *1242*, 162–171. https://doi.org/10.1016/j.brainres.2008.06.083

Calvo, M. G., Fernández-Martín, A., Gutiérrez-García, A., & Lundqvist, D. (2018). Selective eye fixations on diagnostic face regions of dynamic emotional expressions: KDEF-dyn database. *Scientific Reports*, *8*(1), 17039. https://doi.org/10.1038/s41598-018-35259-w

Clear, S. J., Gardner, A. A., Webb, H. J., & Zimmer-Gembeck, M. J. (2020). Common and Distinct Correlates of Depression, Anxiety, and Aggression: Attachment and Emotion Regulation of Sadness and Anger. *Journal of Adult Development*, *27*(3), 181–191. https://doi.org/10.1007/s10804-019-09333-0

Deeb, H., Vrij, A., Leal, S., Giorgianni, D., Hypšová, P., & Mann, S. (2024). Exposing Suspects to Their Sketches in Repeated Interviews to Elicit Information and Veracity Cues. *The European Journal of Psychology Applied to Legal Context*, *16*(1), 1–15. https://doi.org/10.5093/ejpalc2024a1

Deeb, H., Vrij, A., Palena, N., Hypšová, P., Dib, G., Leal, S., & Mann, S. (2023). 'Honesty Repeats Itself: Comparing Manual and Automated Coding of Verbal Veracity Cues'. *Applied Psycholinguistics*, *45*(5), 934–962. https://doi.org/10.1017/S0142716424000298

Delgado-Herrera, M., Reyes-Aguilar, A., & Giordano, M. (2021). What Deception Tasks Used in the Lab Really Do: Systematic Review and Meta-analysis of Ecological Validity of fMRI Deception Tasks. *Neuroscience*, *468*, 88–109. https://doi.org/10.1016/j.neuroscience.2021.06.005

DePaulo, B. M. (1992). Nonverbal behavior and self-presentation. *Psychological Bulletin*, *111*(2), 203–243. https://doi.org/10.1037/0033-2909.111.2.203

DePaulo, B. M., Kashy, D. A., Kirkendol, S. E., Wyer, M. M., & Epstein, J. A. (1996). Lying in everyday life. *Journal of Personality and Social Psychology*, *70*(5), 979–995. https://doi.org/10.1037/0022-3514.70.5.979

DePaulo, B. M., Lindsay, J. J., Malone, B. E., Muhlenbruck, L., Charlton, K., & Cooper, H. (2003). Cues to deception. *Psychological*

Bulletin, *129*(1), 74–118. https://doi.org/10.1037/0033-2909.129.1.74

Diamond, L. M., Hicks, A. M., & Otter-Henderson, K. (2006). Physiological evidence for repressive coping among avoidantly attached adults. *Journal of Social and Personal Relationships*, *23*(2), 205–229. https://doi.org/10.1177/0265407506062470

Dickerson, S. S., & Kemeny, M. E. (2004). Acute Stressors and Cortisol Responses: A Theoretical Integration and Synthesis of Laboratory Research. *Psychological Bulletin*, *130*(3), 355–391. https://doi.org/10.1037/0033-2909.130.3.355

Doherty-Sneddon, G., & Phelps, F. G. (2005). Gaze aversion: A response to cognitive or social difficulty? *Memory & Cognition*, *33*(4), 727–733. https://doi.org/10.3758/BF03195338

Ehrenthal, J. C., Friederich, H., & Schauenburg, H. (2011). Separation recall: Psychophysiological response-patterns in an attachment-related short-term stressor. *Stress and Health*, *27*(3), 251–255. https://doi.org/10.1002/smi.1326

Ekman, P. (2009). *Telling lies: Clues to deceit in the marketplace, politics, and marriage* (4th ed.). W.W. Norton.

Ekman, P., & Friesen, W. V. (1969). Nonverbal Leakage and Clues to Deception †. *Psychiatry*, *32*(1), 88–106. https://doi.org/10.1080/00332747.1969.11023575

Englehardt, E. E., & Pritchard, M. S. (2019). Moral Dimensions of Deceptive Communication. In T. Docan-Morgan (Ed.), *The Palgrave Handbook of Deceptive Communication* (pp. 91–106). Springer International Publishing. https://doi.org/10.1007/978-3-319-96334-1_5

Fischer, L. (2020). The Idea of Reading Someone's Thoughts in Contemporary Lie Detection Techniques. In L. Schlicht, C. Seemann, & C. Kassung (Eds.), *Mind Reading as a Cultural Practice* (pp. 109–137). Springer International Publishing. https://doi.org/10.1007/978-3-030-39419-6_6

Frías, M. T., Shaver, P. R., & Díaz-Loving, R. (2014). Individualism and collectivism as moderators of the association between attachment insecurities, coping, and social support. *Journal of Social and Personal Relationships*, *31*(1), 3–31. https://doi.org/10.1177/0265407513484631

Gálvez-García, G., Fernández-Gómez, J., Bascour-Sandoval, C., Albayay, J., González-Quiñones, J. J., Moliné, A., Pérez-Luco, R., Boso, A., & Gómez-Milán, E. (2021). A trifactorial model of detection of deception using thermography. *Psychology, Crime & Law*, *27*(5), 405–426. https://doi.org/10.1080/1068316X.2020.1815198

Gamer, M., Rill, H.-G., Vossel, G., & Gödert, H. W. (2006). Psychophysiological and vocal measures in the detection of guilty knowledge. *International Journal of Psychophysiology*, *60*(1), 76–87. https://doi.org/10.1016/j.ijpsycho.2005.05.006

Granhag, P. A., Vrij, A., & Verschuere, B. (Eds.). (2015). *Detecting deception: Current challenges and cognitive approaches*. Wiley Blackwell.

Hunnius, S., De Wit, T. C. J., Vrins, S., & Von Hofsten, C. (2011). Facing threat: Infants' and adults' visual scanning of faces with neutral, happy, sad, angry, and fearful emotional expressions. *Cognition & Emotion*, *25*(2), 193–205. https://doi.org/10.1080/15298861003771189

Hypšová, P., & Seitl, M. (2022). *Infračervené termovizní snímání a analýza mimiky při detekci úmyslného zkreslování informací—Případová studie*. https://doi.org/10.13140/RG.2.2.12916.42885

Hypšová, P., Seitl, M., Popelka, S., & Dostál, D. (2024). Infrared thermal imaging and eye-tracking for deception detection: A laboratory study. *Current Psychology*. https://doi.org/10.1007/s12144-024-06840-6

Ikuenobe, P. (2002). The Meta-Ethical Issue of the Nature of Lying: Implications for Moral Education. *Studies in Philosophy and Education*, *21*(1), 37–63. https://doi.org/10.1023/A:1014446323547

Ioannou, S., Gallese, V., & Merla, A. (2014). Thermal infrared imaging in psychophysiology: Potentialities and limits. *Psychophysiology*, *51*(10), 951–963. https://doi.org/10.1111/psyp.12243

Ioannou, S., Morris, P., Mercer, H., Baker, M., Gallese, V., & Reddy, V. (2014). Proximity and gaze influences facial temperature: A thermal infrared imaging study. *Frontiers in Psychology*, *5*. https://doi.org/10.3389/fpsyg.2014.00845

Kalbfleisch, P. J., & Docan-Morgan, T. (2019). Defining Truthfulness, Deception, and Related Concepts. In T. Docan-Morgan (Ed.), *The Palgrave Handbook of Deceptive Communication* (pp. 29–39). Springer International Publishing. https://doi.org/10.1007/978-3-319-96334-1_2

Kim, Y. (2006). Gender, attachment, and relationship duration on cardiovascular reactivity to stress in a laboratory study of dating couples. *Personal Relationships*, *13*(1), 103–114. https://doi.org/10.1111/j.1475-6811.2006.00107.x

Lečbych, M., & Pospíšilíková, K. (2012). Česká verze čkály Experiences in Close Relationships (ECR): Pilotní posouzení vztahové vazby v dospělosti. *E-psychologie*, *6*(3), 1–11.

Levine, T. R. (2014). Truth-Default Theory (TDT): A Theory of Human Deception and Deception Detection. *Journal of Language and Social Psychology*, *33*(4), 378–392. https://doi.org/10.1177/0261927X14535916

Li, Y., Bian, J., & Song, R. (2024). Video-based deception detection using wrapper-based feature selection. *2024 IEEE International Conference on Computational Intelligence and Virtual Environments for Measurement Systems and Applications (CIVEMSA)*, 1–5. https://doi.org/10.1109/CIVEMSA58715.2024.10586610

Ma, D. S., Correll, J., & Wittenbrink, B. (2015). The Chicago face database: A free stimulus set of faces and norming data. *Behavior Research Methods*, *47*(4), 1122–1135. https://doi.org/10.3758/s13428-014-0532-5

Mann, S., Ewens, S., Shaw, D., Vrij, A., Leal, S., & Hillman, J. (2013). Lying Eyes: Why Liars Seek Deliberate Eye Contact. *Psychiatry, Psychology and Law*, *20*(3), 452–461. https://doi.org/10.1080/13218719.2013.791218

Matsumoto, D., & Hwang, H. C. (2018). Microexpressions Differentiate Truths From Lies About Future Malicious Intent. *Frontiers in Psychology*, *9*, 2545. https://doi.org/10.3389/fpsyg.2018.02545

Meijer, E. H., & Verschuere, B. (2014). The Polygraph: Current Practice and New Approaches. In P. A. Granhag, A. Vrij, & B. Verschuere (Eds.), *Detecting Deception* (1st ed., pp. 59–80). Wiley. https://doi.org/10.1002/9781118510001.ch3

Mikulincer, M., & Shaver, P. R. (2019). Attachment orientations and emotion regulation. *Current Opinion in Psychology*, *25*, 6–10. https://doi.org/10.1016/j.copsyc.2018.02.006

Moliné, A., Dominguez, E., Salazar-López, E., Gálvez-García, G., Fernández-Gómez, J., De la Fuente, J., Iborra, O., Tornay, F. J., & Gómez Milán, E. (2018). The mental nose and the Pinocchio effect: Thermography, planning, anxiety, and lies. *Journal of Investigative Psychology and Offender Profiling*, *15*(2), 234–248. https://doi.org/10.1002/jip.1505

Moliné, A., Gálvez-García, G., Fernández-Gómez, J., De la Fuente, J., Iborra, O., Tornay, F., Mata Martín, J. L., Puertollano, M., & Gómez Milán, E. (2017). The Pinocchio effect and the Cold Stress Test: Lies and thermography. *Psychophysiology*, *54*(11), 1621–1631. https://doi.org/10.1111/psyp.12956

Nam, B., Kim, J. Y., Bark, B., Kim, Y., Kim, J., So, S. W., Choi, H. Y., & Kim, I. Y. (2023). FacialCueNet: Unmasking deception - an interpretable model for criminal interrogation using facial expressions. *Applied Intelligence*, *53*(22), 27413–27427. https://doi.org/10.1007/s10489-023-04968-9

National Research Council. (2003). *The polygraph and lie detection*. National Academies Press. https://doi.org/10.17226/10420

Panasiti, M. S., Cardone, D., Pavone, E. F., Mancini, A., Merla, A., & Aglioti, S. M. (2016). Thermal signatures of voluntary deception in ecological conditions. *Scientific Reports*, *6*(1), 35174. https://doi.org/10.1038/srep35174

Posner, J., Russell, J. A., & Peterson, B. S. (2005). The circumplex model of affect: An integrative approach to affective neuroscience, cognitive development, and psycho-pathology. *Development and Psychopathology*, *17*(03). https://doi.org/10.1017/S0954579405050340

Rosenblum, L. D., Miller, R. M., & Sanchez, K. (2007). Lip-Read Me Now, Hear Me Better Later. *Psychological Science*, *18*(5), 392–396. https://doi.org/10.1111/j.1467-9280.2007.01911.x

Speth, J., Vance, N., Czajka, A., Bowyer, K. W., Wright, D., & Flynn, P. (2021). Deception detection and remote physiological monitoring: A dataset and baseline experimental results. *2021 IEEE International Joint Conference on Biometrics*

(IJCB), 1–8. https://doi.org/10.1109/IJCB52358.2021.9484409

Synnott, J., Dietzel, D., & Ioannou, M. (2015). A review of the polygraph: History, methodology and current status. *Crime Psychology Review*, *1*(1), 59–83. https://doi.org/10.1080/23744006.2015.1060080

Török-Suri, K., Németh, K., Baradits, M., & Csukly, G. (2025). Investigating Eye Movements to Examine Attachment-Related Differences in Facial Emotion Perception and Face Memory. *Journal of Imaging*, *11*(2), 60. https://doi.org/10.3390/jimaging11020060

Uccula, A., Mercante, B., Barone, L., & Enrico, P. (2022). Adult Avoidant Attachment, Attention Bias, and Emotional Regulation Patterns: An Eye-Tracking Study. *Behavioral Sciences*, *13*(1), 11. https://doi.org/10.3390/bs13010011

Vance, N., Speth, J., Khan, S., Czajka, A., Bowyer, K. W., Wright, D., & Flynn, P. (2022). Deception Detection and Remote Physiological Monitoring: A Dataset and Baseline Experimental Results. *IEEE Transactions on Biometrics, Behavior, and Identity Science*, *4*(4), 522–532. https://doi.org/10.1109/TBIOM.2022.3218956

Verschuere, B., Crombez, G., Smolders, L., & De Clercq, A. (2009). Differentiating Orienting and Defensive Responses to Concealed Information: The Role of Verbalization. *Applied Psychophysiology and Biofeedback*, *34*(3), 237–244. https://doi.org/10.1007/s10484-009-9093-2

Vrij, A., Edward, K., Roberts, K. P., & Bull, R. (2000). Detecting Deceit via Analysis of Verbal and Nonverbal Behavior. *Journal of Nonverbal Behavior*, *24*(4), 239–263. https://doi.org /10.1023/A:1006610329284

Vrij, A., & Ganis, G. (2014). Theories in Deception and Lie Detection. In *Credibility Assessment* (pp. 301–374). Elsevier. https://doi.org/10.1016/B978-0-12-394433-7.00007-5

Vrij, A., & Granhag, P. A. (2012). Eliciting cues to deception and truth: What matters are the questions asked. *Journal of Applied Research in Memory and Cognition*, *1*(2), 110–117. https://doi.org/10.1016/j.jarmac.2012.02.004

Vrij, A., Granhag, P. A., Ashkenazi, T., Ganis, G., Leal, S., & Fisher, R. P. (2022). Verbal Lie Detection: Its Past, Present and Future.

Brain Sciences, *12*(12), 1644. https://doi.org/10.3390/brainsci12121644

Vrij, A., Granhag, P. A., Mann, S., & Leal, S. (2011). Outsmarting the liars: Toward a cognitive lie detection approach. *Current Directions in Psychological Science*, *20*(1), 28–32. https://doi.org/10.1177/0963721410391245

Warmelink, L., Subramanian, A., Tkacheva, D., & McLatchie, N. (2019). Unexpected questions in deception detection interviews: Does question order matter? *Legal and Criminological Psychology*, *24*(2), 258–272. https://doi.org/10.1111/lcrp.12151

Yin, L., Reuter, M., & Weber, B. (2016). Let the man choose what to do: Neural correlates of spontaneous lying and truth-telling. *Brain and Cognition*, *102*, 13–25. https://doi.org/10.1016/j.bandc.2015.11.007

Zembaty, J. S. (1993). Aristotle on Lying. *Journal of the History of Philosophy*, *31*(1), 7–29. https://doi.org/10.1353/hph.1993.0008

Zheltyakova, M., Kireev, M., Korotkov, A., & Medvedev, S. (2020). Neural mechanisms of deception in a social context: An fMRI replication study. *Scientific Reports*, *10*(1), 10713. https://doi.org/10.1038/s41598-020-67721-z

Zhu, Z., Tsiamyrtzis, P., & Pavlidis, I. (2007). Forehead thermal signature extraction in lie detection. *2007 29th Annual International Conference of the IEEE Engineering in Medicine and Biology Society*, 243–246. https://doi.org/10.1109/IEMBS.2007.4352269

Zloteanu, M., Krumhuber, E. G., & Richardson, D. C. (2021). Acting Surprised: Comparing Perceptions of Different Dynamic Deliberate Expressions. *Journal of Nonverbal Behavior*, *45*(2), 169–185. https://doi.org/10.1007/s10919-020-00349-9

CONCLUSION

This thesis introduces a novel experimental framework for non-invasive deception detection and proposes clear direction for future research. The future focus is on improving data processing automation – especially for thermal and eye-tracking measurements – using machine learning and on increasing ecological validity through emotionally engaging scenarios where the stakes are high. The importance of accounting for individual differences, such as attachment-related characteristics, through person-centred approaches to analysis is needed.

Findings across studies consistently suggest that deception is not characterised by distinct physiological or behavioural signatures; instead, responses are shaped by cognitive load, emotional regulation and individual characteristics. While some markers, such as heart rate, showed signs of deception, others, including facial temperature, emotional arousal, emotional valence and eye fixations, reflected broader task and interpersonal dynamics rather than deception itself. These findings challenge the idea of a universal deception profile and argue for a more nuanced, context-sensitive model that combines stable personality traits with situational demands, and emphasise the need for flexible, theory-driven, and interdisciplinary approaches to deception research.

CZECH SUMMARY / ČESKÝ SOUHRN

Klamání je komplexní forma lidského chování s dopady na justici, bezpečnost i mezilidské vztahy. Tradiční metody detekce lži, jako je polygraf, čelí kritice kvůli své invazivnosti a metodologickým omezením. Tato disertační práce se proto zaměřuje na neinvazivní přístup ke zkoumání klamání, využívající fITI, analýzu emoční exprese, rPPG a eye-tracking. Cílem bylo zjistit, zda tyto technologie dokáží detekovat záměrné zkreslování informací a jakou roli hrají kognitivní zátěž a vztahová vyhýbavost.

Výzkum zahrnoval případovou studii, dvě pilotní studie a hlavní experiment. Případová studie potvrdila proveditelnost kombinace behaviorálních a fyziologických dat a potřebu automatizace zpracování termovizních oblastí zájmu. V první pilotní studii (N = 15) se ukázalo, že spontánní výpovědi vedly k vyšší teplotě obličeje a nižšímu očnímu kontaktu. Byl vyvinut algoritmus pro automatický výběr oblastí zájmu (ve spolupráci s RNDr. Stanislavem Popelkou, Ph.D., Katedra geoinformatiky UP), později nahrazen novým software od Ing. Jana Kubíčka, Ph.D. (Katedra kybernetiky a biomedicínského inženýrství, VŠB Ostrava). Druhá pilotní studie (N = 27) s realistickým scénářem ukázala, že teplota nosu spíše odráží kognitivní zátěž než klamání.

Hlavní studie (N ≈ 100) využila vnitro-subjektový design se čtyřmi podmínkami (spontánní, připravené, pravdivé, klamavé) s doplněním o neutrální konverzační kontext (small-talk). Výsledky neprokázaly konzistentní fyziologické reakce specifické pro klamání. Teplota nosu klesala ve všech

podmínkách, což naznačuje obecnou kognitivní či emoční aktivaci. Srdeční frekvence byla nejvyšší u spontánních lží, což podporuje hypotézu zvýšené aktivace při lhaní. Emoční valence a arousal se nelišily mezi pravdivými a klamavými odpověďmi, ale byly nižší u připravených odpovědí – pravděpodobně kvůli emoční regulaci. Fixace směřovaly převážně na spodní část obličeje tazatele a nebyly ovlivněny typem odpovědi. Vztahová vyhýbavost však souvisela s odlišnými vizuálními vzorci (častější pohledy mimo tazatele) a vyšší fyziologickou reaktivitou, což odpovídá tzv. deaktivačním strategiím. Výsledky zpochybňují existenci univerzálních biomarkerů lži a podporují kontextově a individuálně citlivý přístup.

Zjištění napříč různými studiemi konzistentně naznačují, že klamání nelze jednoznačně identifikovat na základě specifických fyziologických či behaviorálních ukazatelů. Namísto toho jsou reakce jednotlivců formovány kombinací kognitivní zátěže, procesů emoční regulace a individuálních charakteristik. Ačkoli některé indikátory, jako například srdeční frekvence, mohou vykazovat určité souvislosti s klamavým chováním, jiné – včetně teploty obličeje, emočního vzrušení, valence emocí či vizuálních fixací – spíše reflektují komplexní dynamiku interpersonálních interakcí a kontextu daného úkolu než samotný akt klamání. Tato empirická zjištění zpochybňují představu existence univerzálního „profilu lháře“ a podporují přístup založený na diferencovaném, kontextuálně citlivém modelu, který integruje stabilní osobnostní rysy s aktuálními situačními podmínkami. Současně tato perspektiva podtrhuje význam teoreticky ukotvených, flexibilních a interdisciplinárně orientovaných výzkumných strategií při zkoumání fenoménu klamání.

LIST OF PUBLICATIONS DURING DOCTORAL STUDY

Indexed peer reviewed publications (WoS, Scopus)

Kafetsios, K., ..., **Hypšová, P.**, ... & Uskul, A. K. (2025). Higher social class is associated with higher emotion decoding accuracy across cultures. *PLOS ONE, 20*(5), e0323552. https://doi.org/10.1371/journal.pone.0323552

Kafetsios, K., ... , **Hypšová, P.**, ..., & Uskul, A. K. (2024). A contextualized emotion perception assessment relates to personal and social well-being. *Journal of Research in Personality, 114*, 104556. https://doi.org/10.1016/j.jrp.2024.104556

- **Citations in Google Scholar:** 2x Jimp

Deeb, H., Vrij, A., Leal, S., Giorgianni, D., **Hypšová, P.**, and Mann, S. (2024). Exposing Suspects to Their Sketches in Repeated Interviews to Elicit Information and Veracity Cues. *The European Journal of Psychology Applied to Legal Context, 16*(1), 1 - 15. https://doi.org/10.5093/ejpalc2024a1

- **Citations in WoS:** 1x Jimp
- **Citations in Scopus:** 1x Jimp
- **Citations in Google Scholar:** 3x (2x Jimp, 1x D)

Hypšová, P., Seitl, M., Popelka, S., & Dostál, D. (2024). Infrared Thermal Imaging, Eye-Tracking and Remote Photoplethysmography for Deception Detection: A Preliminary Experiment. *Current Psychology.* Online first. https://doi.org/10.1007/s12144-024-06840-6

Deeb, H., Vrij, A., Palena, N., **Hypšová, P.,** Leal, S., & Mann, S. (2024). Honesty Repeats Itself: Comparing Manual and Automated Coding on the Veracity Cues Total Details and Redundancy. *Applied Psycholinguistic.* Online first. https://doi.org/10.1017/S0142716424000298

- **Citations in WoS:** 1x Jimp
- **Citations in Scopus:** 1x Jimp

- **Citations in Google Scholar:** 1x Jimp

Seitl, M., Omastová, E., Sulejmanov, F., Hess, U., Hareli, S., Dostál, D., **Hypšová, P**., & Kafetsios, K. (2023). An Emotional Experience of Work: Attachment Orientations and Emotion Expressions to Work-Related Film Stimuli. *Studia Psychologica, 65*(4), 307–319. https://doi.org/10.31577/sp.2023.04.882

- **Citations in Google Scholar:** 1x thesis

Hypšová, P., & Štindlová, S. (2021). Emoční inteligence příslušníků policie České republiky a běžné populace: vybrané demografické charakteristiky. [Emotional Intelligence of Members of the Police of the Czech Republic and the General Population: Selected Demographic Characteristics]. *Československá psychologie, 65*(6), 592 - 607. https://doi.org/10.51561/cspsych.65.6.592

- **Citations in Google Scholar:** 2x thesis

In review indexed publications (WoS, Scopus)

Hypšová, P., Seitl, M., Kubíček, J., & Mimra, T. (in review, Scientific Reports). Unveiling faking in job interviews: The role of facial thermal cues in deception detection.

Seitl, M., **Hypšová, P.,** Berant, E., Hasoňová, V., Dočkalová, J., Kolařík, M., Viktorová, L., Dostál, D., & Palová, K. (in review). The Popular Responses and Parallel Validity of the Zulliger Test in the Context of Personality Trait Openness to Experience.

Other publications

Hypšová, P., Seitl, M., Kafetsios, K., & Sulejmanov, F. (2023). Překlad a ověření dotazníku emoční regulace (ERQ). [Translation and validation of the Emotion Regulation Questionnaire (ERQ)]. *Proceedings of the 22th*

International Conference of Work and Organizational Psychology.

- **Citations in Google Scholar:** 1x thesis

Hypšová, P., & Seitl, M. (2022). Infračervené termovizní snímání a analýza mimiky při detekci úmyslného zkreslování informací – případová studie. [Infrared Thermal Imaging and Facial Expression Analysis During Deception Detection – Case Experiment]. *Proceedings of the Czech & Slovak Psychological Conference (not only) for Postgraduates and about Postgraduates, 12*(1), 120 – 140. https://doi.org/10.5507/ff.22.24461748

Hypšová, P., & Seitl, M. (2022). Překlad a ověření dotazníku LMX-verze pro leadery. [Translation and Validation of LMX questionnaire for leaders]. *Proceedings of the 21st International Conference of Work Psychology, 21*(1), 101 - 108.

Hypšová, P., & Seitl, M. (2022). Překlad a adaptace Škály pracovní dedikace do českého jazyka. [Translation and Validation of the Job Dedication Scale into Czech]. *E-psychologie, 16*(2), 36 - 53. https://doi.org/10.29364/epsy.443

Hypšová, P., & Seitl, M. (in review). Review of the MSCEIT (Mayer-Salovey-Caruso Emotional Intelligence Test).

Seitl, M., Viktorová, L., & **Hypšová, P.** (2021). Work and Organizational Psychology 2021: Innovation - Research and Application. Proceedings of the 20th International Conference of Work and Organizational Psychology.

Conferences and congresses

Hypšová, P., Seitl, M., & Popelka, S. (2025, April 1-2). *Truth, lies and eye fixations: How personality influences ocular behaviour.* [Invited talk]. Online International Spring School on Visualization, on-line.

Hypšová, P., Kafetsios, K., Seitl, M., Dostal, D., Sulejmanov, F., Perinova, A, Aberlova, E., Hareli, S., & Hess, U. (Oral presentation, July 21-26, 2024). *A Contextualised Test of Emotion Decoding (In)Accuracy Relates to Social Networking and Collectivism*. 33rd International Congress of Psychology.

- **Citations in Google Scholar:** 1x Jimp

Kafetsios, K., Hess, U., Dostal, D., Seitl, M., Sulejmanov, F., **Hypšová, P.,** & Hareli, S. (accepted abstract for paper presentation, July 17-20, 2024). *A contextualized emotion perception assessment relates to well-being: Social interaction as a mediator*. 2024 Conference of the International Society for Research on Emotion.

Hypšová, P., Seitl, M., Popelka, S., & Dostál, D. (2023, December 7-8). *Infrared Thermal Imaging and Eye-Tracking for Deception Detection: A Preliminary Experiment.* [Paper presentation]. Decepticon 2023, on-line.

Hypšová, P., Seitl, M., Kafetsios, K., & Sulejmanov, F. (2023, June 8-9). Translation and Validation of the Emotion Regulation Questionnaire [Paper presentation]. International Conference of Work and Organizational Psychology, Košice, Slovakia.

Debb, H., Vrij, A., Leal, S., Giorgianni, G., Mann, S., & **Hypšová, P.** (2023, June, 6). Exposing Suspects to Their Sketches in Repeated Interviews to Elicit Information and Veracity Cues. [Paper presentation]. Lies and Allies Tuesdays, Deception Research Society, on-line.

Hypšová, P., Seitl, M., & Popelka, S. (2023, May 24-27). Laboratory Design Methodology for Deception Detection Research in Job Interviews: A Case Study. [Poster presentation]. EAWOP Congress, Katowice, Poland.

Hypšová, P., & Seitl, M. (2023, February 6-7). Application of Infrared Thermal Imaging, Eye-Tracking, and

Behavioral Analysis for Deception Detection [Paper presentation]. ICPLDM 2023: 17. International Conference on Psychology, Law and Decision Making, Paris, France.

Hypšová, P., & Seitl, M. (2022, May 26-27). Translation and Validation of LMX Questionnaire for Leaders [Paper presentation]. International Conference of Work and Organizational Psychology, Bratislava, Slovakia.

Hypšová, P., & Seitl, M. (2022, April 1-3). Modern Approaches for Detecting Deception Through Behavioural Analysis and Physiodetection [Invited workshop]. Psychočas Conference: Beyond the Law, Olomouc, Czech Republic.

Hypšová, P., & Seitl, M. (2022, January 31 - February 1). Infrared Thermal Imaging and Facial Expression Analysis During Deception Detection – Case Experiment [Paper presentation]. Ph.D. Existence 12 "Change" Czech & Slovak Psychological Conference (not only) for Postgraduates and about Postgraduates, Olomouc, Czech Republic.

Hypšová, P., & Seitl, M. (2021, May 13-15). Facial Emotion Expression and Thermal Imaging While Detecting Intentional Distortion of Information [Workshop]. International Conference of Work and Organizational Psychology, Olomouc, Czech Republic.

Projects and funds

1. **New technologies for digital healthcare (2024 – 2028)**
   - The project is implemented within the framework of Call No. 02_23_021 Intersectoral Cooperation for ITIs from the Operational Programme Jan Ámos Komenský (CZ.02.01.01/00/23_021/0008829)
   - Position: Researcher

- Main workload: Data collection; statistical analyses; publication of results.

2. **Information Distortion in Dyadic Job Interviews and its Detection Using Non-invasive Technologies (2023 – 2024)**
   - Funding provided by the Czech Ministry of Education, Youth and Sports for specific research, granted in 2023 to Palacký University Olomouc (IGA_FF_2023_035)
   - Position: Principal investigator
   - Main workload: Management of the entire procedure; preparation of the experimental design; statistical analyses; publication of results.
3. **Application of Infrared Thermal Imaging, Eye-tracking and Behavioural Analysis for Deception Detection (2022 – 2023)**
   - Funding provided by the Czech Ministry of Education, Youth and Sports for specific research, granted in 2022 to Palacký University Olomouc (IGA_FF_2022_035)
   - Position: Principal investigator
   - Main workload: management of the entire procedure; reparation of the experimental design; statistical analyses; publication of results.
4. **Accuracy and Bias in the Perception of Facial EMOtion Expressions: Social InterACTion Processes (2022 – 2024)**
   - Funding provided by GA CR Czech Science Foundation (registration number: GA22 15238S) granted in 2022 to the Department of Psychology, Palacký University Olomouc
   - Project leader: prof. Konstantinos Kafetsios, Ph.D.
   - Position: Researcher
   - Main workload: data collection; statistical analyses; publication of results.

ABSTRACT OF THE DOCTORAL THESIS

Name of the thesis: Validity of Non-Invasive Methods for Measuring Behavioural and Physiological Changes in Deception Detection

Author: Mgr. Petra Hypšová

Supervisor: doc. PhDr. Martin Seitl, Ph.D.

Number of pages and characters: 291 pgs.; 567 005 characters

Number of attachments: 3

Number of used references: 585

Abstract: This dissertation investigates the validity of non-invasive methods for deception detection using functional infrared thermal imaging (fITI), remote photoplethysmography (rPPG), facial expression analysis, and eye-tracking. A case study (N = 1), two pilot studies (N1 = 15; N2 = 27) and a main experiment (N ≈ 100) explored deception under different levels of cognitive load (spontaneous vs. rehearsed), veracity (truth vs. lie), and interactions (all conditions including baseline) with attention to moderating role of attachment avoidance. To improve methodological precision, two automated systems for processing thermal data were developed. The results showed an increased heart rate during deception, especially during spontaneous lying, while facial temperature and gaze patterns reflected general task-related demands not deception per se. Emotional valence and arousal varied according to cognitive load, with greater engagement during spontaneous responses. Attachment avoidance moderated physiological responses and gaze behaviour, but not emotional arousal or valence. These findings challenge the notion of universal deception cues and support a context-sensitive, person-centred approach based on individual characteristics and situational factors.

Key words: attachment avoidance; cognitive load; deception detection; eye-tracking; functional infrared thermal imaging (fITI); non-invasive deception detection; remote photo-plethysmography (rPPG)